

# Dental Materials Practical Record

Name : B. AMBARISH KAMATH

Class : II<sup>nd</sup> BDS

Subject : DENTAL MATERIALS

Roll Number : 19D0481

Year : 2020-2021

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**DENTAL MATERIAL  
WORK BOOK**

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# CERTIFICATE

This is to certify that Mr./Miss *B. Ambarish Kamath*.....  
Roll Number *19.DD.481*..... has Satisfactory  
completed the exercise on DENTAL MATERIALS PRACTICALS prescribed by  
RAJIV GANDHI UNIVERSITY OF HEALTH SCIENCES for B.D.S course in the  
laboratory of the institution in the year *2020-21*.....

Date : .....

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Signature of the Examiners : 1. *Praveen*  
2. *Prasad*

Record of Submission :  
Name of the Candidate : *B. Ambarish Kamath*  
University RegNo : *19.DD.481*  
Examination Centre : .....  
Date of Practical Exam : .....

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## INSTRUCTIONS

1. This record book must be kept neat and in good condition.
2. This book will be handed in for progress reports as and when required.
3. Credit will not be given for any work not carried out in the laboratory.
4. No student will be permitted to proceed with his/her work until his/her kit of instruments as prescribed in the official list has been inspected.
5. Students are required to wear clean laboratory aprons with name plates and maintain cleanliness, while working in the lab.
6. Exercise shall be deemed to be completed only when the same is checked and signed by the teacher-in-charge.
7. Attendance in the laboratory will be in accordance with the time table.
8. Un-necessary wastage of water and any materials should be avoided.
9. Excess mixed plaster should be removed from the bowl and placed in the plaster trap. It should not be thrown in the sink.
10. Plaster/stone storage bin must be kept closed when not in use. These materials should be taken out only with clean dry ecoops/spatula.
11. Equipments borrowed from the department should be returned after usage. Under no circumstances must it be placed in a locker and kept for a subsequent session. A student is liable to replace or compensate for equipment that is lost/damaged.
12. No responsibility is taken for student's instruments that are mislaid. Borrowing will not be permitted.

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**GYPSUM PRODUCTS**

GYPSUM: It is a mineral mined in various parts of the world. Various gypsum products are widely used in dentistry.

CHEMICAL FORMULA

Gypsum :  $CaSO_4 \cdot 2H_2O$   
 Gypsum products\* : Plaster of Paris  $\beta CaSO_4 \cdot \frac{1}{2}H_2O$   
 Dental stone  $\alpha CaSO_4 \cdot \frac{1}{2}H_2O$

CLASSIFICATION:

As per A.D.A. Specification No. 25

APPLICATIONS

Type I Impression Plaster: (i) Used in mucostatic impression. (ii) Used in complete denture impression.  
 Type II Dental Plaster: Preliminary cast, diagnostic cast, fabrication of special tray.  
 Type III Dental Stone: For mounting cast on articulator. Fabrication of diagnostic cast, for making mould.  
 Type IV Dental Stone: Used for single tooth prep impression. (higher strength, low expansion)  
 Type V Dental Stone: To prepare dies with increased expansion. (higher strength, higher expansion)

MODE OF SUPPLY:

Powder form (mainly)

COMPOSITION:IMPRESSION PLASTER AND SOLUBLE PLASTER

Dental plaster +  $K_2SO_4$  + Borax + Coloring agents  
+ Flavoring agents.

BALANCED STONE:

$\alpha$ -hemihydrate.  
2-3% - Colouring agent.  
 $K_2SO_4$  - Accelerator  
Borax - Retarder.

INVESTMENT:

$\alpha$ -hemihydrate of gypsum, Quartz, gypsum bonded investment mixed with colloidal silica

DIVESTMENT:

Gypsum bonded investments bonded with colloidal silica

HIGH STRENGTH, HIGH EXPANSION DENTAL STONE:

$\alpha$ -hemihydrate.  
Modifier - accelerator or retarder.

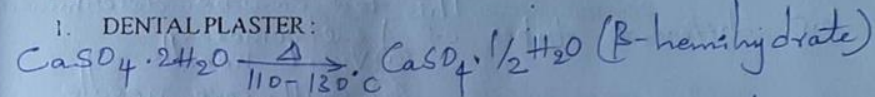
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SYNTHETIC GYPSUM: PANDU MEMORIAL  
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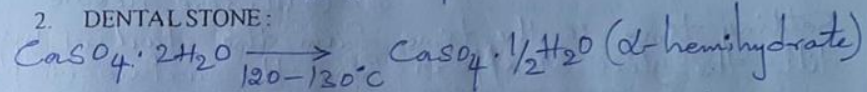
$\alpha$ -hemihydrate of gypsum.  
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MANUFACTURING PROCESS: (CALCINATION)CHEMICAL REACTION:

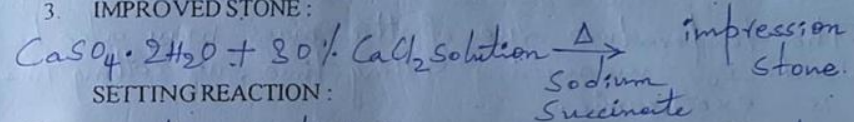
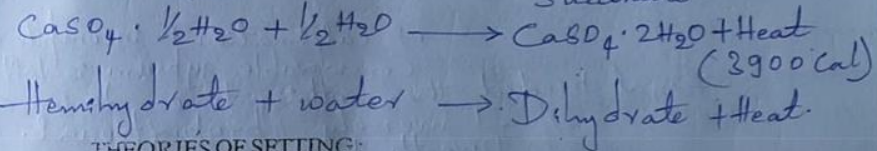
## 1. DENTAL PLASTER:



## 2. DENTAL STONE:



## 3. IMPROVED STONE:

SETTING REACTION:THEORIES OF SETTING:

- (a) Colloidal theory.
- (b) Hydration theory.
- (c) Dissolution precipitation theory.

SETTING TIME:

Initial --- 8-9 min.

Final --- 1 hour.

MEASUREMENT OF SETTING TIME:

- 1. Penetration tests This test can be determined by different types of penetrometer,
  - Ⓐ Vicat needle
  - Ⓑ Gillmore needle
- 2. Loss of Gloss
- 3. Exothermic Reaction

Setting time is the time from the start of mix till the gloss disappear from the surface of plate.

The temperature rise of the mass may also be used for measuring setting time, as setting time is exothermic.

FACTORS AFFECTING SETTING TIME:

- 1. Manufacturing process of calcination is incomplete & considerable gypsum is left in final product then setting time decreases.
- 2. Particle size Inversely proportional.
- 3. Spatulation Directly proportional.
- 4. Modifiers Accelerator - Setting time decreases. Retarder - Setting time increases.
- 5. Effect of Colloidal systems

- (i) Acceleration: Inversely proportional to Setting time
- (ii) Retarders: Directly proportional to Setting time

Strength (N D) is measured when excess H<sub>2</sub>O is not present.

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SETTING EXPANSION:

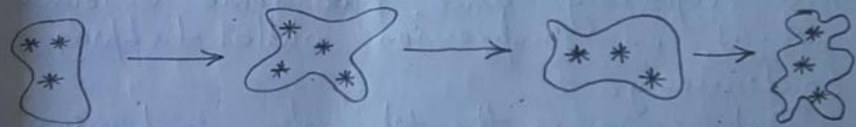
a) Normal setting Expansion --- Setting expansion without water immersion of the setting mass during crystal growth period in normal setting expansion.

b) Hygroscopic setting Expansion --- Setting expansion that occur under water during crystal growth period is hygroscopic setting expansion.

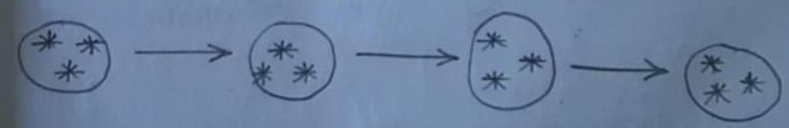
FACTORS AFFECTING SETTING EXPANSION:

- Increased spatulation increases setting expansion
- Increased water/Powder ratio ↓ setting expansion
- Modifiers generally reduces setting expansion. K<sub>2</sub>S<sub>2</sub>O<sub>8</sub> 4% solution reduces, NaH<sub>2</sub>PO<sub>4</sub> ground gypsum increases.

NSE:



HSE:





MANIPULATION :EXPERIMENT :

1. AIM : To study the manipulation of dental plaster and preparation of a block

INSTRUMENTS AND MATERIALS

- |                               |                   |
|-------------------------------|-------------------|
| 1. Flexible large rubber bowl | 6. Porcelain tile |
| 2. Stiff bladed S S spatula   | 7. Sand paper     |
| 3. Plaster knife              | 8. Dental plaster |
| 4. Stop clock                 | 9. Water          |
| 5. Scale                      | 10. Pencil        |

PROCEDURE: W/P ratio : 0.45 - 0.50

Take measured amount of water in a bowl and add dental plaster to it. Mix vigorously and put some amount of it on impression while tapping continuously.

Put some on the tile when impression technique <sup>used</sup> should be done in such a ~~way~~ <sup>that</sup> 3 mm land area and <sup>light</sup> is obtained.

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2. AIM : To study the properties of gypsum products.

- a. Setting time : Initial  
Final
- b. Exothermic reaction
- c. Setting expansion

INSTRUMENTS AND MATERIALS :

- |                      |                   |
|----------------------|-------------------|
| 1. Large rubber bowl | 6. Paper pins     |
| 2. Plaster spatula   | 7. Porcelain tile |
| 3. Stop clock        | 8. Dental plaster |
| 4. Scale             | 9. Water          |
| 5. Plaster knife     | 10. Thermometer   |

PROCEDURE: W:P ratio  $\rightarrow$  0.45 - 0.50.

- ① Water should be measured and powder is weighed.
- ② Water is taken first and powder is dispensed.
- ③ Mix it vigorously in figure of 8 motion or strooping fashion.
- ④ Continue till a smooth creamy mix is got.
- ⑤ Spatulation time 45-60 sec. GRADE :

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DEMONSTRATIONS:

1. AIM: To study the manipulation of dental plaster and preparation of a cast for a compound impression.

Gauging water : W/P = 50 ml. / 100 gms.

PROCEDURE:

Appropriate water/powder ratio is measured & added to bowl. Tap this bowl. mixing is done with a stiff bladed spatula, ensure that no air is trapped in the mix. Once mixing has started do not change W/P ratio. Tap or vibrate the mix and pour into the impression compound.

2. AIM: To study the manipulation of dental stone & pouring and Alginate impression

Gauging water : W/P = 30 ml. / 100 gms.

Powder is weighed (100g) liquid is measured (20ml). Liquid is taken into a bowl, then preweighed powder is added to it. Spatulation is done, mixing a stiff bladed spatula. Vibrate the mix and pour into the impression within 1 hour, immediately as alginate impression undergo dimensional change.

2. AIM: To study the manipulation of die stone & pouring an elastomeric impression

Gauging water : W/P = 25 ml. / 100 gm.

PROCEDURE:

Powder is measured (100g), liquid is measured and taken in rubber bowl. Then preweighed water is added, spatulation using stiff bladed spatula. Once the mix is started, do not change W/P ratio, Tap and pour into impression

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MICROSCOPIC STRUCTURE

- a. Dental plaster: Particles are irregular in shape & porous.
- b. Dental stone: Particles are more uniform, prismatic, porous.
- c. Die stone: Crystals are much more dense and prismatic.
- d. Investment: Crystalline structure.

DIAGRAM OF CRYSTALS:

Dental Plaster



Dental Stone



Die Stone



Investment



10

PROPERTIES	Type I	Type II	Type III	Type IV	Type V
Common names (Classification)	Impression plaster	Dental plaster	Dental stone	Die stone high strength low expansion	Die stone high strength high expansion
Crystal structure	Irregular	Polycrystalline	Prismatic	Subspherical	Subspherical
Setting reaction	$\text{CaSO}_4 \cdot 2\text{H}_2\text{O} \rightarrow 2\text{CaSO}_4 \cdot 2\text{H}_2\text{O} + \text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O} + \text{H}_2\text{O}$				
Gauging water	0.5-0.75	0.45- 0.5	0.28- 0.30	0.22- 0.24	0.18- 0.22
Setting time	4 ± 1	12 ± 4	12 ± 4	12 ± 4	12 ± 4
Wet strength	4	9	20-9	35	48-5
Dry strength	580 ± 240	1300	3500	5000	7000
Surface hardness	82 KHN				
Colour	White green				

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Preparation  
Master  
cast  
bridge wax

Type V  
Preparation  
of die with  
increased expansion

CARE OF GYPSUM PRODUCTS:

Once the setting reaction in cast has been completed, first dimension will be relatively constant, thereafter under ordinary conditions of room temperature & humidity. It's sometime important to soak gypsum in water if it is immersed in turning water, the linear dimension may decrease approx 0.1% for every 20 min of such immersion.

INFECTON CONTROL:

Disinfectant may be employed. Useful disinfectant for stone casts - include spray disinfection hypochlorites and iodophors.

IMPRESSION MATERIALS

DEFINITION OF IMPRESSION: Is an exact negative replica of oral structure with an accurate reproduction of all finer details.  
Maintaining the correct spatial dimension

CLASSIFICATION:

	RIGID	ELASTIC
Set by chemical reaction (Irreversible)	zinc oxide eugenol	Alginate, Polysulfide, Polyether, Addition and condensation silicone.
Set by temperature change (Reversible)	Impression Compound Impression wax.	Agar

IDEAL REQUIREMENTS:

- i). Biological properties: Non-toxic, Non-irritant, biocompatible, easy to disinfect
- ii). Chemical properties: Should be soluble in oral fluids
- iii). Rheological properties: Low viscosity before setting, high viscosity after setting. Should be pourable.
- iv). Thermal properties: 0% minimum coeff of thermal expansion
- v). Longer shelf life: Acceptable taste and odour

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IMPRESSION COMPOUNDCLASSIFICATION:

As per A.D.A. Specification No.3

- Type I --- Low fusing material  
Green stick compound.
- Type II --- High fusing material  
Tray compound.

As an impression material, it is classified as:

- Rigid
- Sets by physical change (reversible)
- Used for edentulous impression

APPLICATIONS:

- Type I --- Stick  
--- Cake  
--- Cones
- Type II --- Tray.

IDEAL REQUIREMENTS:

- Pleasant odour, taste, esthetic odour.
- Adequate shelf life for requirements of storage and distribution
- Freedom from use of irritant constituents.
- Easiest to use with minimum of equipment.
- Dimensionally stable.
- Satisfactory consistency and texture.
- Adequate strength so that it will not break or tear on removal from mouth

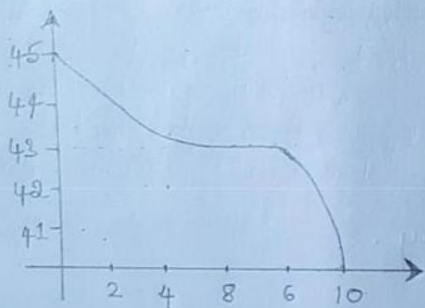
MODE OF SUPPLY:

Cake or sticks.

COMPOSITION:

Ingredients  
Synthetic resin  
Wax  
Plasticizer  
Fillet.

Function  
Thermoplastically produce  
smooth surface.  
Plastically increases strength  
and reduce coeff of TE

FUSION TEMPERATURE:GRAPH:SIGNATURE OF FUSION TEMPERATURE

It indicates a definite reduction in plasticity during cooling. Above the temperature, fatty acids are liquid and form a smooth plastic mass while the impression is being obtained. Thus every details of the mouth tissues is more likely to be reproduced. The tray should be held firmly until the fusion temperature is reached. Below this temperature an accurate and detailed impression cannot be expected.

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MANIPULATION: Softening kneading, loading, tempering, recording, removal, Cast pouring, Cast

EXPERIMENT: removal.

AIM: To study the manipulation and properties of impression compound.

Method of manipulation when used in:

- Large quantity: Thermostatically controlled water bath (were kneading)
- Small quantity: Dry heat over flame.

INSTRUMENT AND MATERIALS

- |   |                      |
|---|----------------------|
| 1. Stock tray                             | 4. Gauge pieces      |
| 2. Impression compound                    | 5. Wax knife         |
| 3. Thermostatically controlled water bath | 6. Bard-parker knife |
|   | 7. Rubber bowl       |

PROCEDURE:

- Softening by heat is pre-requisite. The material should be uniformly soft at the time of placement in tray.
- Thoroughly cooled in the tray before withdrawal from mouth.
- Once the impression tray is seated it should be held in position until is cooled below fusion temperature.

GRADE :

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PROPERTIES:THERMAL PROPERTIES:

a) Thermal conductivity: Low thermal conductivity.

its significance

Indicate the need to allow an extended time to achieve thorough coating and heating of compound first but the inner part does not. So should be kept in water bath for a long time.

(ii) During hardening...

As outer part hardens first and inner part remain soft then we take impression of pattern. Hence should be kept in patent mouth for long.

b) Dimensional change:

High coefficient of thermal expansion, temp. drawn from mouth to room temperature. Poor thermal conductivity contributes to incorporation of stresses in the material. Should not be subjected to thermal changes over removal. Construct the cast after removal.

i) Co efficient of thermal expansion.. Very high

(ii) Thermal contraction (on cooling)

Average linear contraction .... 0.3 to 0.4%

Volume expansion .... 1.38 to 2.29%

Contracts from mouth temperature to room temperature. Not under control of the operator. Special techniques are required to minimize dimensional changes while cooling and setting. They can be minimized by reheating surface the impression in flame and remarking the impression.

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FLOW:

a) Definition: Time dependent plastic deformation.

b) Determination:

A cylinder of the material, 10mm in diameter and 6mm in height, is loaded as a definite temperature with a weight of a 2kg for 10 minutes. The flow is designated as the shortening in length of such specimens during the test.

As per A.D.A. Specification No.3

	37°C	45°C
Type I	6% or less.	85% or more.
Type II	2% or less.	50-80% or more.

CAUSES OF DISTORTION: Increase in temperature results in relaxation of impression compound, can occur in a comparatively short time. This results in warping or distortion of the impression.

PRECAUTIONS:

- a) Overheating: When overheated becomes brittle.
- b) Prolonged heating: It causes it to become brittle & grainy due to leaking of plasticizer.
- c) Overkneading: Incorporation of air and water in compound which act as plasticizers and increase the flow of the hardened compound at mouth temperature.

Cooling with water spray: Cold water can be sprayed on the tray while it is in the mouth until the compound is thoroughly hardened prior to removal from the mouth. It accelerates the setting reaction.

- POURING OF CAST:
- Dental plaster is mixed and poured
  - Air bubbles are avoided.
  - Softening the compound in hot water bath

### LIMITATIONS:

Non elastic  
 High-coefficient of thermal expansion  
 Low-conductivity  
 It's unhygienic surface  
 Doesn't reproduce fine surface details.

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## ZINC OXIDE EUGENOL IMPRESSION PASTE

### CLASSIFICATION

As per A.D.A. Specification No. 16

Type I --- Hard

Type II --- Soft

As an impression material, it is classified as.

- ... Rigid
- ... Set by chemical change (irreversible)
- ... Used for edentulous impression.

### APPLICATIONS:

1. Impression material for edentulous mouth
2. Surgical dressing.
3. Bite registration paste.
4. Temporary retaining materials for dentures.

### MODE OF SUPPLY:

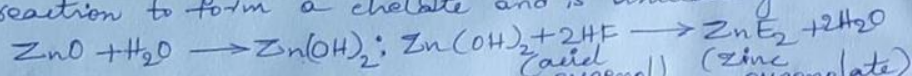
As two-paste system.

- Base paste.
- Reactor paste.

### COMPOSITION:

	Ingredients	Function
	• Zinc oxide → 8%	Reactive ingredient which takes part in setting reaction.
Base paste ...	• Fixed vegetable oil / mineral oil → 18%	Plasticizer and aids in setting action of eugenol
	• Oil of cloves eugenol → 12%	Reactive ingredient
Catalyst paste ...	Gypsum polymerised resin → 50%	Thermoplastic property, Smoothens homogeneous mix
Fillers (Silica gel) → 20%		Used to form a paste with eugenol, increase strength of mixed paste.
Resinous Balsam → 10%		Res flow improve setting properties
Accelerating solution (MgCl <sub>2</sub> , CaCl <sub>2</sub> ) → 5%		Accelerates setting reaction.

SETTING REACTION Setting reaction is an acid base reaction to form a chelate and is autocatalytic.



The chelate forms an amorphous gel imparts increased strength to set mass.

SETTING TIME:

	Initial	Final
Type I	3-6 min.	10 min.
Type II	3-6 min.	15 min.

FACTORS AFFECTING SETTING TIME:

- ① Particle size of  $\text{ZnO}_2$  powder - If the particle size is small and if it is acid coated, setting time is less.
- ② Type and amount of accelerator - The humidity and temperature accelerates the setting reaction and hence reduce setting time.
- ③ Setting time can be increased by coating the mixing slab and spatula and adding small amount of oil/waxes.
- ④ Longer the mixing time, shorter the setting time.

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MANIPULATION:

EXPERIMENT:

AIM: To study the manipulation and properties of impression paste.

INSTRUMENTS AND MATERIALS:

- 1) Glass slab or oil-impervious paper pad
- 2) S.S. Broad bladed, stiff spatula
- 3) Vaseline
- 4) Special tray (custom tray)
- 5) Zinc oxide-Eugenol paste

PROCEDURE: The mixing is accomplished on an oil-impervious paper or glass slab. The proper proportion of two parts is obtained by squeezing two ropes of paste of same lengths one from other.

- Proper proportion is taken on the glass slab
- A flexible stainless steel spatula is used.
- The two ropes are combined with first sweep of spatula and mixing is continued by approx one minute or as directed by manufacturer until a uniform color is observed.

GRADE :

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PROPERTIES:

Hard: Bite registration paste - Materials used for recording the occlusal relationship b/w natural or artificial teeth include impression plaster, Compound wax, resin & metal oxide paste

- Setting time -- 10 mins.
- More fluid consistency.
  - Shorter final setting time.
  - Higher resistance to penetration when set.

Soft: Impression paste --

- Setting time 15 mins.
- Initial setting time 3 to 5 mins.
- Buttery consistency when mixed.

Accuracy: Produces minute details of oral cavity quite accurate.

Dimensional Stability: Satisfactory. Negligible shrinkage (<0.1%) may occur during hardening which doesn't occur with high quality products.

Compatibility with Zinc Oxide:

ZnOE paste is compatible with the cast materials. Usually dental stone (type I)

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ADVANTAGES: ① It has sufficient consistency so as to make for any minor under extension in the tray during imp making

- ② Allow sufficient working time to complete peripheral trimming
- ③ The paste registers accurate surface details
- ④ Minor details can be corrected without discarding.

LIMITATIONS: good impression

- \* Requires special tray for making impression
- \* Sticky in nature & adhere to tissues
- \* Causes burning sensation due to presence of eugenol.
- \* It gives rise to tissue irritation.

NON EUGENOL PASTE:

- Developed over the disadvantages of ZOE paste.
- Eugenol leaches and contacts soft tissues, results burning sensation
- Substitutes for eugenol in EBA

SURGICAL PASTE:

- Can be incorporated without interfering with reaction
- After the surgical removal of diseased tissues, ZnOE paste may be placed over wounds to aid in retention of a medicament & to promote healing
- These pastes are quite soft & slower in their setting reaction in comparison with impression pastes.
- The mix should be capable of forming into ropes that is packed into gingival wounds & the interproximal space to provide retention of dressing.

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HYDROCOLLOIDS

These are elastic, gel-like substances extensively used as impression material.

COLLOIDS: Classified as fourth state of matter

- Colloidal solution or sol in between extreme of very small molecules in solution and very large particles in suspension.
- Has 2 phases - Dispersed and dispersion phase.
- Size ranges from 1-200 nm.

HYDROCOLLOIDS

Used for impression making that could be sterilised and applied without pressure to expose surface of duramater for perfectly recording its convolutions and bony margins of skull. Colloid materials are dissolved with  $H_2O$  to form hydrocolloid.

Type: (i)

Reversible - Agar.

(ii)

Irreversible - Alginate.

GEL: Semisolid material which is produced from a sol during process of gelation. In the gel state agglomerate to form chain of fibrils or micells, which may branch and intermesh into brush-crop structures. The dispersion medium is held in interface b/w the fibrils of capillary adhesion.

Sol or colloidal solution in between the extreme of the very small particles in solution and the very large particles in suspension.

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GELATION: Gelation is the conversion of sol to gel and the temperature at which this occurs is called as the gelation temperature. Within the gel the fibrils and intermesh to form "brush heap" structure.

SYNERESIS: It is the process by which the gel loses water by evaporation from its surface or by exuding fluid into the surface. The gel shrinks as a result of evaporation and syneresis.

IMBIBITION: The process of absorption of water when it is placed in water. During imbibition, gels swell thereby altering the original dimension. The reversible hydrocolloids do not imbibe more than their original content following any loss by syneresis.

HYSTERESIS: Syneresis.

Property where temperature is considerably higher than the gelation temperature at the time of reaction.

REVERSIBLE HYDROCOLLOIDS : AGAR

ADA Specification No. 11

CLASSIFICATION

- Elastic
- Sets by physical change (Reversible)
- Used for dentulous impressions

APPLICATIONS

- Full mouth impression without undercut.
- Used extensively for crown, bridge impression
- Tissue conditions
- For cast duplications.

MODE OF SUPPLY

- ① Supplied as a gel in a collapsible tube and is used with water coated impression tray.
- ② Supplied as a member of cylinder in a glass and is used with a syringe.

COMPOSITION:IngredientsFunction

- |  |  |
|--|--|
| • Agar : 13-17%.                                   | Brush-heap structure.                    |
| • Borate : 0.2-0.5%.                               | Strength retarder                        |
| • Potassium sulphate : 12%.                        | Accelerator                              |
| • Wax, Diatomaceous earth<br>: 0.2-0.5%.           | Fillers.                                 |
| • Thixotropic materials<br>* Thermal<br>* Glycerin | Thickener<br>Bactericidal<br>Plasticizer |
| • Water  | Reaction medium                          |
| • Colouring agent.                                 | Traces.                                  |

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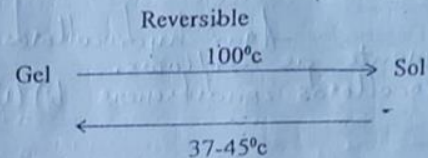
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SETTING REACTIONGELATION TIME:

3-5 minutes.

GELATION TEMPERATURE:

18-21°C. the agar sol should convert to gel at a temperature of 37°C and not more than 45°C.

GEL STRENGTH:

It is directly related to the hydrocolloid concentration strength is modified by modifiers such as fillers and chemicals.

Factors affecting gel strength:

- Addition of retarders : temperature.
- fillers and chemical : Inhibition
- Alteration in W/p ratio : Synergism.

MANIPULATIONINSTRUMENTS AND EQUIPMENT:i) HYDROCOLLOID CONDITIONER

Description: Agar hydrocolloids requires special equipments as follows.  
 a) Hydrocolloids conditioners b) Water cooled resin bath.

Diagram:ii) TRAY:

Description: Rim lock trays with water containing devices. The rim lock tray, a threading in the inside edge of tray that helps in retention of material. It has Diagram: inlet and outlet for connecting water tube. The tray should be able to allow a space of 3 mm occlusion and laterally and extended distally to cover the teeth.

iii) SYRINGE

This is used for injecting the paste into both paste whise. Impression has to be taken

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PROCEDURE: Hydrocolloid agar in gel form is loaded onto the impression trays and carried to the mouth for making impression in 50% state soil is obtained by heating to 75-100°C to 45-60°C before inserting in mouth. When the agar is gelled the peripheral around the impression is broken and the impression is removed rapidly from mouth in a single stroke or snape. Impression is rinsed in water & excess water is removed by shaking.

PROPERTIESMechanical:

- [i] Compressive Strength 8000 gm/cm<sup>2</sup>  
 [ii] Tear Strength ±.5 gm/cm<sup>2</sup>

Dimensional stability:

Since hydrocolloids use water as dispersion medium they are prone for dimensional change due to loss or gain of water. If left in a dry atmosphere water is lost by evaporation and when it is immersed in water, it absorbs water by a process known as imbibition.

CARE OF IMPRESSION:

Storage of agar impression is to be avoided at all costs or no satisfactory medium for storage is available.

COMPATIBILITY WITH GYPSUM CAST & DIE MATERIALS

A known gypsum retarder such as borax is used as a filler in agar impression, but it can cause damage to surface of gypsum prepared casts.

HARDENING SOLUTION:

Borates improves strength of the gel and at sometime it retards the setting as plaster on stone cast.

STORAGE OF MATERIALS

The cast should be poured round. Storage in air results in dehydration and storage in water results in swelling of impression. Storage in 100% relative humidity results in shrinkage as a result of continued formation of agar network agglomeration.

DUPLICATING MATERIALS

Water content is higher & other contents are same as hydrocolloids.

MOULD MATERIALS FOR FLUID RESIN TECHNIQUE:

It is used as ~~hydrocolloid~~ <sup>resin</sup> for fluid resin technique PRINCIPAL constructing denture bases.

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IMPRESSION DESINFECTATION: <sup>31</sup> Since the impression has to be sent to the lab, the used to disinfect is very important. Most manufacture recommend a specific disinfectant. The agar may be iodophor; bleach or glutaraldehyde. separately little distortion occurs if the recommended immersion time is followed and impression is poured properly.

WET FIELD TECHNIQUE:

- It is relatively new technique.
- The areas to be recorded are flooded with warm water.
- Then the syringe material is introduced quickly, the tray material is seated.
- Hydraulic pressure of viscous tray material forms fluid syringe hydrocolloid down into the area to be recorded.
- This motion displaces the syringe materials as well as blood and debris throughout the sulcus.

  
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IRREVERSIBLE HYDROCOLLOIDS : ALGINATECLASSIFICATION:

As per A.D.A. Specification No.16

Type I -

Type II -

As an impression material it is.

--- Elastic

--- Sets by chemical change (irreversible)

--- Used for dentulous and edentulous impressions.

APPLICATIONS: Impression making in undercut.  
 D. indicating module.  
 Preliminary impression for complete denture.

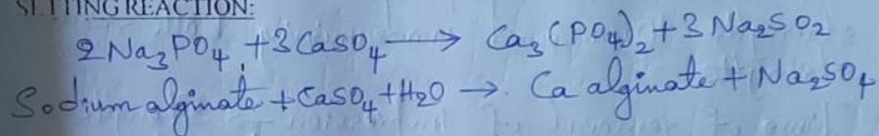
MODE OF SUPPLY: In bulk packaging  
 or preweighed packets for individual  
 compression

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COMPOSITION:

Ingredients	Function
Na/K alginate	Reacts with $Ca^{+2}$
$CaSO_4$	Forms insol calcium Alginate
$ZnO$	Filler
Potassium fluoride	Gypsum hardner
$Na_3PO_4$	Retarder.

SETTING REACTION:GELATION TIME:

Type I (fast set)  $\rightarrow$  1.5 - 2 min  
 Type II (normal)  $\rightarrow$  3 - 4.5 min.

FACTORS AFFECTING GELATION TIME: Retarder  
 Altering temperature of  $H_2O$ .

GEL STRENGTH:

Compressive strength 0.5 - 0.9 MPa  
Tear strength 0.4 - 0.7 KN/m.

Factors affecting strength:

W/P ratio = Too much / little water reduces gel strength. Over and undermixing both reduces strength.

Time of removal of impression → Strength increases if the time of removal is delayed for few minutes after setting.

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MANIPULATION:EXPERIMENT:

AIM: To study the manipulation and properties of Alginate impression material

INSTRUMENTS AND MATERIALS:

- |   |                               |
|---|-------------------------------|
| 1) Alginate impression materials                    | 4) Perforated impression tray |
| 2) Flexible rubber bowl                             | 5) Water and powder measures  |
| 3) Stainless steel spatula<br>(Curved and flexible) | 6) Water                      |
|   | 7) U/L Dentulous Models       |

PROCEDURE The proper W/P ratio as specified by manufacturer should be used. The water is taken first. The powder is sprinkled into the water in rubber mixing bowl and the lid of metal can is replaced immediately. The mixing is started with a stirring motion to wet powder with water. Once the powder has been moistened rapid spatulation by swiping or stropping against the side of the bowl is done. A vigorous figure of 8 motion can also be used.

GRADE:

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PROPERTIES:Mechanical:

- (i) Compressive Strength 0.5 - 0.9 MPa.  
 (ii) Tear Strength --- 0.4 - 0.7 KN/m

Dimensional Stability: Poor due to evaporation, Syneresis and imbibition

Shelf Life Only 1 year.

REMOVAL OF IMPRESSION:

The strength of the material (gel) increase after set. The elastic properties improve with increase in strength. The impression is removed 2 to 3 minutes after set.

CARE OF IMPRESSION: Wash with cold water to remove saliva. Disinfected by immersion in a suitable disinfectant. Covered by a dry napkin to prevent drying. Cast should be poured as soon as possible.

COMPATIBILITY WITH GYPSUM CAST AND DIE MATERIALS:IMPRESSION DISINFECTION:

Phenol, iodophors, Bleach / glutaraldehyde.

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LAMINATE TECHNIQUE: After <sup>37</sup> ingesting the syringe agar onto the area to be recorded an impression tray containing a mix of chilled alginate that will bond with the agar is positioned over it. The alginate sets by a chemical reaction, whereas the agar sets through contact with cool alginate.

MODIFIED ALGINATES:

- Dustless Alginate
  - Alginate with color indications which reveal stage of setting reaction
- Without silica dust rather than the water circulating through tray.

TYPE OF FAILURES:

Type:

Distortion

Grainy impressions

Tearing

Cause

- (i) Delayed pouring
- (ii) Movement of tray during setting.

Inadequate mixing prolong mixing. Less water in mix.

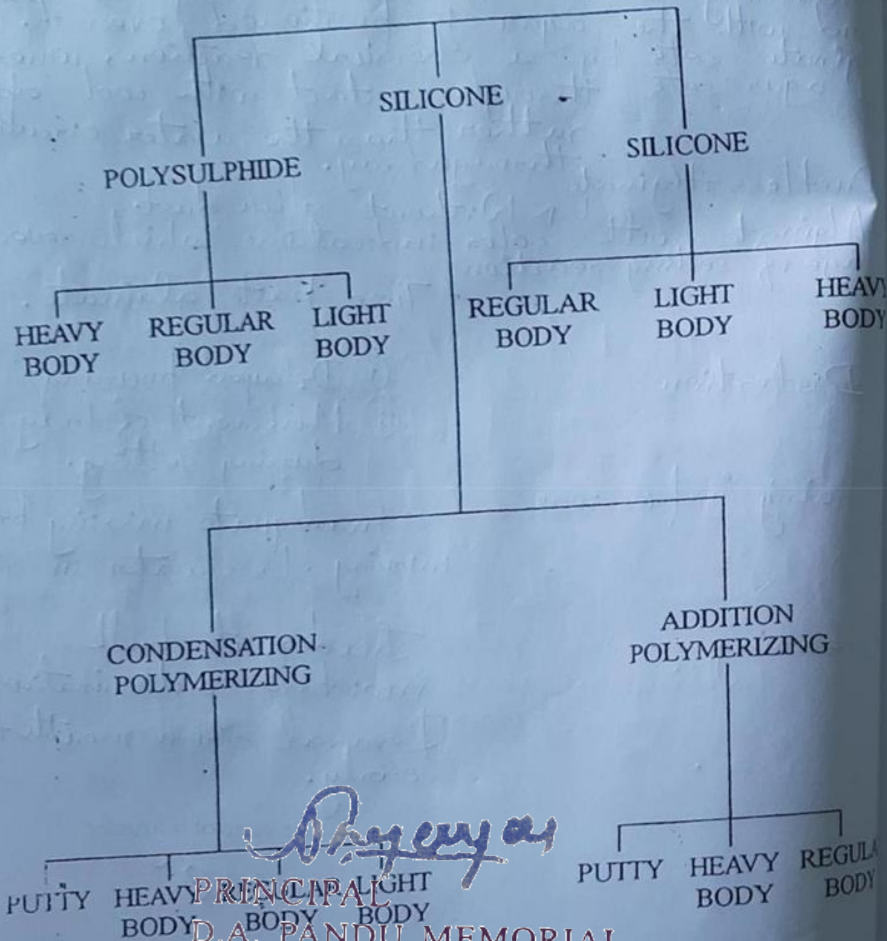
Inadequate bulk moisture contamination Removal from mouth too early.

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## ELASTOMERIC IMPRESSION MATERIALS



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## ELASTOMERIC IMPRESSION MATERIALS

There are elastic impression materials which are rubber like in nature and are referred to as Nonaqueous Elastomeric Dental impression materials.

Chemically there are four kinds : Polysulphide, Condensation polymerizing silicone. Addition polymerizing silicon and polyether, recently, a fifth class of polyetherurethane dimethacrylate.

### CLASSIFICATION

As per A.D.A. Specification No. 19

Based upon selected elastic properties and dimensional change:

TYPE	MAXIMUM PERMANENT DEFORMATION	MAXIMUM FLOW IN COMPRESSION	MAXIMUM DEMENSIONAL CHANGE IN 24 HRS
I	2.5	0.5	-0.5
II	2.5	0.5	-1.0
III	5.5	2.0	-0.5

Each is further divided into four viscosity classes:

CLASS 1	HEAVY BODY	HIGH VISCOSITY
CLASS 2	REGULAR BODY	MEDIUM VISCOSITY
CLASS 3	LIGHT BODY	LOW VISCOSITY

## A VERY HIGH VISCOSITY - PUTTY LIKE CONSISTENCY

As impression materials they are

- Elastic
- Sets by chemical change
- Used for dentulous and edentulous impression

### GENERAL CHARACTERISTICS:

1. Excellent reproduction of tissue detail because of its free nature.
2. Generally acceptable odour and colour (except polysulphide - dark brown unpleasant)
3. No special equipment required, easy to handle (except polysulfide messy to handle)
4. Generally hydrophobic in nature (except polyether)
5. Does not adhere to trays, so adhesives are required.
6. Excellent elastic properties.
7. Good dimensional stability (except polysulphide and condensation silicon)
8. Can be electroplated
9. Can be disinfected by immersion in chemicals (except polyether-disinfect spraying)

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## POLYSULPHIDE

### APPLICATION:

- In fixed partial dentures for impressions of prepared teeth
- Impression of dentulous moulds for removable partial dentures
- Impression of edentulous mouth for complete dentures.
- For bite registration

### MODE OF SUPPLY:

Supplied in collapsible tubes as base and accelerator in paste form  
Base is white coloured while accelerator is brown or gray.  
Available in three viscosities : Light body  
Medium body  
Heavy body

### COMPOSITION:

- | Ingredients   | Function              |
|---|-----------------------|
| → Liquid polysulfate polymer (80-85%)                 | → Reacts with $PbO_2$ |
| → Inert fillers ( $TiO_2, ZnSO_4, Al_2O_3$ ) (16-18%) | → Plasticizer.        |

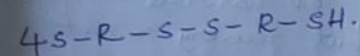
### Base Paste:

- Polysulfide prepolymer with a terminal or peptone SH group
- Inert filler like titanium dioxide (Viscosity, strength)
- Dibutyl phthalate (Plasticizer)
- Sulphur (Accelerator)

### Catalyst Paste:

- Lead dioxide ( $PbO_2$ ) (initiator)
- Chlorinated paraffin oil (Vehicle for  $PbO_2$ )
- Oleic acid or stearic acid (retarder)

### STRUCTURAL FORMULA:



**SETTING REACTION**  $PbO_2$  reacts with polysulfide prepolymer to form polysulfide and water. This reaction is exothermic and can be accelerated by heat & moisture.

$$H-S-R-SH + PbO_2 + S \rightarrow H-S-R-S-S-R-SH + H_2O$$

There is cross-linking and continued polymerization, the material should be held in the mouth for a longer time for better properties.

**SETTING TIME:** 8-12 minutes.  
Heat and moisture accelerate the setting time.

**PROPERTIES:**

- i) Colour and odour:
  - Unpleasant color and odour.
  - It contains color and stains.
  - The color is due to  $PbO_2$ .
- ii) Working characteristics:
  - Has excellent reproduction of surface details.
  - It is hydrophobic so impression area should be dried thoroughly before making an impression.
- iii) Dimensional change: Curing shrinkage - 0.48% is high.
  - Has highest permanent deformation (3-5%).
  - This improves with time, so pouring of model should be for half an hour.
  - Further delay should be avoided to minimize shrinkage.
- iv) Elastic recovery:
  - Good flexibility - 1% and low hardness.
  - Elastic properties are good but recovery is not complete after deformation.
- v) Tear strength:
  - Good tear strength.

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**CONDENSATION SILICONE:**

- APPLICATION:**
- Impressions for edentulous mouths for complete dentures.
  - Impression of dentulous mouths for RPD.
  - In fixed partial dentures for impressions of prepared teeth.

**MODE OF SUPPLY**

- > Base and catalyst form.
- > Also supplied as liquid and putty in jars.
- > Also available in three viscosities - light bodied, medium bodied, putty.

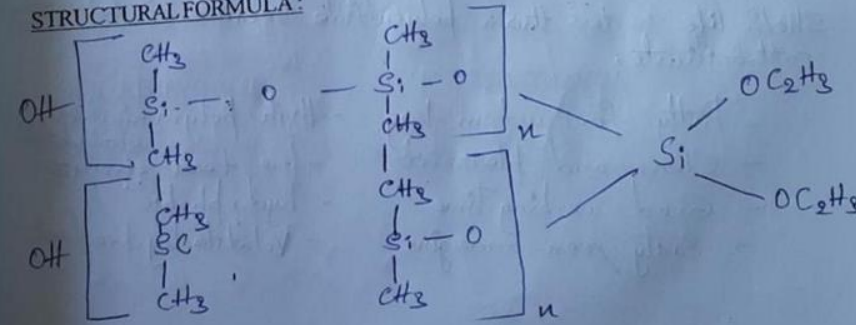
**COMPOSITION**

Ingredients	Functions
-------------	-----------

**Base Paste:** Polydimethyl siloxane.  
Colloidal silica  
Microsized metal oxide.  
Filler

**Catalyst paste:** Colour pigments.  
Ortho-ethyl silicate - Cross linking agent.  
Stannous oxide - Catalyst.

**STRUCTURAL FORMULA:**



SETTING REACTION

It is a condensation reaction of polymerisation occurs because of cross linking agent tetraethyl orthosilicate and terminal OH group of dimethyl siloxane where stannous octate acts as catalyst.  
 Dimethyl + Tetraethyl Stannous Silicone + Ethyl  
 Siloxane orthosilicate Octate rubber + alcohol  
 (by product)

SETTING TIME: 6-8 minutes.

PROPERTIES:

i) Dimensional stability:  
 Dimensional stability is low due to curing shrinkage (0.1-0.5 ethyl alcohol) and hence cast should be poured immediately.  
 Permanent deformation is high (1-3%).

ii) Hydrophobic nature:  
 They are hydrophobic in nature.

(iii) Electroplating:  
 Electroplated with Ag & Cu.

(iv) Shelf life:  
 Shelf life is less than polysulfide because of tetraethyl orthosilicate.

Advantages

- Putty for impression tray
- Clean and pleasant
- Good working time
- Easy to open margins

DISADVANTAGES

- High polymerisation shrinkage
- low tear strength
- hydrophobic
- Volatile by-product

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ADDITION SILICONE

APPLICATION:

- Impression of dentulous mouth for removable partial denture
- Impression of edentulous mouth for complete denture
- In fixed partial denture for impression of prepared teeth.

MODE OF SUPPLY:

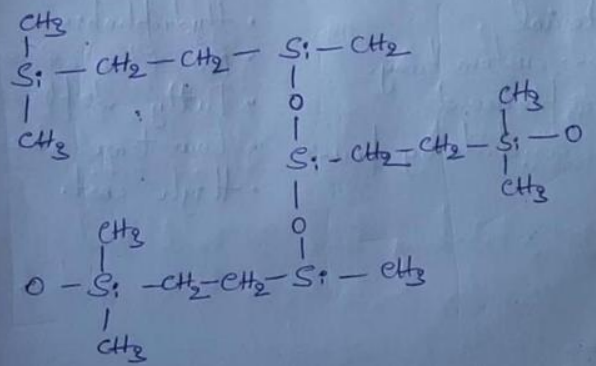
- Base and catalyst form, putty form
- Available in four viscosities: light bodied, medium bodied and putty.

COMPOSITION

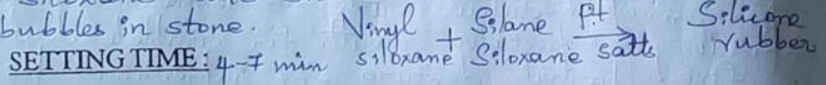
Ingredients	Functions
Base Paste: Polymethyl hydrogen siloxane. Other siloxane prepolymer fillers.	
Catalyst paste: Platinum salt (catalyst) Palladium (H <sub>2</sub> absorber) Retarders & fillers.	

Release of hydrogen causes dimensional problems, so palladium is added as a hydrogen absorber.

STRUCTURAL FORMULA:



SETTING REACTION Base polymer is terminated with vinyl groups, and it is cross linked with silicone and Pt salts are added to accelerate the reaction. H<sub>2</sub> gas might be produced due to improper balance between vinyl siloxane and silane siloxane which can cause air bubbles in stone.



SETTING TIME: 4-7 min

PROPERTIES:

i) Working Time: 2-4 minutes.

ii) Dimensional Stability: Best dimensional stability among the elastomers. curing shrinkage (0.17%) caused permanent deformation if H<sub>2</sub> gas is liberated. Pouring should be 1-2 hour late.

(iii) Flexibility: Low flexibility & harder than polysulfide. Extra spacing should be provided while removing cast from impression.

(iv) Hydrophobic nature: Extremely hydrophobic. So similar care should be taken for impression area & pouring it.

(v) Electroplating: Can be electroplated with Ag/Cu. However hydrophilic silicates are more diff to electroplate.

ADVANTAGES

DISADVANTAGES

- One material
- Putty
- Clean & pleasant
- Stable and delay pour

- Hydrophobic
- No flow of sulcus
- Putty displaces water
- Low tear strength
- High cost

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POLYETHER

APPLICATION: Polyether is used for border moulding of special trays.

MODE OF SUPPLY Available as base and accelerator in capsule tubes. A fluid tube containing air thinner may be supplied.  
 Available in 3 viscosities: ① Light bodied, ② Medium bodied, ③ Heavy bodied.

COMPOSITION

Ingredients  
 Moderately low mol. wt polyether prepolymer with free terminal group.  
Base Paste: Inert filler, plasticizer.

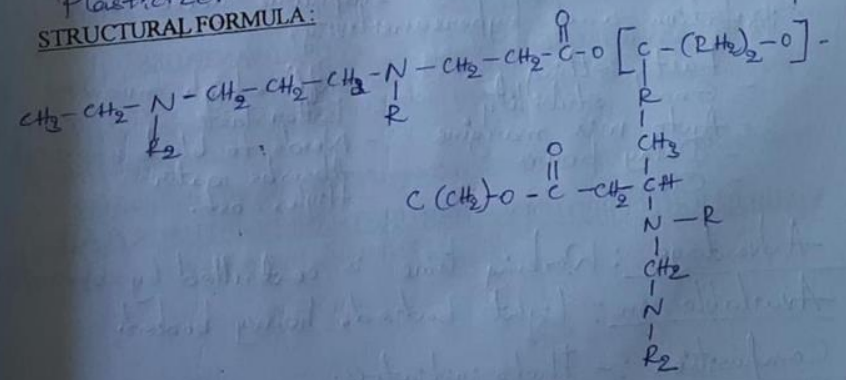
Functions  
 Becomes cross linked to form rubber.

Catalyst paste:

Aromatic sulphuric system  
 Inert filler  
 Plasticizer.

Cross linking agent  
 Controls viscosity.  
 To form pastes.

STRUCTURAL FORMULA:



SETTING REACTION It is cured by reaction by azidine ring which are at the end of branched polyether molecule. The main chain is a polymer of ethylene.

SETTING TIME:

PROPERTIES:

- i) Working Time: Setting time is short (2-5 min). Mixing should be done quickly within 30 sec. Heat decreases setting time.
- ii) Dimensional Stability: Is very good. Curing shrinkage is low. The permanent deformation is low, but polyether absorbs water & change dimension.
- (iii) Flexibility: Extremely stiff. Its hardness is higher than polysulphide and increases with time. Removing it from undercut is difficult. So sufficient space should be given.
- (iv) Hydrophilic nature: It is hydrophilic, so moisture in the impression field is not so critical. It has the best compatibility with stone.
- (v) Water absorption: Polyether absorbs water and can change dimension. They should not be stored in contact with water or in humid climates.
- (vi) Hypersensitivity: Presence of aromatic sulphuric acid causes irritation and hypersensitivity.

ADVANTAGES

- Fast setting
- Good accuracy
- Auto mix mix
- PRINCIPAL
- Clean

DISADVANTAGES

- Stiff, high modulus
- Bitter taste
- Needs to block undercut
- Absorbs water

VISIBLE LIGHT CURED POLYETHER URETHANE DIMETHACRYLATE

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Composition: - Photo initiators.  
- Photo accelerators  
- SiO<sub>2</sub> fillers.

MANIPULATION OF ELASTOMERIC

DEMONSTRATION:

AIM: To study the manipulation and properties of the various elastomeric impression materials.

D) MULTIPLE MIX (DOUBLE MIX) TECHNIQUE:

MATERIALS AND INSTRUMENTS:

- |                                       |                                     |
|---------------------------------------|-------------------------------------|
| 1. Mixing pad - 2 Nos.                | 5. Gauge pieces                     |
| 2. Stiff bladed SS spatula --- 2 Nos. | 6. Tray adhesive                    |
| 3. Syringe                            | 7. Heavy bodied impression material |
| 4. Custom tray                        | 8. Light bodied impression material |

PROCEDURE:

a) Preparation of the tray

Custom tray is prepared on primary cast by chemical or light cured resin

b) Tray adhesive --- application:

A uniform thickness of tray adhesive is applied with the body gently over the edge of trays & it is allowed to dry prior to insertion of impression material. The adhesive furnished with the various types of rubber impression materials are not interchangeable.

Ploysulphide: Butyl rubber or styrene/acrylonitrile dissolved in chloroform or a ketone.

Silicone: Polydimethyl siloxane, or a similar reactive silicone, and ethyl silicate

c) Proportioning, mixing and loading the tray:

This is loaded with tray material and in syringe. The lighter material injected from the filled syringe with on and around tooth preparation. The filled tray is then inserted in mouth & seated over syringe material that has been extended on soft tissue.

d) Making of impression

The tray material will force the syringe material to adapt to prepared tissue. The two materials should bond upon setting.

Then the tray is removed from mouth.

II) RELINTECHNIQUE:MATERIALS AND INSTRUMENTS

- |                          |   |
|--------------------------|---|
| 1. Glass slab/paper pad  | 5. Polyethylene sheet                         |
| 2. Perforated stock tray | 6. Stiff bladed S.S. Spatula                  |
| 3. Tray adhesive         | 7. Putty & light bodies - impression material |

PROCEDUREa) Tray adhesive - application

Perforated stock tray is used.

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b) Proportioning, mixing and loading the tray:

Putty mixed and loaded on perforated stock tray. Light body - mixed and bonded into syringe.

c) Making of impression

First, a preliminary impression is made up with putty. The light body is loaded in the syringe and injected into impression. The impression made with putty is seated over it & held till it sets.

REMOVAL OF IMPRESSION

Under no circumstances should the impression be removed, until the curing has progressed sufficiently to provide adequate elasticity. So that distortion will not occur. One of the methods of determining the time of interest is to inject some of syringe material into space in field of operation.

It consists of a double barrel gun with mixing tip.

Its advantages:

- Improved proportions due to,
- More uniform mix.
  - Loss of air bubbles in incorporated mix.
  - Reduced working time.

PROPERTIES:

POLYSULPHIDE	CONDENSATION SILICONE	ADDITION SILICONE	POLYETHER
Working Time	2-4 min	2-4 min	3 min
Setting Time	6-8 min	4-6.5 min	6 min
Tray adhesive	Butyl rubber/styrene.	Chloroform	
Dimensional stability & Curing shrinkage	Low	best	very good
Permanent Deformation	0.4-0.6%	0.17%	0.24%
Flow	1-3%	0.5-0.2%	1-2%
Accuracy	Excellent	Low	
Flexibility & Thickness of spacer	Stiffer ≠ mm	1st flexibility 3-4 mm	Extremely stiff
Elastic Recovery	No	No	yes
Compatibility with cast & die			

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Ag ± Cu  
 Ag 46  
 1000-400  
 4300 N/m  
 1-2 yrs  
 2 yrs

DISINFECTION OF IMPRESSION

- Glutaraldehyde
- Chlorine compounds.
- Iodophoric.

TYPES OF FAILURES

TYPE	CAUSE
a) Rough or uneven surface on impression.	Incomplete polymerisation caused by premature removal from mouth. Improper mixing ratio, presence of oil and other organic material in teeth.
b) Bubble	Too rapid polymerisation preventing flow, air incorporation during mixing.
c) Rough/Chalky cast	Inadequate cleaning of impression. Excess wetting agent left on impression.
d) Irregularly shaped Voids	Premature removal of cast. Moisture or debris on surface of teeth.
e) Distortion	Resins tray not aged sufficiently. Lack of mechanical retention. Improper removal from mouth.

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SYNTHETIC RESINS

## INTRODUCTION:

**POLYMERS:** Polymers are formed through chemical reactions that connect large number of low-molecular weight molecules known as monomers into large, very high molecular weight long chain macromolecules. Poly - many, mer - units, Part

## STRUCTURE OF POLYMERS:

- i) Linear: mer units are connected to each other in a linear sequence.
- ii) Random: 2 types of mer units, randomly distributed.
- iii) Block: 2 types of mer units, randomly distributed into 2.

① Branched ② Cross-linked

The molecular form which the polymer is constructed is known as monomer.

**POLYMERIZATION:** A series of chain reaction by which a macromolecule or polymer is formed from a group of smaller simpler molecules known as monomers. Polymerization is repetitive intramolecular reaction i.e. capable of preceding indefinitely.

## TYPES OF POLYMERIZATION

① Condensation polymerisation: Repeated elimination of water, acid and ammonia

② Addition polymerisation: No change in chemical composition of products are formed.

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**COPOLYMERIZATION:** Use of two or more chemically different monomer or starting material for polymerisation is called copolymerisation.

## TYPES OF COPOLYMERS:

- i) Random:  $[M-M-Y-M-Y-M-Y-Y-M-M-Y]$
- ii) Graft:  $[M-M-Y-M-M-M-M]$
- iii) Block:  $[M-M-M-Y-Y-M-M-M-Y-Y]$

## CROSS LINKING:

The formation of chemical bonds or bridge between the polymer chains is referred to as cross-linking.

## PLASTICIZERS:

- These are substances added to resin.
- To ↑ the solubility of polymer in the monomer.
  - To ↓ brittleness of polymer.
  - It also ↓ strength and hardness.

2 types.

- ① External: It penetrates between molecules & neutralises the secondary bonds and Intramolecular forces.
- ② Internal: These are plasticising against the part of polymer. It is done by copolymerisation with a suitable monomer.

DENTAL RESINS

CLASSIFICATION: Based on chemical behaviour.

- Thermoplastic can be rapidly softened and molded under heat and pressure without chemical change.
- Thermosetting: They can be molded cannot be softened by retraction.

TYPES

- i) Light - activated
- ii) Chemically - activated
- iii) Plant - activated.

IDEAL REQUIREMENTS:

- Be tasteless, odourless, non-toxic, non-irritant to tissues.
- Be dimensionally stable, should not expand or contract
- Have enough strength, resistance, abrasion resistance
- Be impermeable to oral fluids
- Easy to fabricate and expand
- Have good thermal conductivity.
- Be economical.
- Be radiopaque.

- Have low shrinkage
- Bond strongly with tooth.
- Be aesthetically satisfactory.

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POLY METHYL METHACRYLATE RESINS

As per A.D.A. Specification No. 12

- TYPES:
- Heat activated,
  - Light activated
  - Chemically activated.

HEAT CURED ACRYLIC RESINSAPPLICATION:

Making permanent/removable, partial CD.

MODE OF SUPPLY:

- Powder or liquid
- Gels → Sheets, cakes.

COMPOSITION:

	<u>Ingredients</u>	<u>Functions</u>
<u>Powder:</u>	Polymethylmethacrylate	Major component
	Benzoyl peroxide	Initiator
	Zn/Ti oxide	Opacifiers
	Dimethyl phthalate	Plasticizer
<u>Liquid:</u>	Monomeric sulphate	Dyes
	Fillers - Fibers	Improves physical properties
	Methyl methacrylate	- Plasticizer the polymer
	Di-butyl phthalate	- Plasticizer
	Glycol Dimethacrylate	- Cross-linking agent
	Hydroquinone (0.006%)	- Inhibitor.

MANIPULATION:EXPERIMENT:

AIM: To study the various steps of processing of a wax block.

MATERIALS AND INSTRUMENTS:

Dental flask.  
Plaster  
Acrylic resin.

PROCEDURE:1. Preparation of a Wax Block:

The structure to be created is first constructed in wax. The wax portion will be replaced by acrylic later.

2. Preparation of a Split mould:

The waxed denture is invested in a dental flask with dental stone or plaster, a 3 part technique.

3. (i) Wax elimination & Application of Separating Medium:

After the stone or plaster sets, it is removed by placing this flask in boiling water then apply separating media after drying.

- Cellulose *Acryloyl*
- Solution of *Acryloyl*

- Calipers
- Softer soap
- Sodium silicate
- Starches

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4. Packing of Mould cavity:a) Proportioning and Mixing:

Polymer, monomer ratio by volume 3:1  
Weight 2:1.

Physical stages of reaction

- Stage 1. Sandy stage / wet
- Stage 2. Sticky stage
- Stage 3. Dough / gel stage
- Stage 4. Rubbery stage
- Stage 5. stiff stage.

b) Packing:

Trial Closure: The acrylic dough is packed into the flask in slight excess. The excess is removed during trial packing.

Polyethylene foam used as a separator for upper half of the flask.

- The flask is opened, the flask is trimmed away.
- Before the final closure, the separating film is recovered and discarded.
- The final closure of the flask or metal to metal content of the flask bodies is then compressed in the press.

## 5. PROCESSING:

Prior to processing the flask is kept aside for 15 to 30 minutes. This allows better penetration of the monomer into the polymer. (Sometimes referred to as Bench curing)

Curing Cycles: Heat the flask in water at 60-70°C then heat the flask at 65°C for 90 min. Then boil for 1 hr for absolute polymerisation of thinner portion (Short cycle)

Bench Cooling:

The flask should be cooled slowly, i.e. bench cooled. Fast cooling can result in warpage of denture due to different thermal points of resin and gypsum mold. Cooling overnight is ideal.

6. Deflasking:

The cooled acrylic denture is retrieved from the flask. This is called deflasking. The flask is opened and mold is retrieved. The mold separates quickly because the surrounding plaster was formed in layer. Plaster cutting forceps are used to break plaster.

The denture is smoothened using progressive grades of sand paper. Finely ground pumice in water is commonly used for final polishing.

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INJECTION MOULDING: A sprue hole and a vent hole are formed in the gypsum mold. The soft resin is contained in the injector and forced into mold space.

PROPERTIES:a) Liquid Monomer:

1. Colourness and Volatile liquid, Organic solvent, Phenolic smell.
2. Effect of U.V. light ---
3. Melting point --- 48°C
4. Boiling point --- 100°C
5. Volumetric shrinkage --- 21%.

b) Heat cured acrylic resin:

1. Density --- 1.19 gm/cm<sup>3</sup>
2. Compressive strength --- 75 MPa.
3. Tensile strength --- 4.8 - 6.2 MPa.
4. Modulus of elasticity --- Sufficient stiffness.
5. Proportional limit ---
6. Co-efficient of thermal expansion ---  $8 \times 10^{-1}/^{\circ}\text{C}$ .
7. Thermal conductivity ---  $5.4 \times 10^{-4} \text{ Cal/u/cm}^2$ .
8. Residual monomer content --- of 100°C
9. Solubility --- Insoluble in water and oral fluids.
10. Creep --- Inhibit creep.
11. Biocompatibility --- Biocompatible.

CHEMICAL CURED ACRYLIC RESINS

APPLICATION: For making temporary crowns for FPD

- Construction of special tray.
- For denture repair
- Removable orthodontic appliances
- Adding a post dam to an adjusted upper denture.

MODE OF SUPPLY:

Powder or Liquid.

COMPOSITION:

Ingredients	Functions
• Methyl methacrylate	- Forms the resin matrix
• Benzoyl peroxide	- Initiator.
<u>Powder:</u> • Compounds of HgS, CdS.	- Dyes.
• Zn or Titanium oxide	- Opacifiers
<u>Liquid:</u> • Dibutyl phthalate	- Plasticizer.
• Fillers, glass fibers or beads	- Esthetics

Methyl methacrylate monomer - Dissolves / Plasticizes polymer

Dimethyl - p - toluidine - Activator

Dibutyl phthalate - Plasticizer

Glycol dimethacrylate - Cross linking agent

Hydroquinone - Inhibitor.

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MANIPULATION:

1. SPRINKLE ON TECHNIQUE: Separating media is applied first on the cast. Powder and liquid is applied alternatively from the dropper. Powder is sprinkled on the cast and then wet with monomer. This is condensed till complete of prosthesis.

DOUGH METHOD:

Powder and monomer liquid is proportioned and mixed in glass or porcelain jar. When it reaches the dough stage it is quickly removed and adapted to cast manually and moulded quickly to advised shape.

FLUID RESIN TECHNIQUE (POUR TYPE)

Some type of denture resin have a high molecular weight powder particles that are much smaller and when they are mixed with monomers the mix is very fluid. Therefore referred as 'fluid resin'. Lower P/L ratio ranges from 2:1 to 25:1 easier to mix & pour.

PROPERTIES:POROSITY:

- Internal: Due to repolymerisation of monomer when the temperature of resin increases above the BP of monomer (100°C)
- External: Due to
  - Depth is not
  - lack of pressure during polymerisation.

MISCELLANEOUS RESINS:

REPAIR RESINS: Heat cured resins cured at 70°C  
for self Used - Curing is done at low temperature.

DENTURE RELINERS:

Reliners may be classified as.

- 1) Hard or soft (resilient)
- 2) Heat cured or self cured.
- 3) Short term or long term
- 4) Resin based or silicone based.

DENTURE ADHESIVE:

Slightly viscous aqueous solution which are often mixed to improve the retention of complete denture.

TISSUE CONDITIONERS: The soft elastomers used to protect mucosa. Their function is short they are replaced 3-5 days. Both viscous, viscoelastic behaviour helps in both application to tissues, cushioning of masticatory forces.

MATERIAL IN MAXILLOFACIAL PROSTHESIS:

- Polymethylmethacrylate - Used to make artificial teeth part.
- Polyvinylchloride - Rigid plastic with a glass transition temperature  $T_g$  in normal temperature.

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COMPOSITE RESINS:

As per A.D.A. Specification No. 27

CLASSIFICATION:

Type	Particle Size
Fractional (Conventional)	8-12 $\mu\text{m}$ .
Small particle	1-5 $\mu\text{m}$ .
Hybrid	0.06-1 $\mu\text{m}$ .
Microfilled	0.04 $\mu\text{m}$ .

APPLICATIONS:

Crown and cavity application, adhesive bonding agent for pit and fissure endodontic seals, bond of ceramic veneers, cementation of crown, bridges and fixed prosthesis.

MODE OF SUPPLY:

Supplied as either chemical or light cured.

ETCHING LIQUID (37%  $\text{H}_2\text{PO}_4$ )

Ingredients	Functions
Resin matrix	
Quartz, Colloidal silica or heavy metal	- Filler
Silicone inhibitors.	- Coupling agents.
Camphorquinone.	- Photoinhibitors.
Titanium dioxide or this.	- Opacifiers
Color pigments.	- To metals to colour.

POLYMERIZATION MECHANISM:

TYPE	ACTIVATOR	INITIATOR
1. Chemically activated	M-OH - Dimethyl P-toluene.	Benzoyl Peroxide.
2. Visible light activated	Dimethyl oxime Ethyl methacrylate	Camphor-quinone

SETTING TIME:

In high intensity light  $\rightarrow$  20-50 sec.

WORKING TIME:

For chemically activated resin, it is 90 seconds

ACID ETCHING:

1. Acid used in percentage 37%.
2. Function and mode of action of acid etching of enamel. *Increases the surface area by etching of enamel.*

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BONDING AGENTS:a) Enamel bond agents:

Composition --- Unfilled resin, diluted with monomer of low viscosity.

Function and mode of action --- Imparts physical or chemical properties. Binds with filler particles to form covalent bonds, when it polymerises.

b) Dentin bond agents:

- i) Primers: Types --- I penetration, II penetration, III penetration, IV penetration, V generation, VI generation, VII generation.
- Function ---

Formation of resin tape.

Provides stable opening of dentinal tubules.

## ii) Bond Agents UDMA.

Bis-GMA.

Agents used	Mode of action
UDMA.	Matrix compound melting of surface.
Bis-GMA	Improves physical and mechanical properties.
Polyurethane (PUS).	
Polyacrylic acid (PAA)	
Metalllic anhydrates.	

MANIPULATION:DEMONSTRATION:

AIM: To study the manipulation and properties of chemically and light composites.

INSTRUMENTS AND MATERIALS:

- |                             |                                    |
|-----------------------------|------------------------------------|
| 1. Pumice                   | 9. Foam sponge / Cotton pellet     |
| 2. Cotton rolls             | 10. Tweezer                        |
| 3. Phosphoric acid (30-50%) | 11. Disposable plastic spatula     |
| 4. Water syringe            | 12. Teflon coated metal instrument |
| 5. Brush                    | 13. Celluloid matrix strip         |
| 6. Mixing pad               | 14. Chip blower                    |
| 7. Dish                     | 15. Light cure unit                |
| 8. Bonding agent            | 16. Composite material             |

PROCEDURE:STEPS

1. Cleaning the tooth surface
2. Drying
3. Etching
4. Application of bonding agent
5. Mixing the material
6. Filling the cavity
7. Removal of matrix
8. Removal of excess
9. Finishing and polishing

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STEP 1:

Cleaning the tooth surface: It is necessary to clean the operating site with a slurry of pumice to remove plaque, pellicle and superficial stain. Calculus removal with appropriate instruments may be used.

STEP 2:

Drying: By using cotton rolls, blotting paper, or chip blower. Isolation of operating site is done by rubber dam or cotton rolls (with or without retraction cord). Isolation helps in acquiring access, vision & moisture control.

STEP 3:

Etching: Phosphoric acid (37%) is applied for 15-40 sec. and more than that time for patients suffering from fluorosis or primary dentition. Dry it using moistened cotton/blotting paper to get frosted appearance.

STEP 4:Application of bonding agent:

A surface bonding agent is placed on etched surface to form resin tags. Care should be exercised to avoid adhesive pooling the matrix.



**STEP 5:**

Mixing the materials: Correct proportion of base to catalyst paste are put on mixing pad & combined with rapid spatulation for 20 sec.

**STEP 6:**

Filling the cavity:

The composite is inserted by a bond investment on syringe. Operator run the plunger end of the bond investment to press the material into the preparation. A second increment of composite is applied.

**STEP 7:**

Removal of matrix:

It is removed slowly by loosening the cap preferably remove it from lingual side.

**STEP 8:**

Removal of excess material:

Any excess material removed quickly with the blade of insertion instrument or an explorer line before closing the matrix.

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Finishing and Polishing

best done after 24 hours. Finishing can be done after 15 min of complete polymerisation is also. It is done with rubber impregnated abrasive or rubber cup with polishing pastes or aluminium oxide disks. The best finish is obtained when composite is

HYBRID	CONVENTIONAL	MICROFILLED	SMALL PARTICLE
Filler Loading (Vol %)	60-70	20-80	65-79
Compressive Strength (MPa)	200-300	200-350	350-400
Modulus of Elasticity	8-15	3-6	15-20
Coefficient of Thermal Expansion (10 <sup>-6</sup> /°C)	25-35	50-60	19-26
Water Sorption (mg/cm <sup>3</sup> )	0.5-0.7	1.4-1.7	0.5-0.6
KHN	75	25-35	50-60

Surface Smoothness: By incorporation of microfillers of colloidal silica.

Biocompatibility:

- a) Effect of Monomer: Causes chemical toxicity by affecting the pulp.  
Pulp protection layer of  $\text{CaOH}_2$  or GIC is applied to pulpal of deeper cavities, prior to insertion.
- b) Effect of Microleakage - Infection of pulp tissues  
Promotes material breakdown.

INHIBITION OF POLYMERIZATION

Butylated hydroxy toluene (BHT).

REPAIR OF COMPOSITES: Remove contaminated material from the surface and roughen it. Place fresh composite after applying bonding agent.

POSTERIOR COMPOSITES:

Advantage: Increased resistance  
Lower incidents of cuspal fracture.

RESINS FOR RESTORING ERODED AREAS:

Sandwich technique can be done. Recommended for class II and class V composite restorations.

PIT AND FISSURE SEALANTS:

For preventing caries in susceptible pits and fissures of posterior teeth both filled and unfilled resin have been employed.

PROSTHODONTIC RESINS:

To fabricate veneers, for cast metal restorations.

RESIN INLAY SYSTEMS

- Indirect based restorative materials
- Indication: aesthetic

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TARNISH AND CORROSION

DEFINITION:

Tarnish: Process by which a metal surface is dulled or discolored when a reaction with a sulphide oxide, chloride or other chemical cause a thin film to form.

Corrosion: Chemical (Electrochemical) process in which a solid, usually a metal is attacked by environmental agent resulting in partial / complete dissolution.

CAUSES: Tarnish → hard and soft deposition on the surface of restoration like plaque and calculus and formation of thin oxide sulphide film.

Corrosion - May occur through action of moisture atmosphere, acid or alkaloide.

CLASSIFICATION OF CORROSION:

1. Chemical or dry corrosion In chemical / dry corrosion, there is direct combination of metallic and non-metallic element to yield a chemical compound through a process like oxidation, halogenation / Sulphurization reaction.

Eg: - Discolouration of silver by sulphur where silver sulphide forms by chemical corrosion.

## 2. Electrolytic or Electrochemical or Wet Corrosion:

It is called so because, it requires water and electrolyte to transport in oral cavity e.g: Saliva

### TYPES:

#### a) Galvanic corrosion or Dissimilar metals:

It is a type of wet corrosion occur when dissimilar metals in direct contact with each other. e.g: Saliva with salts, saliva provide a weak electrolyte.

#### b) Heterogenous composition

A type of corrosion occurring within the restoration itself. Heterogenous composition can cause galvanic corrosion. When eutectic alloy is immersed in electrolyte, the metallic grain with decreased electrode potential undergoes corrosion.

c) Stress corrosion: A metal that has been stressed by cold working becomes more reactive at site of more stress. If stressed and unstressed metals are in contact, the stressed metal act as anode and corrode.

d) Concentration cell corrosion or crevice corrosion: Electrolyte concentration cell corrosion. Composition of electrolytes under food debris of various substances, Saliva contributing to corrosion. Oxygen cell corrosion, greater corrosion is seen where  $O_2$  is less.

### PROTECTION AGAINST CORROSION:

Passivation: increasing noble metal contents  
Polishing restoration, avoid dissimilar metal restoration

### CLINICAL SIGNIFICANCE OF GALVANIC CURRENTS:

Galvanic shock - Sudden pain due to galvanic current

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SILVER AMALGAM

DEFINITION OF AMALGAM:

An alloy containing mercury.

CLASSIFICATION:

- As per A.D.A. Specification No.1  
 Low copper alloy :  $< 6\%$  Cu  
 High copper alloy :  $> 6\%$  Cu
- Based on Zinc content  
 Zinc containing alloy :  $0.01\%$  Zn  
 Zinc free alloy :  $< 0.01\%$  Zn
- Based on shape of alloy  
 Lathe cut alloy, Spherical alloy.
- Based on number of alloyed metals.  
 Binary, Tertiary, Quaternary alloys.

APPLICATION:

- As permanent filling material in:-
- Class I and Class II cavities.
  - Class V cavities where aesthetics is not primary consideration.

MODE OF SUPPLY

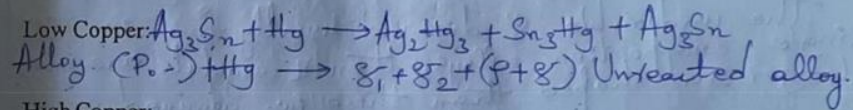
- Bulk powder
- Alloy and mercury
- Preweighed alloy as tablet/pellet and mercury in sachet.

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COMPOSITION:

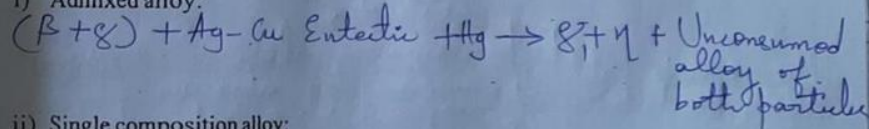
INGREDIENTS:	PERCENTAGE		
	CONVENTIONAL	ADMIXED	SINGLE COMPOSITIONAL
Silver (Main element)	63-70%	40-70%	60%
Increase hardness, setting expansion, Decrease flow)	26-28%	26-30%	27%
Tin (Controls rate of reaction b/w Ag & Hg)	2-5% ( $< 6\%$ )	9-20%	13-30%
Copper (↑ strength & hardness)	0-2%	0-8%	0-1%
Zinc (Scavenger)			

SETTING REACTION:  $\text{deoxidiser}$

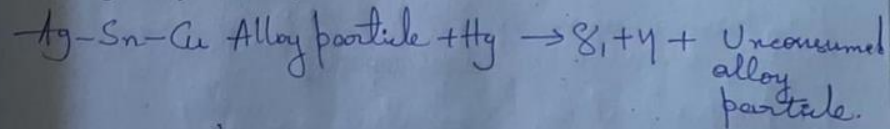


High Copper:

i) Admixed alloy:



ii) Single composition alloy:



REACTION PHASES:

Gamma one ( $\gamma_1$ ) --  $Ag_2Hg_3$  (Strongest phase)  
Solubility of Ag in Hg is much lower than that of Sn so  $Ag_2Hg_3$  phase precipitate first & is designated as

Gamma Two ( $\gamma_2$ ) --  $Sn_7-8Hg$  (Weakest phase)  
 $\gamma_2$  phase participate later.  $\gamma_2$  phase is the least stable in corrosive environment & may suffer corrosion attack equally in restoration

Gamma ( $\gamma$ ) --  $Ag_3Sn$

Main reaction after trituration occur between  $Ag_3Sn$  & Hg.

Eta ( $\eta$ ) --  $Cu_6Sn_5$

The undesirable  $\eta$  does not usually form in most single composition alloys, then  $\eta$  crystals are much larger & rod shaped than those in admixed amalgam.

DIAGRAM:

Conventional

Admixed

Single Composition

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DESCRIPTION OF ALLOY:

1. Conventional: Amalgamation occurs when mercury comes in contact with the surface of silver, tin, alloy particles. When alloy powder and mercury are triturated, the silver and tin dissolve in mercury. At the same time, mercury diffuses into alloy particles & reacting with silver and tin dissolves in form  $\gamma_1$  &  $\gamma_2$  phase. While crystals of  $\gamma_1$  and  $\gamma_2$  phases are being formed, the amalgam is soft and can easily be condensed and carved. As time progresses more crystals of  $\gamma_1$  &  $\gamma_2$  are formed & amalgam becomes harder. All alloy do not react completely with mercury. Set amalgam: Unreacted ( $\gamma$ ) surrounded by a matrix of  $\gamma_1$  &  $\gamma_2$ .

2. Admixed:  $\gamma_1$  &  $\gamma_2$

These are developed by mixing one part silver-copper eutectic alloy with two parts silver tin alloy. An eutectic alloy is one in which components exhibit complete liquid solubility but limited solid solubility. The silver-copper phase exhibit a eutectic structure at composition of silver 71.9% & Copper 28.1%. Admixed amalgam are stronger than latter but low copper alloy, because silver-copper particles act as filler in amalgam matrix, increase strength.

3. Single Composition

Unlike admixed alloy, each particle of a these alloy powders have same chemical composition. Hence called single composition/Uni-compositional alloy. When triturated with Hg, silver & tin dissolve in Hg. Very little copper dissolves in Hg.  $\gamma_1$  crystals grow from matrix that binds together partially dissolved alloy particles. Later  $\eta$  crystals are formed at the surface of alloy particles.

Set amalgam: Core -  $Ag_3Sn$  &  $Ag_2Cu$   
Matrix -  $\gamma_1$  ( $Ag_2Hg_3$ )

MANIPULATION:EXPERIMENT:

AIM: To study the manipulation and properties of silver amalgam.

INSTRUMENTS AND MATERIALS:

- |                      |                    |
|----------------------|--------------------|
| 1) Amalgam dispenser | 5) Amalgam carvers |
| 2) Mortar and pestle | 6) Ball burnishers |
| 3) Amalgam carrier   | 7) Dental napkin   |
| 4) Amalgam condenser |                    |

PROCEDURE1. PROPORTIONING:

Mercury --- alloy ratio: Amount of alloy & Hg to be used

- It signifies the No. of parts of Hg by weight to be divided by no. of parts of alloy to be used for parts technique.
- Hand mixing --- 6:5
  - Eames tech. --- 1:1

2. TRITURATION

Bottle method to reduce mercury content.

Objectives: Proper amalgamation of mercury & alloy.

The oxide layer is removed by abrasion when the alloy particle and mercury are triturated.

Hand Mixing: It is done using a mortar & pestle. The inner surface of mortar is roughened to increase friction between amalgam & glass surface. Time: 35-40 sec.

Mechanical Mixing:

Mechanical amalgamators are used which are standardized & safe.

\* Capsules serve as mortar. A cylindrical metal pestle is used.

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\* The alloy and mercury are dispensed in capsule which capsule is secured in machine, it is turned on, the amalgamation is accomplished.

\* Automatic timer is present.

\* Multiple speed amalgamator provide greater versatility.

3. CONDENSATION

Objectives: To adapt amalgam to preparation walls. To provide restoration free of voids, reduce marginal leakage, enhance strength, reduce creep, remove excess mercury.

Hand Condensation: The mixed material is packed in increments so that it is properly adapted. The alloy should be carried to prepared cavity by amalgam carrier.

Mechanical Condensation: Mechanical condensers are available which provide vibration or impact type of force to pack the amalgam.

4. CARVING & FINISHING:

After amalgam is overfilled into the prepared cavity, the filling is carved to reproduce the proper tooth anatomy. The carving should not be started until the amalgam is hard.

5. BURNISHING:

After carving the restoration should be smoothed. This is done by burnishing the surface & margins of restoration using a ball burnisher. A ringing sound is heard.

6. POLISHING

The objective of finishing and polishing is to remove the superficial scratches and irregularities. This minimizes corrosion and prevents adherence of plaque. The polishing should be delayed for 24 hrs. Wet polishing is advised.

GRADE:

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PROPERTIES:

1. Dimensional Change: Dental amalgam may expand or contract depending on its manipulation. Ideally the dimensional change should be small. Excessive contraction will lead to microleakage. i.e Secondary caries. Excessive expansion can produce pressure on pulp & post operative sensitivity.  
Effect of moisture contamination:

If zinc containing copper amalgam is contaminated with moisture during trituration/Condensation it leads to a large expansion called delayed expansion. The zinc react with moisture to form  $H_2$  gas, that accumulates in amalgam causes expansion.

Strength:

Compressive strength:

- Low copper  $\rightarrow$  145 MPa (1hr) & 343 MPa (7 days)
- Admix  $\rightarrow$  137 MPa (1hr) & 431 MPa (7 days)
- Single composition  $\rightarrow$  262 MPa & 570 MPa (7 days)

Tensile strength:

- Low copper  $\Rightarrow$  60 MPa
- Admix  $\Rightarrow$  48 MPa
- Single composition  $\Rightarrow$  64 MPa

Factor affecting strength:

- $\rightarrow$  Trituration: *Praveen* Trituration will decrease strength.
- $\rightarrow$  Mercury content: Excess mercury content will decrease strength.
- $\rightarrow$  Condensation: Lathe cut alloys greater spherical amalgam higher strength and adapted to higher pressure give better strength.
- $\rightarrow$  Porosity: Voids & porosity reduce strength.

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3. Creep: Time dependent plastic deformation. Creep rate correlate with marginal breakdown. Higher the creep, greater degree of marginal deterioration. According to ADA specification number-01 Creep should be  $< 2\%$  for low copper 0.8-8% for high copper (0.4-1%).

Factors affecting creep:

- The increased strength and low creep:
  - $\rightarrow$  Minimum mercury, alloy ratio.
  - $\rightarrow$  Maximum condensation pressure for lathe cut alloy
  - $\rightarrow$  Attention should be paid to timing of trituration and condensation.

4. Tarnish and Corrosion:

Amalgam restorations often tarnish and corrode in oral environment. The degree of tarnish depends on:  
i) Oral environment ii) Type of alloy used.

5. Mercury Toxicity:

Mercury penetrates from restorations to tooth and leads to discoloration of tooth, also it is released during mastication but unaffected. Mercury vapour inhalation is toxic, that mainly affects the dentists/operator.

6. Marginal break down:

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DIRECT FILLING GOLD:CLASSIFICATION:

- 1) Foil (Fibrous gold) Sheets  $\begin{cases} \text{Cohesive} \\ \text{Non cohesive} \end{cases}$
- 2) Electrolytic precipitated - Mat foil, Mat gold
- 3) Granulated gold.

APPLICATION: Pits of small class I restoration

For repair of casting margins  
For Class II, V, VI restoration.

Perforations in gold crown.

MODE OF SUPPLY:

flat square sheets

Preformed cylinders.

Many gold foil sheets placed one above the other  
Laminated foil.

A sheet of pure platinum placed between  
pure sheets of gold - Platinised gold

Type of laminated gold.

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Types:1. GOLD FOIL:a) Sheet:

Cohesive and noncohesive gold can also be transformed to other physical form like pellets, cylinders, ropes.

b) Preformed Foils: Condensed laminates of varying thickness as produced by manufacturers.

c) Platinized Foil: It is laminated or with one sheet of platinum foil between two gold foil.

2. ELECTROLYTIC PRECIPITATE:

Microcrystalline gold powder formed by electrolytic precipitation which is sandwiched between sheets of gold foil and formed into strips.

Mat Gold

The electrolytic ppt can be bent to a desired size and it is often preferred for its ease in building up the internal bulk of restoration. Mat gold of which is alloyed with trace amount of calcium, can yield a further increase in hardness by dispersion, strengthening without affecting in hardness handling properties.



Wet Electrolytic Precipitate: Gold powder in agglomerated form can also be prepared by chemical precipitation.

3. POWER GOLD: Gold powder in agglomerated form can also be prepared by chemical precipitation, atomisation from molten gold. To prevent agglomeration form disintegration the atomised and chemically precipitated powder are first mixed with a soft wax to form a pellets. These wax gold pellets are wrapped with foil. The resulting pellets are cylindrical in shape and available in several diameters and lengths. Heating to burn away wax is mandatory before insertion into prepared cavity.

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## MANIPULATION:

### STEPS:

1. Desorbing or Degassing: Absorbed gases prevent gold from fumes. Hence it is necessary for a dentist to heat foil/pellet, immediately before it is carried in prepared cavity. This heating process which removes surface gases and ensure a clean surface called desorbing.

### 2 Compaction:

- Hand mallet.
  - Pneumatic vibrating condenser.
  - Static driven condensers.
- Condenser penetration should be less than the thickness of each segment that is compacted. The depth of each cold welded mass is usually between 0.2 - 0.3 mm.
- The final density is controlled by directed
    - e.g :- Magnitude of compaction force and by the size of shape of condenser tip.

## PHYSICAL PROPERTIES OF COMPACTED GOLD:

1. Strength:

161 - 227 MPa

2. Hardness:

52 - 75 VHN

3. Density:

19.3 g/cm<sup>3</sup>

14.3 - 15 g/cm<sup>3</sup> (Apparent density)

4. Tarnish and Corrosion Resistance

Has good tarnish and corrosion resistance  
But rarely get tarnish/corroded in oral cavity.

5. Biocompatibility:

Minimal pulpal response is compacted gold

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## DENTAL CEMENTS

Dental cements are restorative materials of comparatively low strength, but they are used extensively in dentistry when strength is not a prime consideration. They are also used as insulators and luting agents.

### CLASSIFICATION:

FUNCTIONS	CEMENTS
Final cementation of completed restoration	Zinc phosphate, Zinc silicophosphate Reinforced Zinc oxide-eugenol, Zinc Polycarboxylate, Glass ionomer
Temporary cementation of completed restorations or cementation of temporary restorations	Zinc oxide-eugenol, Noneugenol Zinc oxide.
High strength bases	Zinc phosphate, Reinforced Zinc oxide eugenol Zinc polycarboxylate, Glass ionomer.
Temporary fillings	Zinc oxide-eugenol, Reinforced Zinc oxide eugenol, Zinc polycarboxylate,
Low strength bases	Zinc oxide-eugenol, Calcium hydroxide.
Liners	Calcium hydroxide in a suspension.
Varnishes	Resin in a solvent.
<u>Special Applications:</u>	
Root canal sealant	Zinc oxide-eugenol, Zinc polycarboxylate
Gingival tissue pack	Zinc oxide-eugenol.
Surgical dressing preparations	Zinc oxide-eugenol, Zinc oxide
Cementation of orthodontic bands	Zinc phosphate, Zinc polycarboxylate.
Orthodontic direct bonding	Acrylic resin, Composite resin.

SILICATE CEMENT

As per A.D.A. Specification No. 9

APPLICATIONS: Anterior aesthetic filling material  
Intermediate restoration for caries.

MODE OF SUPPLY:

Powder and Liquid.

COMPOSITION:

<u>Ingredients</u>	<u>Functions</u>
Silica 40%.	Principle ingredients
Alumina 20%.	
Sodium fluoride traces.	Releases fluoride ions.
Calcium fluoride	
Ca-Phosphate ions.	

Powder:Liquid:

Phosphoric acid - 52%  
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Reacts with  
silica fluoride

PROPERTIES1. Mechanical Properties:

	<u>Psi</u>	<u>MPa</u>
Compressive strength ---	2600	180
Tensile strength ---	500	85

2. Solubility and Disintegration:

Solubility is high initially but later decreases.

3. Adhesion: Bonding is mechanical in nature.4. Esthetics: Very good aesthetics, stain may appear, if restoration are allowed to any surface, it becomes powdery and opaque.5. Biological properties:

pH - 2.8 severe irritant

6. Dimensional change:

Slight contraction occurs during setting

7. Thermal Properties:

COTE is lower than other cement. It is close to enamel and dentin.

8. Anticariogenic Properties:

Fluoride prevent accumulation of plaque.

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GLASS IONOMER CEMENT

CLASSIFICATION:

As per A.D.A. Specification No. 66

- Type I --- For luting
- Type II --- For restoration
- Type III --- liners and bases.

APPLICATIONS: It is used as an anterior aesthetic restorative material for class III and class V. Also used as a luting agent for restoration of orthodontic brackets. It is used as liners and bases and for core build up.

MODE OF SUPPLY

- Powder / Liquid in bottle
- Pre-portioned powder and liquid in capsule
- Light cure system
- Water settable type.

COMPOSITION:

	<u>Ingredients</u>	<u>Functions</u>
<u>Powder:</u>	Silica Alumina	Reacting particles of powder
<u>Liquid:</u>	Aluminum fluoride Calcium fluoride Sodium fluoride	Releases ions for cross-linking

Aq. Solution of polyacrylic acid  
 Copolymer of methacrylic acid  
 (Co) Terephthalic acid  
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 Tartaric acid acts as a controlling additive

Coarse particles are used for restorative cement  
 increases the reactivity, its viscosity and tendency for gelation.  
 its normal working time

SETTING REACTION: While mixing into a paste etches the surface of glass particles and Co, Al, Na and F ions are released into aqueous medium. Polyacrylic acid cross linked by Ca<sup>2+</sup> replaced by Al<sup>3+</sup> within 24 hours. Na<sup>+</sup> may replace H<sup>+</sup> of carboxyl groups. Unreacted glass silt particles are sheathed by silica gel developed during removal of action

SETTING TIME:

- Type I --- 4-5 min.
- Type II --- 4-5 min.

FACTORS AFFECTING SETTING TIME:

- ① Glass composition  
Higher alumina - silica ratio, faster set and shorter working time.
- ② Particle size - Finer the powder faster the set
- ③ Addition of tartaric acid - Shorter setting, less working time, improves handling properties
- ④ Relative properties of the constituents, greater proportion of water faster the set.
- ⑤ Temperature

MANIPULATION:EXPERIMENT:

AIM: To study the manipulation of Glass Ionomer Cement.

MATERIALS AND INSTRUMENTS:

- |                                    |                             |
|------------------------------------|-----------------------------|
| 1. Glass slab or mixing pad        | 5. Cotton pledge            |
| 2. Agate spatula                   | 6. Glass ionomer cement     |
| 3. S.S. Plastic filling instrument | 7. Cavity varnish           |
| 4. Tweezer                         | 8. Cellulose acetate matrix |

PROCEDURE

- The powder-liquid ratio recommended by the manufacturer should be used.
- Spatula used - ~~stiff plastic or metal spatula~~
- The powder and liquid is dispensed just prior to mixing.
- A non-absorbent paper pad is used.
- The powder should be incorporated rapidly into the liquid for restorative applications.
- Half of the powder is mixed into liquid for 5-15 sec. The rest is then added quickly.
- Mixed by Pragya cement on itself until a glossy appearance is achieved.
- Mixing time is achieved by 45 sec.

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PROPERTIES:

- Mechanical Properties: Compressive strength similar to Zinc phosphate and its diameter. Tensile strength is slightly higher.  $M\&OE$  is half that of phosphate cement.
- Solubility:
  - The initial solubility is high due to leaching of intermediate products.
  - Solubility in water for luting type - 1.25% wt.
  - Solubility in water for Restorative type - 0.4% wt.
- Adhesion: Chelation of carbonyl groups of the polycarboxylic acids with calcium in the apatite of enamel and dentin.
- Anticariogenic Properties: After setting, glass ionomers releases fluoride in amounts comparable to those of silicate cements. Which helps in prevention of demineralisation of enamel & dentin which help in anticariogenic properties.
- Biological Properties: GIC's elicit a greater pulpal reaction than ZOE cement but less than Zinc phosphate.

METAL MODIFIED GLASS IONOMER CEMENTS:

Metal fillers are incorporated in GICs to improve their fracture toughness and stress bearing capacity. The fillers are derived from Ag alloy powder. The adhesion and F released are useful for core buildup of tooth.

LIGHT CURABLE GLASS IONOMER CEMENTS

ZINC OXIDE EUGENOL CEMENTCLASSIFICATION

As per A.D.A. Specification No. 30

- TYPE I -- Temporary cementation.  
 TYPE II -- Long term cementation of fixed prostheses.  
 TYPE III -- Temporary filling and thermal insulating bases.  
 TYPE IV -- Intermediate fillers, Cavity liners.

APPLICATIONS:

- Luting agent
- Temporary restoration
- Endodontic sealers
- Root end filling material
- Periodontal coating

MODE OF SUPPLY

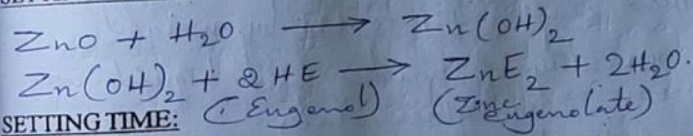
- ① Powder and liquid form
- ② Two paste system.

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COMPOSITION:

	Ingredients	Function
<u>Powder:</u>	Zinc oxide	→ Principle ingredient.
	White resin	→ To reduce brittleness.
	Zinc stearate	→ Accelerator, Plast, sizer.
<u>Liquid:</u>	Zinc acetate	→ Accelerator, Improves
	Magnesium oxide	→ main ingredient strength.
	Eugenol	→ Reacts with ZnO
	Olive oil	→ Plast, sizer.

SETTING REACTION:SETTING TIME:

4-8 min

FACTORS AFFECTING SETTING TIME:

- ① Manufacture
- ② Particle size: Smaller the size set faster.
- ③ Accelerators: faster setting
- ④ Retarder
- ⑤ Heat
- ⑥ Powder-liquid ratio.

EBA CEMENT:

EBA: Ethoxy Benzoic cement.

\* It is a substitute for eugenol liquid. in orthobenzoic acid & alumina is added to the powder.

\* It shows improved strength and abrasion resistance.

MANIPULATION:EXPERIMENT:

AIM: To study the properties and manipulation of zinc oxide eugenol cement.

INSTRUMENTS AND MATERIALS:

1. Glass slab
2. Stainless steel spatula
3. S.S. Plastic filling instrument
4. Zinc oxide powder and Eugenol liquid

PROCEDURE

- \* Powder liquid ratio: 4:1 to 6:1 by weight
- \* Measured quantity of powder and liquid are dispensed on cool glass slab.
- \* The bulk of the powder is incorporated into the liquid and spatulated thoroughly in a circular motion.
- \* Zinc oxide eugenol exhibit pseudothickening.
- \* Further vigorous spatulation or stropping loosens the mix.
- \* For temporary restorations - Putty like consistency is recommended.

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PROPERTIES:1. Mechanical properties

	Psi	Mpa
Compressive strength ---	725 - 797 Psi	5 - 55 Mpa.
Tensile Strength	46 - 768 Psi	0.32 - 5.3 Mpa.

2. Solubility and Disintegration

→ Solubility of the cement is high (0.4 to 1.5% wt)  
 → They disintegrate in oral fluids, due to hydrolysis of zinc eugenolate to form  $Zn(OH)_2$  and Eugenol.

3. Adhesion:

→ Solubility is reduced by increasing P/L ratio  
 They do not adhere to enamel or dentin

4. Optical Properties:

Set cement is opaque.

5. Biological Properties:

- Mild pulpal response.
- pH → 6.6 to 8.0 They are least irritants of all cements.
- They inhibit the growth of bacteria & have an soothing effect on pulp.

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ZINC PHOSPHATE CEMENTCLASSIFICATION

As per A.D.A. Specification No. 8

- Type I Fine grained for luting (Thickness  $< 25 \mu\text{m}$ )  
 Type II Medium grained for luting and filling  
 (Thickness  $> 25 \mu\text{m} < 40 \mu\text{m}$ )

APPLICATIONS: ① Luting of restorations (Inlays, crowns, fixed dental prosthesis)

- ② High strength bases.  
 ③ Temporary restorations  
 ④ Luting of orthodontic bands and brackets

MODE OF SUPPLY:

- ① Powder and liquid system  
 ② Capsules of pre-portioned powder & liquid  
 ③ Supplied in shades of yellow, green, brown.

COMPOSITION:IngredientsFunctionsPowder:

Zinc oxide — Principle ingredient

Magnesium oxide — Aids in sintering

Other oxides (like Bismuth fluoride, Calcium oxide, Barium oxide)

Liquid:

Phosphoric acid — Improves smoothness of the mix

PRINCIPAL 38-59%. Reacts with ZnO

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Aluminium phosphate CA/37/24th Main, J.P. Nagar, 1st Phase.

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Zinc phosphate upto 60%. Buffers to reduce rate of reaction

SETTING REACTION

When mixed, phosphoric acid dissolves the zinc oxide which react with aluminum phosphate and forms zinc aluminophosphate gel. on the remaining undissolved zinc oxide particles. The set cement contains unreacted ZnO increased in an amorphous matrix.

SETTING TIME:

2.5 - 8 mins.

CONTROL OF SETTING TIME:

- particle size finer particles reacts more quickly as a greater surface area is exposed to liquid.  
 - Water content of liquid present of excess water accelerates whereas insufficient water retards the reaction.  
 - Sintering temperature - Higher the temperature slower it sets

PRECAUTIONS:Care of Powder and Liquid

The liquid should not be dispersed onto the slab until the powder is dispensed & divided & the cement is ready for use because the water from the liquid will evaporate.



MANIPULATION:EXPERIMENT:

AIM: To study the manipulation of Zinc phosphate cement.

INSTRUMENTS AND MATERIALS:

- 1) Glass slab
- 2) S.S. Cement spatula
- 3) Plastic filling instrument
- 4) Zinc Phosphate Cement --- Powder  
--- Liquid

PROCEDURE:

- The powder is added in small increments
- Mixing is done with stainless spatula using circular motion.
- Each increment is mixed for 15-20 sec.
- A large area is covered during mixing in order to dissipate heat
- Maximum amount of powder should be incorporated in liquid to ensure minimum solubility & maximum strength.

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PROPERTIES

1. Mechanical properties It has a compressive strength as high as 104 MPa. Tensile strength of 5.5 MPa & an elastic modulus of 134 Pa. Making it relatively strong and stiff compared with other cements.
2. Solubility and Disintegration
  - It has a relatively low solubility in water 0.06%.
  - Shows greater disintegration.
  - In vivo disintegration in the presence of lactic acid, acetic acid and citric acid.
3. Adhesion: acid and citric acid.
- \* It does not chemically bond to tooth prosthesis. It bonds simply mechanical the cemented restoration help by mechanical interlocking of set cement with surface roughness of both restoration.
4. Biological Properties:
  - ▶ Pulp response is moderate.
  - ▶ Phosphoric acid in liquid makes mixture quite acidic and hence cytotoxic when prosthesis treated with cement.
5. Optical Properties:

Set cement is opaque.

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ZINC POLYCARBOXYLATE CEMENT

As per A.D.A. Specification No. 61

APPLICATIONS:

- Primarily for luting of permanent restorations
- As bases and liners.
- Used in orthodontics in cementation of bands
- Used as root canal fillings in endodontics.

MODE OF SUPPLY:

- Powder and liquid in bottle.
- Stab Settable cements
- As pre-encapsulated powder and liquid system

COMPOSITION:

	<u>Ingredients</u>	<u>Functions</u>
<u>Powder:</u>	Zinc oxide	- Base ingredient
	Magnesium oxide	- Principal modifier also aids in sintering
	Bismuth oxide	- Smooth mix
	Alumina	- Filler.
<u>Liquid:</u>	Stannous fluoride	- Anticariogenic properties
	Water	

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SETTING REACTION: When the powder and liquid are mixed, the surface of powder particles are attacked by acid releasing zinc, Magnesium and tin ions. These ions bind to the polymer chain via carboxyl group. They also react with carboxyl group of adjacent polymer chain to form cross linked chains.

SETTING TIME:

6-9 min.

FACTORS AFFECTING SETTING TIME:

When P/L ratio increases setting time increases. The pH of the mix rapidly form 2-6 mins as setting reaction proceeds. The pH of the cement liquid is initially slightly less acidic than that of Zinc phosphate cements but it is still very low.

The cement should be mixed on a non absorbent surface such as glass slab.

The powder should be rapidly incorporated into the liquid. The liquid should be dispensed just before use because the water in liquid evaporates quickly. Water control the setting time.

Refrigerating the powder is useful because it retards the reaction without raising the viscosity of the liquid.

MANIPULATION:EXPERIMENT:

AIM: To study the properties and manipulation of Polycarboxylate cement

MATERIALS AND INSTRUMENTS:

- 1) Glass slab or mixing pad
- 2) Cement spatula
- 3) S.S. Plastic filling instrument
- 4) Polycarboxylate cement.

PROCEDURE

1.5 mg parts of powder to 1ml parts of liquid. The liquid should be dispensed just before use as the water in the liquid evaporates quickly which is its viscosity. The powder should be rapidly mixed into the liquid. A long mixing time can yield cement that is too viscous for intended application. The cement must be used before glassy appearance because glassy surface indicates free carboxylic acid and groups are still present for good bonding to tooth.

A dull looking mixture means insufficient present

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1. Mechanical Properties:

	Psi	MPa
Compressive strength --	8900	55 MPa
Tensile strength		6.2 MPa

2. Solubility and Disintegration: It tends to absorb water and is slightly more (0.6% wt) than zinc phosphate. Thus dissolution is more when used for cementing. It is more soluble in organic acids like lactic acid. Low powder results in higher solubility to disintegration in oral cavity.

3. Adhesive: An outstanding characteristic of zinc polycarboxylate is that the cement binds chemically with the tooth structure.

Precaution: Tooth surface must be cleaned for better adhesive properties.

Polyacrylic acid may be used to condition the tooth surface.

4. Optical Properties: They are very opaque due to large quantities of unreacted zinc oxide due to that zinc polycarboxylate is not used for unrestrictive purpose.

5. Biological Properties:

- pH cement is 5-6.
- pulpal response is mild.
- Polyacrylic acid molecules limit acid penetrates into dentinal tubules because of molecular weight.

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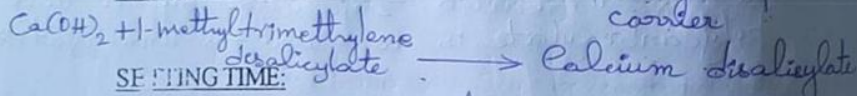
CALCIUM HYDROXIDE

APPLICATION: For direct and indirect pulp capping. Serves as barriers against irritants.

MODE OF SUPPLY: Two paste system, Powder form, Light cured system, Single paste in syringe form.

COMPOSITION:

	Ingredients	Function
	Methyl trimethylene disalicylate	Reacts with Calcium and ZnO
Page 1	Titanium dioxide	Inert fillers of pigment
	Calcium tungstate or barium sulphate	Provides radiopacity
Page 2	Calcium hydroxide	Principal reactive ingredient
	Zinc stearate	Accelerator
	Ethylene toluene sulfonamide	Oily compound acts as carrier

SETTING REACTION:SETTING TIME:

2.5 - 5.5 minutes

FACTORS AFFECTING SETTING TIME:

Setting time reduced if there is moisture and accelerators.

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MANIPULATION:EXPERIMENT:

AIM: To study the properties and manipulation of Calcium Hydroxide cement.

MATERIALS AND INSTRUMENTS:

- 1) Glass slab
- 2) Cement spatula
- 3) S.S. Plastic filling instrument
- 4) Calcium Hydroxide cement

PROCEDURE

Equal length of two pastes are dispensed on a paper and mixed to a uniform colour. The material is coarse and applied using a Calcium hydroxide carrier or applicator. It is applied to deep areas of cavity (or) directly over mildly exposed pulp.

GRADE :

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PROPERTIES:1. Mechanical Properties:

	Psi	MPa
Compressive strength ---	8900	10.27 MPa (after 24 hrs)
Tensile strength ---	1444	101 MPa

2. Solubility and Disintegration:

Solubility high  $\rightarrow$  0.4 - 7.8%.

3. Thermal Properties: If used in sufficiently thick layers provide some thermal expansion but thickness is greater than 0.5 mm is not recommended.

4. Biological Properties: Alkaline in nature, pH 9.2-16.7. Induce formation of secondary dentin.

VISIBLE LIGHT CURE CALCIUM HYDROXIDE

These elements have recently become available and consists of  $\text{Ca}(\text{OH})_2$  and barium sulphate dispersed in methanol methacrylate increases. They have longer working time and are less brittle than conventional 2 paste system. ✓

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CAVITY VARNISHES, LINERS AND BASES

Cavity varnishes, liners and insulating bases are designed to be used as adjuncts to the restorative materials in order to protect the pulp against thermal and chemical insults, microleakage and certain of these agents themselves have beneficial effects upon the tooth.

CAVITY VARNISHES: It is a solution of one or more resins which when applied onto the cavity walls evaporates leaving a thin resin, that serves as a barrier between the restoration and dentinal tubules.

APPLICATIONS: ① Reduces the passage of irritants to dentinal tubules.

② Reduces microleakage.

③ Varnishes may be applied as a temporary protection on metallic restoration against galvanic shock.

④ In electrosurgery, as temporary electric insulator.

COMPOSITION: ⑤ Fluoride containing varnishes release F<sup>-</sup>

- Natural gum such as copal resin, dissolved in an organic solvent like alcohol, acetone or ether.
- Medicinal agents such as chloroformol, thymol and eugenol may be added.
- Some varnishes also contain fluoride.

Manipulation: Varnishes may be applied using a brush or a small pledget of cotton. Several thin layers are applied. Each layer is allowed to dry before applying the next one. When first layer dries small pin holes develop. These voids are filled in by succeeding varnish applications.

Properties:

- \* Varnishes neither possess mechanical strength nor provide thermal insulation because of thin film thickness. (Film thickness 2-400  $\mu\text{m}$ )
- \* Solubility of dental varnishes is low; they are virtually insoluble in water.

Contra indications:

① Composite resins: The solvent in varnish may react with the resin.

② Glass ionomer: Varnishes eliminates the potential for adhesion if applied between GIC and ~~any other~~ any other.

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③. D.A. PANDU MEMORIAL R.V. DENTAL COLLEGE is expedited for the overlapping cement action. e.g. Zinc oxide eugenol & calcium hydroxide.

CAVITY LINERS: Is used like a cavity varnish to provide a barrier against the passage of irritants from cements or other restorative material & to reduce the sensitivity of freshly cut dentin.

Types:

- 1) Calcium Hydroxide
- 2) Type III Glass ionomer
- 3) Type IV Zinc-oxide-eugenol

Composition: [Calcium hydroxide liner]:

- Suspension of  $\text{Ca(OH)}_2$  in an organic liquid such as methyl ethyl ketone or ethyl alcohol.
- Acrylic polymer beads or barium sulphate calcium monofluorophosphate.

Manipulation:

Cavity Liners are fluid in consistency & be easily flowed or painted over dentinal surface. The solvent evaporates to leave a thin film residues that protects the pulp. The paste form is applied in the cavity then light cured.

Properties:

- Like varnishes, cavity liners does not possess any mechanical strength nor provide any significant thermal insulation.
- Calcium hydroxide liners are soluble and shouldn't be applied at the margins of restoration.
- Fluoride contents are added to some cavity liners in an attempt to reduce the possibility of secondary caries around permanent restoration.

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CEMENT BASES: Are applied in thick layers greater than (0.75 mm) beneath restorative material to protect the pulp against thermal injury, galvanic shock & chemical irritation.

Types:

1) High Strength bases: Provides thermal protection for the pulp and mechanical support for restoration. Examples of high strength bases are Zinc phosphate, zinc polycarboxylate, Glass ionomer & reinforced ZOE cements.

2) Low Strength bases: Have minimum strength and low rigidity. Main function is to act as a barrier to irritants chemicals & to provide therapeutic benefit to pulp. e.g. ( $\text{Ca(OH)}_2$ , ZOE)

Properties:1) Thermal Properties:

- Base must provide thermal protection to pulp in metallic restoration
- Thermal conductivity of most cement bases is similar to tooth & is in the range of recognized insulator such as cork and asbestos
- For effective thermal protection the base should have minimal thickness of 0.75 mm.

## 2) Protection against chemical insults:

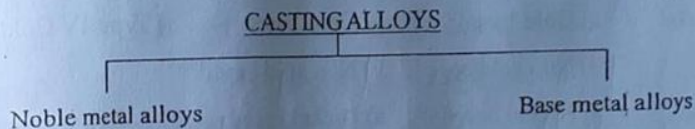
- Base also serves as barrier against penetration of irritants constituents (e.g. Acid, monomer) from restoration material.
- Calcium hydroxide, Zinc oxide eugenol are most effective especially in deep cavities.
- GIC is also used as chemical barriers in moderate cavities.
- 3) Strength: Base must have sufficient strength to.
  - Withstand forces of condensation.
  - Withstand fracture or distortion under masticatory stresses.
  - Minimum strength requirement for bases.
- 4) Therapeutic Effect:
  - 0.5 MPa - 1.2 MPa
- \*  $\text{Ca(OH)}_2$  acts as pulp capping agent & promote the formation of 2<sup>o</sup> dentin.
- \* Zinc oxide eugenol has an obtundent effect on pulp.

### Clinical Consideration:

- Base is selected according to
  - Design *Pragya*
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## DENTAL CASTING ALLOYS

Dental casting alloys are used for the fabrication of cast metal restorations, which are fabricated outside the mouth. There are different types of casting alloys used in dentistry.



### DEFINITIONS:

Noble metals: Gold and platinum group metals which are highly organic resistance to oxidation and discolouration acid

### Previous metals:

Indicates the intrinsic value of metal

### Base metals:

A metal that oxide or corrode.

Alloy: A crystalline solid with metallic properties i.e. compound of 2 or more chemical elements one of which is metal.

### KARAT:

Part of pure gold present in 24 parts of alloy.

### FINENESS:

Part per thousand of gold.

### PERCENTAGE:

$$\text{Percentage of gold} = \frac{\text{Karat} \times 100}{24}$$

$$\text{Percentage of gold} = \frac{\text{Fineness}}{10}$$

Percentage for karat and gold.



### CLASSIFICATION OF DENTAL CASTING ALLOYS:

- BY FUNCTION : Hardness increases from Type I to Type IV  
Metal ceramic RPD alloys
- BY DESCRIPTION:

	Crown & Bridge	Metal ceramic	RPD
Noble metal Alloys	a) Gold based b) Non gold based	a) Gold based b) Non gold based	a) Type IV Gold Alloys
Base metal Alloys	a) Nickel based b) Cobalt based	a) Nickel based b) Cobalt based	a) Cobalt chromium b) Nickel Cobalt chromium Nickel

CLASSIFICATION BY FUNCTION: As per A.D.A. Specification No. 5 Applications

- Type I 'A' Soft — soft inlays, class III and IV, no great strength  
 Type II 'B' Medium — Inlay subjected to moderate strength  
 Type III 'C' Hard — Inlays, crowns and bridges.  
 Type IV 'D' Extra hard — Compatible for

METAL CERAMIC Hard — for short span bridge

METAL CERAMIC Extra Hard — for long span bridge

REMOVABLE PARTIAL DENTURE RPD, framework and denture base

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### COMPOSITION:

Alloys :	Au %	Cu %	Ag %	Pd %	In, Sn, Zn, Ga %	Fe.
Type I	3	6	10	10.5	0.5	
Type II	7	7	14	1	1	
Type III	7.5	7	14	1	3	
Type IV	6.9	10	12.5	3.5	5	

METAL CERAMIC HARD

METAL CERAMIC

EXTRA HARD

### FUNCTION OF EACH INGREDIENTS:

Ingredients	Function
GOLD	Provide tarnish and corrosion resistances, provide ductility and malleability.
SILVER	Whitens alloys helps to combat reddish color of copper, increase strength.
COPPER	Increase hardness Decrease melting point
PLATINUM	Increase strength Increase melting point
PALLADIUM	Increase hardness
ZINC	Increase temperature. Provide tarnish temperature. Acts as O <sub>2</sub> scavengers.

PROPERTIES	GOLD ALLOYS	METAL CERAMIC
1. Fusion temperature	Low: 879°-943°C	High: 1149°-1394°C 350°C above that of porcelain
2. Coefficient of thermal expansion	High	Low: To be compatible dental porcelains
3. Copper content	Present	Absent

HEAT TREATMENT:

Types :

a) Softening Heat Treatment (Annealing)

i) Temperature: 700°C

ii) Alteration of properties:

Increases: Ductility

Decreases: Strength, proportional limits, hardness

iii) Indicated for appliances that are graded, shaped, worked inside/outside the mouth.

b) Hardening Heat Treatment (Age hardening)

i) Temperature: 200° - 450°C

ii) Alteration of properties:

Increases: Strength, proportional limit, hardness

Decreases: Ductility

iii) Indicated for metallic partial denture base

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FUNCTIONAL CHARACTERISTICS:

- Melting Range: Type I - Type IV Should have lower fusion temperature  
Type III - 932 - 960°C  
Type IV - 921 - 943°C
- Density:  
Type III - 15.5 g/cm<sup>3</sup>  
Type IV - 15.2 g/cm<sup>3</sup>
- Yield Strength:  
Type III - 207 MPa  
Type IV - 275 MPa
- Hardness:  
Type III - 121 VHN  
Type IV - 147 VHN
- Elongation (Ductility):  
Type III - 30-40%  
Type IV - 30-35%
- Modulus of Elasticity:  
Type IV -  $9 \times 10^{-8}$  MPa
- Casting Shrinkage:  
Ranges from 1.25 - 1.65
- Type of Investment:  
Gypsum bonded investment.

DENTAL CASTING BASE METAL ALLOYS

As per A.D.A. Specification No. 14

Types:

COBALT - CHROMIUM

NICKEL - CHROMIUM

COBALT - CHROMIUM - NICKEL

APPLICATIONS: Denture base.  
Cast removable, partial denture framework,  
surgical implants.

COMPOSITION:INGREDIENTSFUNCTION

Cobalt: Imparts hardness, rigidity to alloy.

Chromium: Passivating effect, excess, chromium resistance.

Nickel: Decreases strength, hardness, modulus of elasticity of fusion temperature.

Iron & Beryllium: Effect of ~~beryllium~~ reduce ductility to a extent.PRINCIPAL

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PHYSICAL PROPERTIES:

- Melting Range: Type I  $\rightarrow 1200^{\circ}\text{C} - 1420^{\circ}\text{C}$   
Type II  $\rightarrow$  temp.  $\approx 1300^{\circ}\text{C}$ .
- Density: Half of gold.  $2.9 \text{ g/cm}^3$
- Yield Strength: Higher than gold alloy  $\rightarrow 710 \text{ MPa}$
- Hardness: Harder than gold alloy  $\rightarrow 0.432 \text{ KHN}$
- Elongation (Ductility): Lower than gold alloy  $\rightarrow 11.12\%$ .
- Casting Shrinkage: Greater than gold alloys sinked are in crown & bridge  $\rightarrow 22\%$ .
- Modulus of Elasticity: Twice as stiff as gold alloy  $2.225 \times 10^5 \text{ MPa}$
- Type of Investment used: Phosphate bonded.
- Type of Flame used: Oxygen acetylene torch.

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COMPARISON OF PROPERTIES OF COBALT-CHROMIUM ALLOYS AND GOLD ALLOYS

PROPERTIES	COBALT CHROMIUM	TYPE IV GOLD
Strength	Adequate	Adequate
Density	Lighter	15 (heavier)
Hardness	Harder than cliff enamel	Softer than enamel
Stiffness	Stiff	flexible
Melting Temperature	1300°C	900°C
Casting Shrinkage	2-2.5%	1.25-1.65%
Heat treatment	Complicated	Simple
Tarnish Resistance	High	Adequate
Colour	Stable	Highly Corrosive

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WAXES

Waxes are used widely in the intermediate stages of the fabrication of many of the restorations and prosthesis used in dentistry. There are many varieties of waxes and each has particular properties depending on the purpose for which it is used.

CLASSIFICATION:

PATTERN WAX	PROCESSING WAX	IMPRESSION WAX
Inlay cavity	Boxing wax	Conductive wax
Base plate	Sticky wax	bite registration wax
RPP casting	Cordling wax	

I) PATTERN WAX:

Used to produce - Wax patterns of inlay, onlay, crown & bridge for wax casting technique.

II) PROCESSING WAX:

Boxing wax - To build vertical walls around impression.  
Beading wax - To produce desired size & form of base of cast.

III) IMPRESSION WAX:

Used to keep wax imprint edentulous part of mouth.  
Generally used in combination with other impression material.

INLAY CASTING WAXCLASSIFICATION:

As per A.D.A. Specification No. 4

Type - I A medium wax is used for direct wax technique  
 Type - II Soft wax is used for indirect wax technique

APPLICATIONS:

Type I → Used for direct wax pattern technique  
 Type II → Used for indirect wax pattern technique

MODE OF SUPPLY:

Blue or purple - Sticks of about 1.5 cm long and 3mm in diameter

COMPOSITION:IngredientsFunctions

Paraffin wax - Provides moldability, melting point.

Carnauba wax - Increases melting range, decreases flow at mouth temperature and given glass.

Ceresin wax - Gives carving characteristic wax.  
 Gives toughness.

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Synthetic wax - Gives stable flow properties.  
 Reduces mouth temperature.

IDEAL REQUIREMENTS:

- Should be no roughening of surface when wax is moulded.
- The wax should not flake or crumble when the wax is softened.
- The color should contrast with the die.
- During burnout (500°C), it should vaporize completely without residue.

1. Flow:

Type I Marked plasticity as flow at temp below mouth temperature hardens at 50°C and softens at 40°C  
 Type II 70% to 90% at 45°C.

2. Wax distortion: It is due to release of stresses in the pattern.

Causes of distortionPrecautions

- |  |   |
|--|---|
| - Not heated to uniform temp. when inverted into cavity.               | - Soften the wax uniformly.   |
| - If not held under uniform pressure during cooling.                   | - Place the soften or molten increments atypically to bond with earlier investment. |
| - Added wax at deficient areas introduces strength.                    | - Carefully to the carving without pulling from the margin.                         |
| - During carving some molecules of wax will be disturbed and stressed. | - Remove pattern carefully investment pattern is made without delay.                |

MANIPULATION:I) Direct technique - Type I wax (Medium)

Wax is softened by heating over a flame and released & shaped and shaped to form to prepared cavity. Then held under pressure until it hardens. Cold carving investment is used. To withdraw the pattern and invest as easily as possible.

II) Indirect technique - Type II wax (Soft)

Impression is taken. Dye is made. Melted type II wax is added in layers. Cavity is overfilled and wax is carved to proper contour. Wax pattern is removed & invested as early as possible.

CASTING WAX

These waxes should be readily adaptable and should possess slight tackiness. They must vapourise with minimal residue.

APPLICATIONS:

Take metallic framework pattern for RPDs  
Give uniform thickness in areas of palatal denture framework.

MODE OF SUPPLY:

Sheets 0.4mm thickness  
Ready made shapes

COMPOSITION:IngredientsPRINCIPAL

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Functions

Paraffin wax - melting point  
Cera - carving characteristics  
Bees wax - reduces flow at mouth temperature  
Natural resin - suitable flow properties.

BASEPLATE WAX

These waxes should have reduced flow at mouth temperature and a smooth surface after gentle flaming.

APPLICATIONS:

- To make occlusal rims.
- To produce declined contours of denture, after teeth are set in position.
- To make pattern for endodontic appliances & prostheses.
- To check articulating relation in mouth.

MODE OF SUPPLY:

Available as sheets.

CLASSIFICATION:

As per A.D.A. Specification No. 24

- Type I Soft wax - for building veneers.
- Type II Hard - To use in mouths in normal climates.
- Type III Extra hard - For use in tropical climates.

COMPOSITIONIngredientsFunctions

- Ceresh wax - Improves carving characteristics.
- Bee wax - Reduces brittleness & reduce flow at mouth temperature.
- Normal / Synthetic resin - Gives stable flow properties.
- Microcrystalline - Establishes required melting point.

BOXING WAX

These waxes should have sufficient strength and toughness, and should be readily adaptable to the impression at room temperature.

APPLICATIONS:

- To build vertical sides around impression.
- To produce desired size & form of base of cast.
- To preserve certain landmarks of impression.

MODE OF SUPPLY

Boxing wax sheets - 15-300 mm length & 3 mm thickness  
 Beading wax - 3-4 mm thickness.

COMPOSITION:IngredientsFunctions

Paraffin wax. - Decreases brittleness.  
 Bee wax - More flexible and tough.  
 Microcrystalline - Tough solvent.  
 Carnauba wax - Adhesive property.

UTILITY WAX

These waxes are tacky and have the highest ductility and flow than any other dental wax.

APPLICATION:

Used to adjust contour of perforated tray for use with hydrocolloid.

MODE OF SUPPLY:

- Cakes

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COMPOSITIONIngredientsFunctions

Bee wax. - Decreases brittleness.  
 Natural resin - Tough substances.

STICKY WAX

Sticky waxes are tacky when melted, but firm and brittle when cooled.

APPLICATIONS:

Used for joining metal plates before soldering procedure & for joining fragments of denture before repair procedure.

IMPRESSION WAXES

They are soft at smooth temperature but rigid at room temperature.

APPLICATIONS:

To record zero undercut, edentulous position of mouth and used in combination with polysulfide ZOE, impression paste as impression compound.

COMPOSITIONIngredients

Paraffin  
Natural resin  
Micro crystalline  
Bees wax

Functions

Brittleness  
Adhesive property  
Toughness  
Reduces brittleness.

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INVESTMENTS

These are materials used to surround a wax pattern. The wax when removed creates a space or mould cavity. Molten metal is poured into this form a dental casting.

TYPES:

- i) Gypsum bonded investments
- ii) Phosphate bonded investments
- iii) Silica bonded investments.

IDEAL REQUIREMENTS OF INVESTMENT MATERIALS

- The powder should have fine particle size to give a smooth surface to the casting.
- Capable of reproducing shape, size and details recorded in wax pattern.
- Capable of maintaining its shape and integrity at high temperatures.
- Should compensate for casting shrinkage.
- Should be economical.
- Should break easily from metal after casting and not react chemically with it.



GYPSUM BONDED INVESTMENTSCLASSIFICATION

As per A.D.A. Specification No.2 based upon appliance to be fabricated and method of obtaining expansion required to compensate for alloy shrinkage.

Type I Inlays, crowns and shrinkage by thermal expansion.

Type II Inlays, onlays and crowns.

Type III Crown and partial denture undergo thermal expansion.

APPLICATIONS:

Inlay, FPD, Removable partial denture.

MODE OF SUPPLY

Powder in bulk as preweighed packs.

COMPOSITION:Ingredients

Binders (2.5-4.5%)

( $CaSO_4$  and hemihydrate)

Functions

Binds the refractory material

Refractory material  
(Silica and quartz)

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Provide refractory material during heating to regulate thermal expansion.

SETTING REACTION: Similar to dental stone, when water is mixed, hemihydrate reacts to form dihydrate which sets to form a solid mass. Which binds silica particles together.

SETTING TIME:

9-18 min

SETTING AND THERMAN EXPANSIONS:

The casting shrinkage of the alloy is compensated for, by expansion of the investment in three ways.

a) Normal Setting Expansion:

Expansion takes place when material sets in air enlarges mold cavity.

Factors Affecting:

Higher gypsum content  
Thin wax pattern a soft wax - High expansion.

b) Hygroscopic Setting Expansion:

When setting occurs under water greater than normal setting expansion. The increased amount of expansion is because water helps in outward growth of crystal.

Factors Affecting:

Less. W/P ratio - lesser the expansion.

More mixing time - More hygroscopic setting expansion.

Finer silica particles - More HSE.

More water immersion - More HSE.

c) Thermal Expansion of Mould:

Type I - 0.1% - 0.6% of thermal expansion. hygroscopic expansion of 0.5 - 0.6%. Max thermal expansion should be attained at  $\pm 70^\circ\text{C}$ .

Factors affecting: temp & w/p ratio  
Effect of w/p ratio - More water less expansion.  
Effect of chemical modifiers - Addition of NaCl, KCl, HCl increases expansion.

MANIPULATION

- Mixed in proper w/p ratio.
- Vibrated into the setting ring.
- Allowed to set.

PROPERTIES:1) Strength:

Use of  $\text{CaSO}_4$  hemihydrate increases compressive strength & also allow chemical modifiers more water reduces strength if investment contain NaCl.

2) Fineness:

- Fine particle size prepared.
- Finer the investment, smaller will be the surface irregularities on the casting.

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3) Porosity:

More gypsum crystals present in set investment less porosity, less hemihydrate content & greater the amount of gauging water, the more is its porosity.

- A mixture of coarse and fine particles exhibit less porosity than an investment composed of uniform particle size.

4) Thermal contraction:

- Addition of chemical modifiers like NaCl, HCl
- Eliminates contraction caused by gypsum

## PHOSPHATE BONDED INVESTMENTS

### APPLICATIONS:

Most widely utilized investments in dentistry. Substantive amount of cast dental structures today use high fusing

MODE OF SUPPLY: noble or base metal alloy

Powder and aqueous solution

### COMPOSITION:

	Ingredients	Function
Powder:	Aluminium diacid phosphate	Strength soluble in water and provides ion
	Silica	Refractory material

Liquid: Magnesium oxide Reacts with phosphate  
Silica sol in water High thermal expansion

### SETTING REACTION:

Ammonium diacid phosphate reacts with MgO to give strength. It is added in more amount so that it reacts with silica. At high temperatures silica reacts with phosphate to form a refractory material. Investment is mixed with liquid silica & on water and gives higher thermal expansion.

### SETTING TIME:

9-13 min  
Affected by temperature ↑ accelerator set  
MgO ↑ accelerator set  
Increases delay setting.  
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## SILICA BONDED INVESTMENT

### APPLICATIONS:

Casting of RPDs with base metal alloy.

### MODE OF SUPPLY:

Powder and liquid

### COMPOSITION:

	Ingredients	Function
Powder:	Silica	Refractory material
	Ethyl silicate	Binder.
	Modified MgO <sub>2</sub>	
	Aluminium chloride.	
Liquid:	Stabilized alcohol	Strengthen gel
	Solution of silica gel	accelerator.

### SETTING REACTION:

Silica which is refractory material is bonded by hydrolysis of ethyl silicate in presence of HCl.

The product of hydrolysis is formation of colloidal solution of silicic acid and ethyl alcohol.

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## MODEL, CAST AND DIE MATERIALS

DEFINITIONS: A positive replica of the dentition and surrounding structure used as a diagnostic aid.

Model: A dimensionally accurate reproduction of a portion of the oral cavity and extra-oral facial structures produced in a durable hard material.

Cast: It is a positive replica of one or few prepared tooth.

Die:

### TYPES:

- 1) Gypsum: Type IV - Densite: Die stone (High strength, low expansion)  
Type V - die stone (High strength, Low expansion)
- 2) Metal:
- 3) Polymer: Metal filled resins as inorganic filler Resin
- 4) Cements: Silico-phosphate or polyacrylic acid based
- 5) Ceramic: *Malapragada*

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## IDEAL PROPERTIES OF DIE MATERIALS:

- ▶ Should have high strength.
- ▶ Should have high abrasive resistance to that surface will not be damaged during carving of wax pattern.
- ▶ Should have ability to reproduce finer details and sharp margins.
- ▶ Should remain dimensionally stable under conditions use and storage.

## RECOMMENDED DIE MATERIALS

- a) Gypsum product (Type IV and V)
- b) Electroformed dies
- c) Epoxy resin
- d) Amalgum die
- e) Ceramic die material
- f) Metal sprayed dies.

## DISADVANTAGES OF OTHER DIE MATERIALS

- 1) Polymers: Low compressive strength, abrasive resistance and large polymerisation shrinkage.
- 2) Cements: Undergoes shrinkage during setting.
- 3) Metal sprayed: Low fusing - Bi-Sn alloy of melting point around  $140^{\circ}\text{C}$  can be melted and projected on certain impression to form a metal layer which is then poured with die alone.  
This method cannot be used for thermoplastic impression.

## 1) IMPROVED DENTAL STONE OR DIE STONE - TYPE IV & TYPE V

Type IV - Dense, powder mixed with water and poured into impression. It shows very small setting expansion (0.1%) adequate strength, wet str  $> 34.5$  MPa, dry str (60 MPa - 80 MPa).

Type V : Die stone, high str and high expansion powder mixed with water and poured into impression to get enlarged. High setting expansion 0.1-0.3%, large strength 80-100 MPa.

### Advantages:

#### Type IV

- Simple method for die formation
  - Compatible with all impression material
  - Adequate mechanical properties
- Can be electroplated

### Disadvantages:

- Brittle material
- Can get abraded.

#### Type V

- Easy method die formation

## 2) ELECTROFORMED CASTS AND DIES:

These are dies prepared by electrodeposition of metals. Some impression material can be electroplated from impression compound and in addition silver can be copper plated whereas polysulfides polyethers and addition & condensation silicone can be silver plated.

### Advantages:

- No contraction or expansion occurs with electroformed die unless that impression compound shrinks before initial plating is deposited (dimensionally stable)
- Higher strength, hardness and abrasion resistance
- Allows finishing and polishing of metal restoration on die.

### Disadvantages:

- Time consuming
- Special equipment needed
- Not compatible with all impression material.

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ELECTROFORMING (ELECTROPLATING)

Definition: Process by which a metal surface is deposited on the impression i.e. metal is deposited on non-metal which is non conductor of electricity.

Metalizing:  
Impression surface is made conductive, so that it can conduct electric current, thin layers of metal is laid down on surface of impression.

Agents used:

Powdered graphite  
Brasing powder suspended in aqueous  
Suspension of Ag powder.

Metal used:

- Copper
- Silver.

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Requirements for Electroplating

- Impression to be coated is made cathode.
- Anode is metal deposited - Cu/Ag.
- Anode and cathode holder.
- Electrolytic solution with which current passed.
- Ammeter - Register current in mA.
- Making: - Register current tank of glass or rubber.
- Impression is washed and dried.
- Metals are made conductive by applying.
- Solution or powder with camel brush.
- Impression tray surface is covered by wax - 2mm.
- Then impression is filled with electrolyte to avoid air bubbles.
- Impression attached to cathode holder and is immersed in electrolyte bath. The distance b/w cathode and anode should be atleast inch.
- Current should not exceed 5 mA, then increased ~~10 mA~~ for 12-15 min.  
10 mA
- Current is disconnected impression is washed.
- Die is completed by pouring resin or dental stone to support the surface of cast and 10 cm from bone.
- Then copper ring is gently washed over flame.
- Die is trimmed.

Figure 2

Composition of Electroplating bath:

Copper - Copper sulphate crystals.  
Sulphuric acid  
Phenol  
Water (distilled)

Silver - Silver cyanide  
Potassium cyanide  
Potassium carbonate  
Distilled water.

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3) EPOXY RESIN DIE MATERIALS:

Compatible with polyether polysulphide and silicone impression material

Advantages:

Toughness and more abrasion resistance than die stone.

Disadvantages:

Not as accurate and dimensionally stable.  
at it shrink (0.1%)

DIE STONE-INVESTMENT COMBINATION (INVESTMENT)

Combination of die material and investing material. A gypsum bonded material called investment is mixed with colloidal silica liquid.

Die is constructed and wax pattern is invested in investment. Thus possibility of distortion of wax pattern during removal from die or during setting of investment is minimized.

Setting expansion - 0.9%

Thermal expansion - 0.8%

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## CASTING PROCEDURE FOR DENTAL ALLOYS

### DEMONSTRATION:

**AIM:** To study the steps in casting of the Dental Alloy.

### INSTRUMENTS AND EQUIPMENT:

- |                    |                          |
|--------------------|--------------------------|
| 1) Die             | 10) Vacuum mixer         |
| 2) Die spacer      | 11) Furnace              |
| 3) Wax pattern     | 12) Dental casting alloy |
| 4) Sprue           | 13) Flux                 |
| 5) Crucible former | 14) Graphite crucible    |
| 6) Ring liner      | 15) Casting machine      |
| 7) Casting         | 16) Container of water   |
| 8) Wetting agent   | 17) Sandblasting unit    |
| 9) Investment      | 18) 50% HCl              |

### MANIPULATION

#### I) Preparation of Die:

A die of the prepared tooth is made by pouring an elastomeric impression with improved stone.

#### II) Preparation of Wax Pattern:

Final restoration is made with type II inlay wax

#### III) Selection & Attachment of Sprue:

A sprue made of Phenolic or metal thickness is proportional to wax pattern

A reservoir length is adjusted so that the wax pattern is approximately  $\frac{1}{4}$  the other end of the ring.

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#### V) Preparation of Casting Ring:

##### Type of ring liners :

- 1) Fibrous ceramic alumino silicate
- 2) Cellulose (Paper)
- 3) Ceramic-cellulose combination.

#### VI) Investing: (Hand/Vacuum):

Apply wetting agent on the wax pattern to reduce air bubble. Seat the casting ring into curable former taking care that is located near center of ring.

The ring is seated on the curable former and vibrated. Gradually filled with remaining investment & allowed to set for 1 hour.

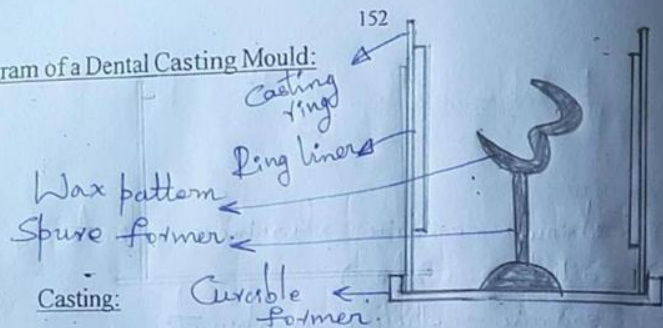
#### VII) Wax Elimination: (Burn Out)

- To eliminate wax from the mould.
- To expand the mold. (Thermal expansion)
- Metallic sprue should be removed before burnout
- Heating should be gradual.
- Rapid heating produces steam which causes the walls of mold cavity to flake.

If a plastic sprue is used a two stage burnout techniques is followed. In case of a metal sprue, it should be removed with a plier.



Diagram of a Dental Casting Mould:



VIII) Casting:

Types of casting machines:

- Torch melted.
- Induction melted.
- Arch melting.

IX) Quenching:

For gold alloys.

- The ring is immersed into water. This leaves the cast metal in an annealed condition and also helps to fragment the investment.

- Metal-Ceramic alloys and base metal alloys are not quenched.

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X) Recovery of casting

Investment is removed and casting is recovered.

XI) Sandblasting

Process by which particles of an abrasive (Aluminium oxide) is projected at high velocity using compressed air in a continuous stream, to clean remaining investment.

XII) Picking

A process of treating casting with either warmed 50% HCl or H<sub>2</sub>SO<sub>4</sub> for few seconds to make it free from any surface oxide & residual investment material.

XIII) Separation of sprue

IX) Finishing and polishing

Minimum polishing is required of all the procedures from wax pattern to casting.

CASTING DEFECTSA) Dimensional Errors in Casting:

Problem	Cause	Precaution
Distortion of wax when investment hardens.	Over expansion of investment material	Use of thick wax pattern Use of appropriate material.

B) Rough surface and fins:

Rough surface.	Investment breakdown.	Avoid overheating of investment
	Air bubbles	Correct use of wetting agent
	Weak surface	Avoid diluting wax of investment material
	Cracking of investment	Avoid rapid heating of investment.

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C) Porosity:

Problem	Cause	Precaution
Irregular voids.	Shrinkage in cooling of alloys.	Use correct spare thickness.
Spherical voids.	Inclusion of gases into molten alloy.	Avoid overheating and prolonged heating of alloy
Rounded margin regular large void.	Bulk pressure affect air bubbles escape from the mould.	Use adequate casting force Use porous investment.
Porosity	Turbulent flow of molten alloy into mould.	Correct placement of spare reservoir.

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DENTAL CERAMICS

Dental ceramics are white, translucent, tooth-like material, used for restoring natural teeth and for making artificial teeth. Traditionally they have been referred to as 'Porcelains'.

GENERAL USES OF PORCELAINS:

- ▶ Inlays and onlays.
- ▶ Esthetic laminates over natural teeth.
- ▶ Single crown.

CLASSIFICATION:A) According to Fusion Temperature

High fusing  
Medium fusing  
Low fusing

B) According to Uses:

Opaque ceramics  
Veneering ceramics  
Stain  
Glaze.

MODE OF SUPPLY

In the form of fine ceramic powders in bottles, in different shades of enamel dentin and opaque, with ~~powders~~ and filled water.

Available as powder and liquid.

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COMPOSITON:

Ingredients	Function
Feldspar	Basic glass former
Kaolin	Green stage binder.
Quartz	Filler
Alumina	Glass former and flux
Alkalies	Glass modifiers.

MANIPULATIONA) ADAPTATION OF MATRIX/METAL SUBSTRUCTURE:

A clean metal surface and other impurities from fungus can contaminate degassing and oxidizing.

B) SELECTION OF POWDER

- 1) Core or Opaquer
- 2) Dentin and Enamel

C) MIXING:

The powder is mixed with the liquid to make a paste and built over the matrix. As shrinkage is anticipated, the crown built up is larger.

D) CONDENSATION: The process of packing the powder particles together and removing the excess water <sup>is known as condensation.</sup>

a) Objectives: Proper condensation packs the particles together. It also helps remove excess water.

b) Methods:

Vibration  
Spatulation  
Dry powder.

E) FIRING PROCEDURETypes of Furnaces:

- i) Air.
- ii) Vacuum.

Advantages of Vacuum Firing:

Reduces porosities in porcelain.

Preheating Condensed mass should not be placed directly into the hot furnace. Modern furnaces have mechanism where the whole is gradually raised furnace

Stage of Firing

Low bisque, Medium bisque, high bisque.

Low Bisque Material becomes rigid and very porous. Very brittle, shrinkage and particles lack cohesion.

Medium Bisque Complete cohesion of powder particles. Lack of translucency and glaze.

High Bisque Complete shrinkage and mass exhibits smooth surface.

At any stage the crown can be removed from the furnace, the morpho..... modified, i.e., addition or trimming, and fired again till right size is obtained.

Increased number of firings results in a crown that is overly translucent ..... lifeless. The fewer and firing cycle the better will be the strength and esthe.....

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F) GAZING:

a) Overglaze: The glaze is mixed with special liquid and applied to restoration. The firing temperature is lower than that of body porcelain.

b) Selfglaze  
A separate glaze layer is not applied. Instead the restoration is subjected to controlled heating at its firing temperature. This causes only the surface layer to mature.

PROPERTIES:

- 1) Shrinkage of firing: 40% volume.
- 2) Porosity: Is due to air inclusion during firing can be corrected in partial vacuum.
- 3) Chemical properties: Insoluble and impermeable to oral fluids.
- 4) Mechanical properties: Compressive strength : 331 MPa.
- 5) Thermal properties  $6-4 - 7.8 \times 10^6 / ^\circ F$
- 6) Aesthetics: Excellent  
Matches against tooth surface.

METAL CERAMICS

Requirements of Alloy for Porcelain Fused to Metal :

- i) Same value of COTE.
- ii) High fusion temperature.
- iii) High modulus of elasticity.

Mode of Bonding:

- a) Mechanical Bond: Mechanical interlocking bonding increased by sandblasting
- b) Compressive Stresses: 50-60 MPa.

c) Chemical Bond: An adherent oxide layer is essential for good bonding. In BMA chromium oxide is responsible for bond.

RECENT PORCELAINS:

- a) Core Porcelains: Used in place of aluminium core materials.

- b) Castable Ceramics

Only porcelain restorations made by a centrifugal casting technique

Ceramic contains growth of microcrystals within ceramic matrix

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DIFFERENCES BETWEEN PORCELAIN AND ACRYLIC TEETH

Porcelain Teeth	Acrylic Teeth
Does not stain easily	Colour stability
Abrasion of opposing teeth	Clear with loss of VD
Clicking sound	No sound.
Poor impact resistance	Good impact resistance
Chipping of denture tooth	No chipping
More natural	Not natural
Brittle	Not brittle.
Higher density	Lower density
Increased weight	Decreased weight

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SOLDERING, BRAZING AND WELDING

DEFINITION: Process of joining metals by heating them to a suitable temperature below it solidifies of substrate metals applying a filler metal having liquid not more than  $150^{\circ}\text{C}$  than

SOLDERING: melts and flow by capillary attraction b/w parts

BRAZING: Process of joining metals by heating them for a suitable temperature below it solidifies of substrate metals and applying a filler with more than  $450^{\circ}\text{C}$  melting & flowing by

WELDING: capillary attraction b/w parts.

Joining of metals by applying heat / pressure / with / without a filler metal to produce localized union through fusion / diffusion.

Desirable properties of Dental Solders :

- ▶ Base of flow at a decreased temperature
- ▶ Good wettability
- ▶ High strength, tarnish and corrosion resistance.
- ▶ Acceptable colour.
- ▶ Resistance to pitting during heating.

TYPES:Gold Solders :

## a) Composition:

Gold - 45-81 wt. /

Silica - 8-30 wt. /

Copper ~~10-15 wt. /~~PRINCIPAL

Thi... of Tin, Zinc, Phosphorus  
mod... and quality

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b) Fusion Range Limits:  $750 - 900^{\circ}\text{C}$ 

c) Applications: Crowns and bridge application.

Silver Solders:a) Composition: Ag  $\rightarrow$  10-80% Zn  $\rightarrow$  4-35%  
Cu  $\rightarrow$  15-30%.b) Fusion Range: Low fusing :-  $600 - 750^{\circ}\text{C}$ 

c) Applications: Used along with stainless steel and other base metal alloys.

FLUX:

Purpose: To remove any oxide coating on the substrate metal surface.

## Types according to activity:

1. Surface protection type.
2. Reducing type.
3. Solvent type.

## Mode of supply:

Prefixed solder - available.

Precautions: Minimal flux used.  
Entrapment of flux within filler metal can cause a weak joint  
Residual flux that is caused with porcelain can cause discolouration and bubbling of porcelain.

Heat Source1. Gas-air or Gas Oxygen Torch :

Most common instrument for application of heat.

Types of Fuel

Hydrogen: Low heat content, So heating is slow.  
Used in soldering.

Natural gas: Heat content is 4 times that of Hydrogen but contains water vapour in it. So cooling of the place take place.

Propane: Best choice :- It has the highest heat content good flame temperature.

2. Oven (Furnace) Brazing : A furnace should be chosen with enough voltage to provide the heat required to raise the temperature of the filler metal to its flow point.  
- Advantage is that every component can be heated and cooled uniformly to prevent discoloration.

- 1) Cleaning the surface to be joined.
- 2) Assembling the parts to be joined.
- 3) Selection of right solder and flux.
- 4) Application of ~~Propane~~ and flux.
- 5) Heating and production of solder.

6) Control of temperature and time to ensure adequate flow of the solder.

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STAINLESS STEELS

Steels are iron-based alloys that contains less than 1.2% carbon.

**STAINLESS STEEL** : When the chromium (generally 12 to 30%) is added to steel, the alloy is commonly defined as stainless steel.

**18-8 STAINLESS STEEL**: Contains 18% Chromium and 8% Nickel by weight. It is the most commonly used alloy for orthodontic stainless steel wires.

GENERAL APPLICATIONS:

Endodontic instruments

TYPES: Orthodontics.

TYPES	COMPOSITION		APPLICATIONS
FERRITIC	Chromium 11-5-27%	Nickel 0	Carbon 0-2% Little application in dentistry.
MARTENSITIC	11.5-17%	0-2.5%	0.15-1.2% Surgical and cutting instruments.
AUSTENITIC	16-26.0%	7-22%	0.25% Orthodontic wires. Endodontic instruments. Crucial in pediatric dentistry.

PROPERTIES:

18-8 Stainless Steel :

Modulus of Elasticity: 134 g PA.

Yield Strength: 1200 MPa

Hardness: 525 kg/mm<sup>2</sup>

WELD DECAY (SENSITIZATION) When austenitic stainless steels heated between 400-900°C Fe-Cr carbides precipitates along the boundaries and Cr is depleted near grain boundaries below concentration necessary for protection. Elements such as Titanium and tantalum. Which preferentially forms carbides can be added to stainless steel.

Solders Used: Softer solder Gold solder  
Hard solder Silver solder.

Temperature Used: Precious metal solder  
Non-precious metal solder  
Less than 450°C

Fluxes Used: Borax flux.  
Fluoride flux.

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ORTHODONTIC WIRES

A number of wrought base metal alloys are used in dentistry, mainly as wires for orthodontic treatment. The metallurgy of these alloys are extremely complex. The wires drawn from these alloys have a variety of gauges (thickness) and cross sectional shapes, such as round rectangular and square. They are supplied in the form of straight lengths, spools and preformed arches. Multistranded wires are also available.

PROPERTIES OF ORTHODONTIC WIRES

Orthodontic wires are formed into various appliances in order to apply forces to teeth and move them into a more desirable position. Low, constant forces and large elastic deflections are clinically desirable. Elastic behaviour of any material is defined in terms to an external load.

Stress strain: Strain is change in length per unit original length.

Stress: Internal resistance offered to external stress.  
Stress =  $\frac{\text{Force}}{\text{Area}}$ , Strain =  $\frac{\text{Change in length}}{\text{Original length}}$ .

For orthodontic purposes, three major properties of beam are strength, stiffness (or its inverse springiness) and range.

Strength: Force applied directly to a tooth is directly proportional to the wire modulus of elasticity.  
Maximum stress required to fracture a structure.

Range: Distance or extent that the wire bends elastically before permanent deformation occurs.



Stiffness (or inverse Springiness)

It is the measure of flow of a wire

Other characteristics of an Orthodontic wire are:

Resilience: Energy storage capacity of a wire - Combination of strength and springiness

Formability: Represents the amount of permanent bonding. The wire can tolerate before it breaks.

Ease of Joining:

The ease by which the wire can be joined.

Stability in Oral Environment:

Stable

Biocompatibility:

Good.

TYPES OF ORTHODONTIC WIRES:1) Stainless steel:

Contains less than 1.2% Carbon. Chromium (12-30%) is added to Stainless steel

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2) Cobalt-chromium-Nickel:

Cobalt - 40%  
Chromium - 20%  
Nickel - 15%

3) Beta Titanium:

Ti - 11%  
Molybdenum - 6%  
Zinc - 4%

4) Nickel Titanium: Large deflection or working range & limited formability because of low stiffness and moderately high strength.

DENTAL BURS

Dental burs are essentially miniature milling cutters as used in industry. Many shapes and sizes of dental burs are available for various purposes in the preparation and finishing of cavities and restorations. For eg. straight fissure (spiral) bladed and double spiral bladed) tapered dome, inverted cone, pear shape round and egg-shaped bur.

CLASSIFICATION: Carbon Steel burs.  
Tungsten Carbide burs.

According to composition:  
Steel bur  
Tungsten Carbide bur.

MANUFACTURES:DESIGN OF DENTAL BURS:

Number of teeth: Normally 6-8.

Blade or Cutting Edge: Is in contact with horizontal line

Tooth Face: Side of tooth ahead of cutting edge in the direction of restoration.

Back of Flank: The opposite of face.

Rake Angle: Angle formed b/w rake and radial line drawn from center of bur.

Negative rake angle: When the rake phase is ahead of radial line.

Zero or Radial rake angle:

Positive rake angle: *Very easy*

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Clearance :

Land: The space that immediately follows tooth surface.

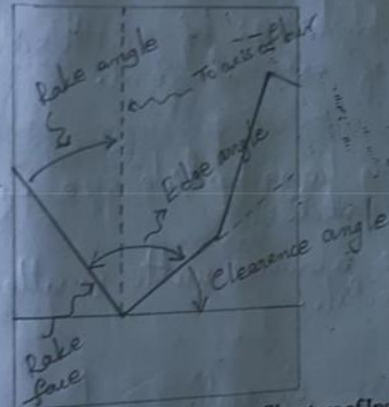
Primary Clearance :

Secondary Clearance :

Tooth Angle: Measured between base and land.

Flute or chip Space: Space between successive teeth.

DIAGRAM: Cross section of DENTAL BUR:



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Direction of Rotation

ABRASIVE AND POLISHING AGENTS:

These are agents used to smoothen and polish a dental restoration, prosthesis, or appliance before placing it in the mouth. This makes it more esthetic, hygienic, resistant to tarnish and corrosion, and comfortable to the patient.

ABRASION: It is the wearing away of a substance or structure through a mechanical process, such as grinding, rubbing or scraping.

POLISHING:

It is the production of smooth surface without much loss of external form.

DIFFERENCE BETWEEN ABRASION AND POLISHING:

Agent having large particle size act as an abrasive producing scratches.

The same abrasive with smaller particles, may be used to polish.

CLASSIFICATION:

- i) Finishing Abrasives: Generally hard abrasives are used initially to develop desired contour and removal of gross irregularities.
- ii) Polishing Abrasive: They are of fine particle size and less hard than abrasive used for finishing, these are used to produce smooth surface after use of abrasives.
- iii) Cleaning Abrasives: Softer materials with small particle size and intended to remove adhered material that adheres to enamel.

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FACTORS AFFECTING RATE OF ABRASION:

- i) Size of Particle: Larger particles: Deeper scratches - wear away surface at a faster rate.
- ii) Pressure applied: Heavy pressure - Deep scratches and more rapid removal of material.
- iii) Speed: Higher the speed: Higher rate of abrasion.

TYPES OF ABRASIVE AND POLISHING AGENTS:

AGENTS USED	MODE OF SUPPLY	APPLICATION
1. Emery	Natural oxide of Al called Corundum.	Polishing agent.
2. Sand	Powder, Sand paper	Abrasive agent
3. Diamond	Bonded abrasive Rotatory instrument Flexible metal packed strips.	Abrasive for enamel, ceramic, resin.
	Diamond polishing point	

AGENTS USED	MODE OF SUPPLY	APPLICATION
4. Carbides	Silicon carbide Boron carbide	Used for cutting metal alloy ceramic.
5. Pumice	Powder form	Used for polishing of denture base teeth.
6. Rough	Cake form	Polishing agent for gold and white metal alloys.
7. Chalk	Powder	Dentifrice as polishing agent.
8. Zirconium Silicate	$ZrSiO_4$	Polishing agent.
9. Cuttle	Coated abrasive	Delicate abrasive.

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### MANIPULATION

### DEMONSTRATION:

**AIM:** To study the method of smoothing and polishing of a cast metal restoration and an acrylic denture.

### A) SMOOTHENING AND POLISHING OF AN ACRYLIC DENTURE

#### Materials and Instruments:

1. Handpiece
2. Lathe
3. Carbide trimmers
4. Alpine stones
5. Felt cone
6. Rag wheel
7. Sandpaper (rough & fine)
8. Sandpaper holder (Mandril)
9. Pumice
10. Woolen buff
11. Bristle brush

**Procedure:** Smoothen with a coarse abrasive after changing to fine abrasive for a smooth surface and scratch free surface.  
**Precautions:** Then the work is coated with pumice and polished on wheel for heat generation.

Proper consistency of pumice should be used.  
Light pressure is applied to avoid too much heat generation.

## B) SMOOTHENING AND POLISHING OF A CAST METAL RESTORATIONS:

### Materials and Instruments:

- 1) Handpiece
- 2) Bristle brush wheel
- 3) Abrasive impregnated rubber wheels
- 4) Carborundum disc
- 5) Sandpaper discs
- 6) Rag wheel
- 7) Rouge cake

Procedure: Polishing is done after 24 hours. Wet polishing is applied. Powder in paste form is used and polishing is done using a different polishing bur.

POLISHING OF AMLGAM RESTORATIONS: It is done after 24 hours wet polish is advised. It is done using polishing bur.

POLISHING OF COMPOSITE RESTORATIONS: Polishing is done using a rubber disc impregnated with abrasive or rubber cup with polishing paste or aluminium oxide disc.

### POLISHING OF NATURAL TEETH:

A suspension of finely grounded pumice in water is used.

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ELECTROLYTIC POLISHING: Alloy to be polished is made the anode. Current is passed, some of the anode is dissolved leaving a bright surface.

BURNISHING: It is done to adapt the material around the cavosurface margins of the tooth.

PROPHYLACTIC PASTES: Used to remove intrinsic stains, pellicle material and also used to impart a highly polished and aesthetic appearance.

DENTIFRICES: Agents used along with tooth brush to clean and polish natural teeth. They should have maximum cleaning efficiency with resin tooth abrasive.

### DENTURE CLEANSERS:

Denture cleanser used to remove deposits in 2 ways.

- ① Professional repolishing in lab clinics
- ② Soaking denture at home.

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- 1) Why is excess water necessary to mix the hemihydrate powder?
- 2) Why is the initial setting important?
- 3) What is the practical significance of the setting expansion of dental gypsum production
- 4) How do modifiers in gypsum product act?

- ①  $\beta$ -hemihydrate crystals are more regular in shape and porous in character and require more water to wet the powder particles so that they can be stirred & powder.
- ② Increased setting expansion is desired in case of investment patients help to compensate the shrinkage of metal during casting.
- ③ During the time, the material becomes more rigid. It can be carved but not moulded.
- ④ Most commonly used accelerator is potassium sulphate (32%). Water contains numerous fine gypsum particles that act as nuclei of crystallisation or serve as accelerators.

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- 1) What importance does the low thermal conductivity have on the clinical handling of impression compound?
- 2) What factors affect the flow of impression compound?
- 3) What is the glass transition temperature?

- ① Low thermal conductivity indicates the need to attain an extended time to a thorough cooling and heating of compound. The material should be uniformly soft at time it is placed in tray and thoroughly cooled in tray before the impression is withdrawn from mouth.
- ② Higher the temperature, higher is the flow. Longer the impression, higher the flow.
- ③ The glass transition temperature is the temperature range where the polymer substrate changes from a rigid glassy material to soft (not melted) material. Measured in terms of stiffness or modulus.

- 1) What two factors are critical with respect to the setting time of zinc-eugenol impression paste?
- 2) What is the type of reaction between zinc oxide and eugenol?
- 3) What is the dimensional stability of zinc oxide-eugenol impression paste?

1) Particle size of zinc oxide, powder type and amount of accelerator.

2) Acid base reaction

3) Quite satisfactory and negligible shrinkage.

- 1) What is the importance of hysteresis in the clinical use of agar hydrocolloid?
- 2) Do agar hydrocolloid impressions completely recover from the deformation experienced during their removal from undercut areas?
- 3) What is the dimensional stability of agar-agar?
- 4) What is the purpose of conditioning the agar?

1) It is possible to use agar as the base.

2) 98.8%.

3) Agar-Agar shrinks when stored in air or 100% relative humidity and expand when stored in water.

4) For conditioning gel state to sol state so that it can be loaded on trays for taking impression.

*Principals*

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- 1) Why are alginate impression materials called irreversible hydrocolloids?
- 2) What effect does water temperature have on the working and setting time of alginates?
- 3) Why is the alginate impression removed from the mouth?
- 4) What are dust free alginates?

- 1) Because the alginate can be converted from sol to gel state by crystallisation and can't be reversed back.
- 2) Water temperature is increased, increase in gelation time. So increase in working and setting time.
- 3) Alginate impression is removed so that cast can be poured as soon as possible.
- 4) To avoid the the inhalation problem of alginate dust, some materials have been introduced glycerol coating to powder.

*Praveen*

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- 1) What is the catalyst that is generally used to initiate the setting reaction of polysulphide impression material? What other compounds can be used as substitutes?
- 2) How does elastic recovery of the various elastomers effect clinical usage?
- 3) Why is the thickness of the spacer 4mm in polyether impression materials?

- 1) Lead oxide - Can be replaced by an organic hydroxy peroxide.
- 2) On stretching chain, uncoil and on removal of stress, they shape took to their elongated states.
- 3) Removing is from induced is difficult so sufficient spacing should be given.



- 1) How is cross-linked polymer obtained and what advantages does it offer compared with regular acrylic polymers?
- 2) Name the various separating media?
- 3) What are the various denture cleansers used? Give their composition.
- 4) How does a sodium alginate separating media act?

- ① Cross linked polymer is obtained by chemical bonds or bridges between linear polymer.
- ② Tin foil, cellulose, alginate, evaporated milk, soap, starch.
- ③ Dentifrice, water, salt, soaps, bleaches.
- ④ It reacts with Ca of plaster or stone to form a film of insoluble calcium alginate.

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- 1) What is the purpose of a coupling agent in dental composites?
- 2) How is a bond between enamel and composite accomplished?
- 3) Wh are cavity varnishes contra-indicated under composite restoration?
- 4) What is the practical significance of acid etching?

- 1) Bonds the filler particle to resin matrix.
- 2) By acid etching.
- 3) Solvent in the varnish may react with and soften the resin.
- 4) Improving the bond and marginal seal b/w Resin and enamel.

- 1) What is the significance of creep to amalgam performance?
- 2) How would you minimise tarnish and corrosion?
- 3) What are the advantages of high copper one-hour strength?
- 4) What is the advantage of mulling dental amalgam?
- 5) What is the significance of burnishing dental amalgam?

- ① Creep has been found to correlate with marginal breakdown of traditional low Cu amalgam.
- ② Surface in a restoration should be made homogenous and smooth to minimize tarnish and corrosion regardless of alloy system used.
- ③ To improve mechanical properties resistance to corrosion.
- ④ To improve homogeneity
- ⑤ For smoothing the restoration.

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- 1) List five uses of dental cements.
- 2) What are the disadvantages of silicate cement?
- 3) Describe the adhesive properties of glass ionomer cement?
- 4) List 5 requirements of luting cements?

- ① Final cementation of completed restorations  
Temporary restoration  
High strength bases.  
Temporary filling
- ② Silicates get attached to oral fluids and have short shelf life.
- ② Provides good adhesion to enamel and dentin  
Binds chemically to tooth structure.

- 1) What effects do zinc oxide-eugenol cements have on resin restorative materials?
- 2) What materials can be added to zinc oxide eugenol cements to improve the strength?
- 3) What is the effect of manipulative variables on the strength, solubility and initial acidity of zinc phosphate cement?

- 1) To improve mechanical properties of conventional ZOE.
- 2) EBA and polymer resin.
- 3) For increasing strength  
Reduced solubility  
Reduced acidity.

✓

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- 1) Give possible reasons for the minimal effect on the pulp of zinc polycarboxylate cements.
- 2) What cements are used as temporary fillings?
- 3) What are the uses of cavity varnishes?
- 4) Name the cement that could be used as pulp capping agents.

- 1) Classified as mild pulp irritant because liquid is rapidly neutralised by the powder presentation of polyacrylic acid into the dentinal tubules.
- 2) Zinc oxide Eugenol cements  
Zinc phosphate cement  
Reinforced ZOE.
- 3) Reduced microleakage, passage of irritant and corrosion products into dentinal tubules.
- 4)  $\text{Ca(OH)}_2$ .

✓

- 1) What is the atomic number of gold, silver, copper, platinum and palladium?
- 2) How are gold alloys superior to dental amalgam in mechanical properties?
- 3) Which three elements are added in fraction amounts to harden high gold contents alloys to be used with porcelain?

1) Gold - 79  
 Silver - 47  
 Copper - 29  
 Platinum - 78  
 Palladium - 46.

- 2) Gold can be used in pure condition  
 - Restorative material  
 As direct filling material into prepared cavity.
- 3) Iron, Indium, Tin.

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- 1) Justify the need for the following in the casting of gold restorations:
  - a) Investment of pattern immediately after it is ready.
  - b) Applying soap solution to the wax pattern prior to investing
  - c) Use of a reservoir.
  - d) Lining the inside of the casting ring with a wet liner.
- 2) What are the functions of the sprue?
- 3) How is the casting shrinkage compensated?

- 1)
  - a) For minimising distortion
  - b) To prevent air bubbles on wax pattern.
  - c) Permit easy repair
  - d) It allows mold expansion.
- 2) To create a channel for molten alloy during casting
- 3) To compensate for alloy shrinkage.

DEPARTMENT OF CONSERVATIVE DENTISTRY  
AND ENDODONTICS

D.A.P.M.R.V. DENTAL COLLEGE & HOSPITAL

J. P. NAGAR, BANGALORE - 560 078.

Certificate

*This is to Certify that*

*Mr./Ms. B Ambarish Kamath*

*Reg. No. 19D0481*

*has fulfilled the pre clinical requirements in the*

*"Preclinical Operative Dentistry"*

*within the time frame. His/her work is graded*

*as good/bad/satisfactory.*

Date :

Place :

*Principals*  
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*Dr. Pallavi*  
*Prof. Masad*  
Professor and Head

Department of Conservative Dentistry And Endodontics  
D.A.P.M.R.V. Dental College, Bangalore

# PRE CLINICAL OPERATIVE DENTISTRY

II YEAR B.D.S



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**Instrument List**  
(Required for the II, III, IV YEAR B.D.S and the Internship)

S.No.	Instruments	Quantity
1	Instrument Pouches (Disposable)	
2	Head Caps (Disposable)	
3	Masks (Disposable)	
4	Disposable Gloves	1 Box
5	Mouth Mirror	2
6	Straight Probe	2
7	Curved Probe	2
8	Tweezer	2
9	Periodontal Probe	2
10	Spoon Excavator (Small)	2
11	Spoon Excavator (Medium)	2
12	Glass Slab	2
13	Stainless Steel spatula	2
14	Agate Spatula	1
15	Plastic Filling Instrument	2
16	Amalgam Carrier	2
17	Cylindrical Condenser	2
18	Parallelogram Condenser	2
19	Diamond Carver	2
20	Hollenback Carver	2
21	Ward's arver	2
22	Ball Burnisher	2
23	Beaver Tail Burnisher	2
24	Straight Enamel Chisel (0.5 mm blade width)	2
25	Monoangle Enamel chisel (0.5 mm blade width)	2
26	Enamel Hoe (Mesial & Distal) (0.5 blade width)	2 Pairs
27	Enamel Hatchet (Right & Left) ( 1mm blade width)	2
28	Gingival Marginal Trimmer (Mesial & Distal) (0.5 mm blade width)	2 Pairs
29	Scissors (Curved & Stainght) Small	2 Each
30	Airotor Hand piece & Burs :	1 Set of 008 # & 1 Set 010 # +
	a. Straight fissure	
	b. Round	
	c. Inverted cone	
	d. Tapered fissure with flat end (short & long)	Amalgam Burs (No.5)
	e. Tapered fissure with p2 Pairsointed end (long)	

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### Instrument List

S.No.	Instruments	Quantity
31	Micromotor Burs	1 Set of 008 #
	a. Straight fissure	&
	b. Round	1 Set of 010 #
	c. Inverted cone	
	d. Tapered fissure	
	e. Stainless steel large round bur	1
32	Bur cleaning brush	1
33	Matrix retainer & bands	1 each
	a. Ivory no. 1	
	b. Tofflemire	
34	Mortar & Pestle	1
35	B.P. Handle & blade no. 15	1
36	Cotton holder	1
37	Chip blower 1	
38	Dappen dish	4
39	Patient drape	3
40	Spectacles	1
41	Stainless steel scale (Small)	1
42	Stainless steel tray with lid	2
43	Enamel tray	1
44	Bristle brush (L.T.)	1
45	Painting brush (0 no.)	2
46	Reamers - 25 mm. (45-80)	1 Set
47	K-files 25mm (45-80)	1 Set
48	Endo box	1
49	Endo Spreader 15-40 (25 mm) and Pluggers 45-80 (25 mm)	1
50	Barbed broaches (assorted)	1
51	Carborndum stone (small, flame shape - L.T.)	1
52	Green stone - Alpine stone (Cylindrical - S.H.P.)	1
53	Rubber cup	1
54	Cotton rolls, cotton pellets & wedges	
54	Disposable glasses	1
56	Spirit lamp	1
57	Wax carver	1
58	Casting ring with crucible former	1
59	J.C. Flask	1
60	Rubber bowl & Stainless steel spatula	1
61	Wax Knife	1
62	Tip of File	5 Nos.
63	Box of Box	1 No.
64	Triodont reeth with jaws & hinge	1 Set
65	Dispenser cup (medium)	1

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BOOKS RECOMMENDED

**OPERATIVE DENTISTRY : Modern Theory and Practice**  
Marzouck, M.A

**PRINCIPLES AND PRACTICE OF OPERATIVE DENTISTRY**  
Charbeneau, Gerald. T

**OPERATIVE DENTISTRY**  
Gilmore, William, H

**THE ART AND SCIENCE OF OPERATIVE DENTISTRY**  
Sturdevant

**ENDODONTIC PRACTICE**  
Louis I Grossman

**DENTIN AND PULP IN RESTORATIVE DENTISTRY**  
Brannstromm, Martin

*Prayasa*










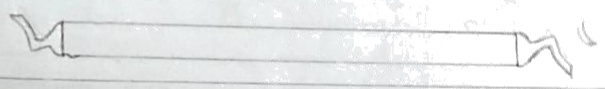
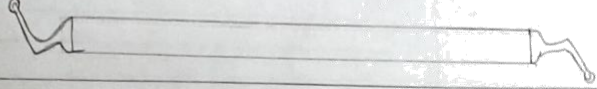
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Date	SL No	Work Done	Signature
9/3/21	1.	Quota of work on plaster models completed	<i>Shu</i> 9/3/21

Date	SL No	Work Done	Quota completed	Signature
	01)	Class I	06	
	02)	Class II	06	
	03)	Class III	08	
	04)	Class V	05	
	05)	Full wax pattern	01	
	06)	MOD cavity	01	
27/08/21		2nd internal - Class II conventional MO-46.		<i>Quota of wax submitted</i>
15/09/21		3rd internal - Class I Conventional MO-14		<i>Shu</i> 15/9/21

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HAND CUTTING INSTRUMENTS/DIAGNOSTIC INSTRUMENTS

MOUTH MIRROR	
STRAIGHT PROBE	
PERIODONTAL PROBE	
EXPLORER	
TWEEZER	
HOE	
CHISEL	
ENAMEL HATCHET	
MESIAL GMT	
DISTAL GMT	
DISCOID SPOON EXCAVATOR	

# CARVING AND FILLING INSTRUMENTS

# RESTORATIVE INSTRUMENTS

DISCOID	CLEOID	DIAMOND CARVER	MARTZ CARVER	HOLEN BACK CARVER	BALL BURNISHER	PARALLELO-GRAM CONDENSER	ROUND CONDENSER	AMALGUM CARRIER	PLASTIC FILLING INSTRUMENT	PLASTIC SPATULA	CEMENT SPATULA

1.3/21

*Praveen*  
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## 1. Definition of Operative Dentistry.

Operative dentistry is the art and science of the diagnosis, treatment and prognosis of defects of teeth that don't require full coverage restoration for correction. Such treatment should result in the restoration of proper tooth form, function and esthetics while maintaining the physiological integrity of the teeth in harmonious relationship with the adjacent hard and soft tissues, all of which should enhance the general health and welfare of the patient.

## 2. Definition of tooth preparation.

Tooth preparation is defined as the mechanical alteration of a defective, injured or diseased tooth to best receive a restorative material that will reestablish a healthy state for the tooth, including esthetic corrections where indicated, along with normal form and function.

## 3. G.V. Black's classification of tooth preparation

→ Classification of tooth preparations according to the anatomic areas involved as well as by the associated type of treatment was presented by G.V. Black and designated as Class I, Class II, Class III, Class IV and Class V.

i) Class I restorations: All pit and fissure restorations are class I.

\* On occlusal surface of premolars and molars.

\* On occlusal 2/3rd of buccal and lingual surface of molars and premolars.

\* On lingual surface of maxillary incisors.

ii) Class II restorations: On proximal surface of posterior teeth.

iii) Class III restorations: On proximal surface of anterior teeth that DO NOT involve the incisal angle/edge.

- v) Class IV restorations: On the proximal surface of anterior teeth that DO involve the incisal angle.
- v) Class V restorations: On the gingival third of the buccal or lingual surface of all teeth.
- vi) Class VI restorations:
  - \* On the incisal edge of anterior teeth
  - \* Occlusal cusp height of posterior teeth

4) Initial and final stages of tooth preparation

Initial tooth preparation stage.

- Step 1: Outline form and initial depth.
- Step 2: Primary resistance form.
- Step 3: Primary retention form
- Step 4: Convenience form.

Final tooth preparation stage.

- Step 5: Removal of any infected dentin and/or old restorative material, if indicated.
- Step 6: Pulp protection, if indicated.
- Step 7: Secondary resistance and retention form.
- Step 8: Procedures for finishing external walls.
- Step 9: Final procedures: Cleaning, inspecting, sealing.

Initial tooth preparation stage

→ Extension and incisal angle of the external walls of the preparation are specified, limited depth so as to provide access to the cavity or defect, reach sound tooth structure, preservation of the tooth or restorative material, secondary forces, principally with the long axis of the tooth, the restorative material in the tooth.

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1) Step 1: Outline form and initial depth

Establishing outline form means:

- a) Placing preparation margins in the positions they will occupy in final preparations, except for finishing enamel walls and margins and
  - b) Preparing an initial depth of 0.2-0.8 mm pulpally of the DEJ position or normal root surface position.
- Depth of dentin isn't exact 0.2-0.5 mm, deeper dimension necessary when placing secondary retentions

⇒ Principles (3 general principles)

- a) All friable or weakened enamel should be removed.
- b) All fault should be included.
- c) All margins should be placed in a position to afford good finishing of the margins of restoration. (Differ for pit and fissure preparations as compared to smooth surface preparations).

⇒ Factors.

- Extent of carious lesion, defect or faulty old restoration affect outline form.
- Esthetic and occlusal conditions affect the proposed preparations
- Adjacent tooth encounter.
- Defined/Desired cavosurface marginal configuration

⇒ Features.

- a) Preserving cuspal strength
- b) Preserving marginal bridge strength
- c) Minimizing faciolingual extensions
- d) Using enameloplasty.
- e) Connecting two close faults (<0.5 mm apart)
- f) Restricting depth of preparation into dentin to a minimum of 0.2 mm for pit and fissure caries and 0.2-0.8 mm for axial wall of smooth surface caries.

Step 2. Primary resistance form.

Primary resistance form may be defined as that shape and preparation walls that best enable both the restoration and the tooth to withstand, without fracture, masticatory forces delivered principally in the long axis of the tooth

Principles.

- To use box shape with a relatively flat floor.
- To restrict extensions of external wall to allow strong cusp and ridge areas to remain with sufficient dentin support.
- Slight rounding of internal line angles to reduce stress concentration.
- To cap weak cusps and include enough of a weakened tooth.
- To provide enough thickness of restorative material.
- To bond material to tooth structure.

Factors

- Occlusal contact on mesial and distal walls of restoration and remaining tooth structure
- Type of restorative material
- Relates to enhancement of resistance form by bonding a restorative to the tooth.

Features

- a) Box shape
- b) Relatively flat floors
- c) Inclusion of weakened tooth structure.
- d) Preservation of original ridges.
- e) Rounding of internal line angles.
- f) Adequate thickness of restorative material
- g) Reduction of cusps for capping when indicated.

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Step 3. Primary retention form.

Primary retention form is shape or form of conventional preparation that resists displacement or removal of restoration from tipping or lifting forces.

Principle - Since retention needs are related to restorative material used, principles of primary restoration form vary depending upon the material.

Features

- a) For amalgam restorations, the material is retained in the tooth by developing external walls that converge occlusally. (Class I, II).
- b) In other conventional preparations for amalgam, external walls diverge outwardly to provide strong enamel margins. ∴ Grooves are prepared in dentinal walls to provide retention form.
- c) For composite resin: Provide enamel bevel.
- d) For cast metal: Close parallelism of walls with a slight degree of occlusal converge (2-5°)

Step 4. Convenience form.

Convenience form is that shape or form of preparation that provides for adequate absorption, accessibility and ease of preparation in preparing and restoring the tooth.

- Severe caries destruction may necessitate the extension of distal, mesial, facial or lingual walls so as to gain adequate space to deeper areas of preparation
- The occlusal divergence of vertical walls of tooth preparations for class II cast restorations also may be considered as convenience form.
- Preparing proximal walls to obtain clearance with an adjacent prox. surface affords better access to finish the prep. walls and restorative material.



+ flat + floor will prevent restorative movements. Charners rounded pulp floor will allow a non bonded restoration, rocking action, producing a scraping force, which may lead to shearing of tooth structure.

### Final tooth Preparation stage

Once the extensions and wall designs have fulfilled the objectives of initial tooth preparation, should be inspected carefully for other needs.

Step 5 : Removal of any remaining enamel pit or fissure, infected dentin and/or old restorative material if indicated.

Removal of any remaining bit or frame infected dentin, and/or old restorative material is the elimination of any infected carious tooth structure or faulty restorative material left in the tooth after initial tooth preparation.

In dentin caries progress an area of decalcification of dentin of microbes. This area of decalcification often appears as a brownish discoloration with normal dentin.

In dentin caries progress an area of decalcification of dentin of microbes. This area of decalcification often appears as a brownish discoloration with normal dentin.

Preparations with removal of infected dentin may be accomplished early in the initial tooth preparation.

Removal of caries is indicated early in tooth preparation when a patient has numerous teeth with extensive caries.

Examination of the area with an explorer following removal of infected dentin is advisable but should be done judiciously to avoid perforation into the pulp.

• Removal of remaining old restorative material Step 6 : Pulp protection, if indicated.

• Adapting preparation for receiving the final restorative material.

• Reason for using traditional liners/bases is to either protect pulp or to aid pulpal recovery or both.

• Liners is reserved for vitals or aqueous suspensions or dispersions of ZnO or Ca(OH)<sub>2</sub> that can be applied to a tooth surface in a relatively thin film and are used to afford a particular pulpal response.

• Bases are considered these consists commonly used in thicker dimensions beneath permanent restorations to provide for mechanical, chemical and thermal properties of pulp.

• Liners and bases in exposure areas should be applied without fracture.

Step 7 : Secondary macular and retention form.

Two types:  
 A) Mechanical preparation features  
 B) Treatment of preparation with etching, priming and adhesive material.

Mechanical features →  
 - Retention locks, grooves  
 - Groove collars  
 - Chamfers  
 - Beveled enamel margins  
 - Pins, slots, steps & margins

Placement of enamel rods on prepared walls.

- Enamel wall etching
- Dentin treatment.

Step 8 : Procedures for finishing the external walls of the tooth preparation.

Finishing the preparation walls is the further development, when indicated, of a specific cavosurface design and degree of smoothness or roughness that produces maximum effectiveness of restorative material being used.

⇒ Objectives :

- Creates the best marginal seat possible between the restorative material and the tooth surface.
- Affords a smooth marginal junction.
- Provides maximum strength of both the tooth and the restorative material at and near the margin.

⇒ Factors (To be considered in finishing of enamel walls and margins)

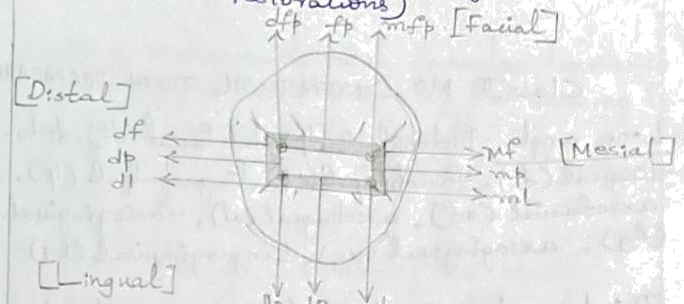
- Direction of enamel rods.
- Support of the enamel rods both at DEJ and laterally.
- Type of restorative material to be placed in preparation.
- Location of the margin.

⇒ Features

- Has two primary features.
- Design of cavosurface margin: angle.
- Degree or smoothness or roughness of wall.

Step 9. Final procedures: Cleaning, Inspecting and sealing.

- Includes cleaning the preparation, inspecting it and applying a sealer when indicated.
- First the visible, fine debris are removed using warm water.
- After all the visible debris has been removed, the preparation is dried free of visible moisture. It is important not to dehydrate the tooth by overuse of air or by application of alcohol.
- In accomplishing the final procedure before insertion of the restorative material, sterilisation is done.
- Elimination of bacterial penetration is so important that the use of dentin bonding agents or sealers will likely become universal (Under all restorations)



Class I tooth preparation

Line angles : faciopulpal (ffp), Linguopulpal (lfp), distofacial (df), mesiofacial (mf), distopulpal (dp), mesiopulpal (mp), distolingual (dl), mesiolingual (ml).

Point angles :- Distofaciopulpal (dff), mesiofaciopulpal (mfp), distolinguiopulpal (dlp), mesiolinguiopulpal (mlp).





## CLASS I SILVER AMALGAM RESTORATION

No	Exercise	Tooth No.	Cavity (20)	Pulp Protection & Matrix, (20)	Restoration (15)	Finish & Polish (5)	Total (50)	Sign
1	Conventional Class I Cavity and Restoration	46	Sh 16/7/21	cut imp/pt.				
2	Conventional Class I Cavity and Restoration	16	Sh PL	Sh 20/7/21	_____			Sh 20/7/21
3	Class I with Palatal extension & Restoration	26	Sh 21/9/21	Sh 21/9/21	_____			Sh 21/9/21
4	<del>Conventional</del> Conservative Class I with Buccal extension and Restoration	36	Sh 8/9/21	Sh 8/9/21	_____			Sh 8/9/21
5	Conservative Class I (mesial to oblique ridge)	26	K (Mesial cavity) 26/7 K 26/7	SM 26/7	_____			(SM 26/7)
6	Conservative Class I (distal to oblique ridge)				_____			
7	Conventional Class I in the occlusal fissure	14						
8	Conventional Class I (Mandibular)	35						
9	Conservative Class I (Mandibular)	36	Sh 21/7/21	Sh 21/7/21	_____			Sh 21/7
D.A. RANDU MEMORIAL R.V. DENTAL COLLEGE CA 37, 24th Main, J.P. Nagar, 1st Phase, BANGLORE - 560 078.		GRAND TOTAL						
AVERAGE								

## CLASS I SILVER AMALGAM RESTORATION

No	Exercise	Tooth No.	Cavity (20)	Pulp Protection & Matrix, (20)	Restoration (15)	Finish & Polish (5)	Total (50)	Sign
1	Conventional Class I Cavity and Restoration							
2	Conventional Class I Cavity and Restoration							
3	Class I with Palatal extension & Restoration							
4	Conservative Class I with Buccal extension and Restoration	36						
5	Conservative Class I (mesial to oblique ridge)							
6	Conservative Class I (distal to oblique ridge)							
7	Conventional Class I in Premolar (Maxillary)							
8	Conventional Class I Premolar (Mandibular)							
9	Conservative Class I Mandibular Molar							
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## CLASS II SILVER AMALGAM RESTORATION

No	Exercise	Tooth No.	Cavity (20)	Pulp Protection & Matrix, Wedge (20)	Restoration (15)	Finish & Polish (5)	Total (50)	Sign
1	Conventional Class II (MO)	14	Sw 16/9/21	Sw 16/9/21	III internals.			Sw 18/9/21
2	Conventional Class II (MO)	16	Sw 11/9					
3	Conventional Class II (MO)	36	Sw 2/9/21	Sw				Sw 10/2
4	Conservative Class II (MO)	46	Sw 3/8/21	Sw 4/8/21				Sw 4/8/21
5	Conservative Class II (MO)	16	Sw 11/9/21	Sw 1/9				Sw 7/9
6	Conventional Class II (DO)	37	Sw 12/9	Sw 17/9				Sw 10/8
7	Conventional Class II (DO)	16	Sw 18/8	Sw 11/9/21				Sw 11/9 21
8	Conventional Class II (DO)							
9	Conservative Class II (DO)	17	Sw 16/9/21	Sw 16/9/21				Sw 18/8
10	Conservative Class II (DO)							
11	Conventional Class II							
12	Conventional Class II							
		GRAND TOTAL						
		AVERAGE						

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CLASS III GLASS IONOMER RESTORATION

No	Exercise	Tooth preparation (20)	Tooth Conditioning (10)	Restoration (15)	Finish & Polish (5)	Total (50)	Sign
1	Mesial Class III in 21	22/9/21					
2	Distal Class III in 12						
3	Mesial Class III in 41						
GRAND TOTAL							
AVERAGE							

CLASS V GLASS IONOMER RESTORATION

No	Exercise	Tooth preparation (20)	Tooth Conditioning (10)	Restoration (15)	Finish & Polish (5)	Total (50)	Sign
1	Class V in labial 21	22/9/21					
2	Class V in labial 23						
3	Class V in palatal 15						
4	Class V in 11						
5	Class V in 13						
GRAND TOTAL							
AVERAGE							

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### CLASS V RESTORATIONS

No	Exercise	Cavity (20)	Tooth Conditioning (10)	Restoration (15)	Finish & Polish (5)	Total (50)	Sign
1	Class V in buccal (Posterior)						
2	Class V in buccal (Posterior)						
3	Class V in Anterior tooth						
4	Class V in Anterior tooth						
5	Class V in Anterior tooth						
GRAND TOTAL							
AVERAGE							

### CLASS IV COMPOSITE RESTORATION (DEMONSTRATION)

Shreyas

No	Exercise	Tooth preparation (20)	Pulp Protection (10)	Restoration (15)	Finish & Polish (5)	Total (50)	Sign
1	Mesio angular fracture in I1 involving the incisal edge & contact area						

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## DEEP CARIES MANAGEMENT

No	Exercise	Removal of Caries (20)	Pulp Protection & Matrix, Wedge (10)	Restoration (15)	Finish & Polish (5)	Total (50)	Sign
1	Indirect pulp capping in extracted carious molar mounted in plaster block (Silver amalgam restoration)						
2	Direct pulp capping in extracted carious molar mounted in plaster block in contact with the adjacent tooth (Temporary restoration)						

## ROOT CANAL ACCESS OPENING

No	Exercise	Pre endodontic management (10)	Access (10)	W.L estimation (10)	Cleaning & Shaping (10)	Obturation in Xray (10)	Total (50)	Sign
1	RCT in extracted carious central incisor mounted in acrylic resin block							

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**CLINICAL CONSERVATIVE DENTISTRY  
AND ENDODONTICS  
III YEAR B.D.S  
IV YEAR B.D.S Part I & II**

*Principals*

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AND ENDODONTICS  
D.A.P.M.R.V. DENTAL COLLEGE & HOSPITAL

J. P. NAGAR, BANGALORE - 560 078.

Certificate

*This is to Certify that*

*Mr./Ms.* \_\_\_\_\_

*Reg. No.* \_\_\_\_\_

*has fulfilled the Clinical requirements in*  
*"Conservative Dentistry and Endodontics"*  
*within the time frame. His/her work is graded*  
*as good/bad/satisfactory.*

Date :

Place :

*Shreyas*  
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DENTAL COLLEGE  
CA 37, 24th Main,  
J.P. Nagar, 1st Phase,  
BANGLORE - 560 078.  
D.A.P.M.R.V. Dental College, Bangalore

Professor and Head

Department of Conservative Dentistry And Endodontics

**CLASS I SILVER AMALGAM RESTORATION WITH / WITHOUT B/P EXTENSION**

Case Number	Patient's Name		Age	Sex	OPD No.	Date	Tooth No.
	Procedure						
Marks	Cavity (20)	Pulp protection & Matrix (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign	

Case Number	Patient's Name		Age	Sex	OPD No.	Date	Tooth No.
	Procedure	<p align="center"><i>Praveen</i></p> <p align="center"><b>PRINCIPAL</b></p>					
Marks	Cavity (20)	Pulp protection & Matrix (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign	
	CA 37	24th Main, I.P. Nagar, 1st Phase.					

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**CLASS I SILVER AMALGAM RESTORATION WITH / WITHOUT B/P EXTENSION**

Case Number	Patient's Name	Age	Sex	OPD No.	Date	Tooth No.
Procedure						
Marks	Cavity (20)	Pulp protection & Matrix (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign

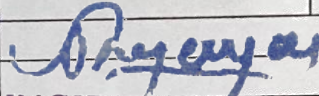
Case Number	Patient's Name	Age	Sex	OPD No.	Date	Tooth No.
	<i>Praveen</i>					
Procedure	PRINCIPAL					
	D.A. PANDU MEMORIAL					
Marks	R.V. DENTAL COLLEGE	Pulp protection & Matrix (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign
	CA 37, 24th Main, J.P. Nagar, 1st Phase,					

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**CLASS I SILVER AMALGAM RESTORATION WITH / WITHOUT B/P EXTENSION**

Case Number	Patient's Name		Age	Sex	OPD No.	Date	Tooth No.
Procedure							
Marks	Cavity (20)	Pulp protection & Matrix (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign	

Case Number	Patient's Name		Age	Sex	OPD No.	Date	Tooth No.
Procedure							
Marks	Cavity (20)	Pulp protection & Matrix (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign	

  
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**CA 37, 24th Main,**  
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**CLASS I SILVER AMALGAM RESTORATION WITH / WITHOUT B/P EXTENSION**

Case Number	Patient's Name	Age	Sex	OPD No.	Date	Tooth No.
Procedure						
Marks	Cavity (20)	Pulp protection & Matrix (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign

Case Number	Patient's Name	Age	Sex	OPD No.	Date	Tooth No.
Procedure	<i>Prayasa</i>					
	PRINCIPAL					
Marks	Cavity (20)	Pulp protection & Matrix (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign

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**CLASS I SILVER AMALGAM RESTORATION WITH / WITHOUT B/P EXTENSION**

Case Number	Patient's Name	Age	Sex	OPD No.	Date	Tooth No.
Procedure						
Marks	Cavity (20)	Pulp protection & Matrix (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign

Case Number	Patient's Name	Age	Sex	OPD No.	Date	Tooth No.
Procedure	<i>Prayasa</i>					
Marks	Cavity (20)	Pulp protection & Matrix (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign

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**CLASS II SILVER AMALGAM RESTORATION WITH / WITHOUT B/P EXTENSION**

Case Number	Patient's Name	Age	Sex	OPD No.	Date	Tooth No.
Procedure						
Marks	Cavity (20)	Pulp protection & Matrix, Wedge (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign

Case Number	Patient's Name	Age	Sex	OPD No.	Date	Tooth No.
Procedure	<p align="center"><i>D. Pandu</i></p> <p align="center">PRINCIPAL</p>					
Marks	Cavity (20)	Pulp protection & Matrix, Wedge (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign

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**CLASS II SILVER AMALGAM RESTORATION WITH / WITHOUT B/P EXTENSION**

Case Number	Patient's Name	Age	Sex	OPD No.	Date	Tooth No.
Procedure						
Marks	Cavity (20)	Pulp protection & Matrix, Wedge (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign

Case Number	Patient's Name	Age	Sex	OPD No.	Date	Tooth No.
Procedure	<p align="center"><i>Principals</i></p> <p align="center">PRINCIPAL</p>					
Marks	Cavity (20)	Pulp protection & Matrix, Wedge (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign

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**CLASS II SILVER AMALGAM RESTORATION WITH / WITHOUT B/P EXTENSION**

Case Number	Patient's Name		Age	Sex	OPD No.	Date	Tooth No.
Procedure							
Marks	Cavity (20)	Pulp protection & Matrix, Wedge (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign	

Case Number	Patient's Name		Age	Sex	OPD No.	Date	Tooth No.
Procedure	<i>Prayasa</i>						
Marks	Cavity (20)	Pulp protection & Matrix, Wedge (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign	

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**CLASS II SILVER AMALGAM RESTORATION WITH / WITHOUT B/P EXTENSION**

Case Number	Patient's Name	Age	Sex	OPD No.	Date	Tooth No.
Procedure						
Marks	Cavity (20)	Pulp protection & Matrix, Wedge (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign

Case Number	Patient's Name	Age	Sex	OPD No.	Date	Tooth No.
Procedure	<i>Prayera</i>					
Marks	Cavity (20)	Pulp protection & Matrix, Wedge (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign

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**CLASS II SILVER AMALGAM RESTORATION WITH / WITHOUT B/P EXTENSION**

Case Number	Patient's Name		Age	Sex	OPD No.	Date	Tooth No.
Procedure							
Marks	Cavity (20)	Pulp protection & Matrix, Wedge (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign	

Case Number	Patient's Name		Age	Sex	OPD No.	Date	Tooth No.
Procedure							
Marks	Cavity (20)	Pulp protection & Matrix, Wedge (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign	

*D. A. Pandu*

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**CLASS I/II/III/V/ GLASS IONOMER RESTORATIONS**

Case Number	Patient's Name		Age	Sex	OPD No.	Date	Tooth No.
Procedure							
Marks	Tooth preparation (20)	Pulp protection (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign	

Case Number	Patient's Name		Age	Sex	OPD No.	Date	Tooth No.
Procedure	<i>Praveen</i>						
Marks	Tooth preparation (20)	Pulp protection (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign	

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CLASS I/II/III/V/ GLASS IONOMER RESTORATIONS

Case Number	Patient's Name	Age	Sex	OPD No.	Date	Tooth No.
Procedure						
Marks	Tooth preparation (20)	Pulp protection (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign

Case Number	Patient's Name	Age	Sex	OPD No.	Date	Tooth No.
		<i>Prayasa</i>				
Procedure	PRINCIPAL					
	D.A. PANDU MEMORIAL					
Marks	Tooth preparation (20)	Pulp protection (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign

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CLASS I/II/III/V/ GLASS IONOMER RESTORATIONS

Case Number	Patient's Name		Age	Sex	OPD No.	Date	Tooth No.
	Procedure						
Marks	Tooth preparation (20)	Pulp protection (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign	

Case Number	Patient's Name		Age	Sex	OPD No.	Date	Tooth No.
	Procedure	<p align="center"><i>Pragya</i></p> <p align="center">PRINCIPAL</p>					
Marks	Tooth preparation (20)	Pulp protection (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign	

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DEEP CARIES MANAGEMENT

CLASS I / CLASS II DIRECT / INDIRECT PULP CAPPING WITH / WITHOUT B/P EXTENSIONS

Case Number	Patient's Name		Age	Sex	OPD No.	Date	Tooth No.
Procedure							
Marks	Removal of Caries/Cavity (20)	Pulp protection & Matrix, Wedge (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign	

Case Number	Patient's Name		Age	Sex	OPD No.	Date	Tooth No.
Procedure	<i>Praveen</i>						
Marks	Removal of Caries/Cavity (20)	Pulp protection & Matrix, Wedge (10)	Restoration (15)	Radiographic Evaluation (5)	Total (50)	Sign	

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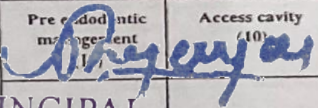


**ROOT CANAL THERAPY**

Case Number	Patient's Name		Age	Sex	OPD No.	Date	Tooth No.
Access Cavity							
Working length estimation	Reference point	Radiographic length of the tooth (mm)	Radiographic error adjustment (mm)	Corrected length to the radiographic apex in mm	Corrected length to the anatomic apex (WL in mm)		
Cleaning and shaping	Initial apical file	Master apical file	Step back file / length	Coronal flare instrument	Irrigant used		
Dressing	Number of close dressing			Intra canal medicament used			
Obturation	Obturation material	Sealer material	Obturation method	Master cone number	Coronal seal material		
	<i>Theyerayal</i>						
Marks	Pre endodontic management (10)	Access cavity (10)	Working length estimation (10)	Cleaning and shaping (10)	Obturation in X-ray (10)	Total (50)	Sign

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**BANGLORE - 560 078.**

## ROOT CANAL THERAPY

Case Number	Patient's Name	Age	Sex	OPD No.	Date	Tooth No.	
Access Cavity							
Working length estimation	Reference point	Radiographic length of the tooth (mm)	Radiographic error adjustment (mm)	Corrected length to the radiographic apex in mm	Corrected length to the anatomic apex (WL in mm)		
Cleaning and shaping	Initial apical file	Master apical file	Step back file / length	Coronal flare instrument	Irrigant used		
Dressing	Number of close dressing			Intra canal medicament used			
Obturation	Obturing material	Sealer material	Obturation method	Master cone number	Coronal seal material		
Marks	Pre endodontic management (10)	Access cavity (10)	Working Length estimation (10)	Cleaning and shaping (10)	Obturation in X-ray (10)	Total (50)	Sign
							

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## CASE SHEETS

*Shreyas*

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J.P Nagar, 1st Phase,  
BANGLORE - 560 078.

Comprehensive Case Sheet Number

**CASE SHEET - HISTORY FORM**

**PERSONAL DETAILS**

PATIENT'S NAME					
AGE		SEX		OPD NUMBER	
ADDRESS					

**CHIEF COMPLAINT**


**HISTORY FOR PRESENT COMPLAINT**


**FOR PAIN, SWELLING**

Location
Inception
Progression
Frequency
Intensity
Quality
Provoking factors
Relieving factors

**PAST DENTAL HISTORY**


**MEDICAL HISTORY**


*Dr. Ananya*  
**PRINCIPAL AND FAMILY HISTORY**

**PRINCIPAL**  
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# CASE SHEET - CLINICAL EXAMINATION FORM

## HEAD, NECK AND ORAL SOFT TISSUE EXAMINATION

### ORAL HYGIENE SCORE

Plaque score	0	1	2	3	4
Caldulus / stain score	0	1	2	3	-
Gingival bleeding score	0	1	2	3	-
STATUS	GOOD/BAD/MODERATE				

### HABITS

Oral habits	Smoking / Alcohol / Tobacco / Betel nut / Chewing gum
STATUS	GOOD/BAD/MODERATE
Oral hygiene habits	Use of Brush / Paste / Powder / Floss / Neem Stick / any other Fluoridated paste / Non fluoridated paste Brushing once / twice
STATUS	GOOD/BAD/MODERATE
Dietary habits	Balanced diet / Frequent intake of snacks / sweets in between meals
STATUS	GOOD/BAD/MODERATE

### CARIES RISK ASSESSMENT

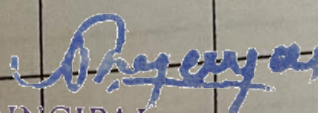
Susceptible age factor	Yes / No	Dietary habit	Good / Bad / Moderate
Past history of extractions of carious teeth	Yes / No	Presence of active carious lesions	Yes / No
Past history of restoration of carious teeth	Yes / No	Presence of root stumps in need of extraction	Yes / No
Medical history predisposing to caries	Yes / No	Presence of restorations done for carious reason	Yes / No
Family tendency	Yes / No	Salivary flow	High / low / moderate
Socio economic status and Dental awareness	Good / Bad / Moderate	Salivary pH	High / low / moderate
Oral habit status	Good / Bad / Moderate	Buffering capacity of saliva	High / low / moderate
Oral hygiene status	Good / Bad / Moderate	Smutans count	High / low / moderate
Oral hygiene habit status	Good / Bad / Moderate	Lactobacilli count	GOOD/BAD/MODERATE
STATUS	J.P Nagar, 1st Phase, BANGLORE - 560 078.		

BANGLORE - 560 078.



## CASE SHEET - DENTAL EXAMINATION AND TREATMENT PLAN FORM

Tooth No	Existing condition	Clinical data	Signs & symptoms	Diagnostic tests	Test results	Diagnosis	Treatment plan
18							
17							
16							
15							
14							
13							
12							
11							
21							
22							
23							
24							
25							
26							
27							
28							

  
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Tooth No	Existing condition	Clinical data	Signs & symptoms	Diagnostic tests	Test results	Diagnosis	Treatment plan
38							
37							
36							
35							
34							
33							
32							
31							
41							
42							
43							
44							
45							
46							
47							
48							

PREVENTIVE TREATMENT

*Praveen*

PRINCIPAL  
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R.V. DENTAL COLLEGE  
CA 37, 24th Main,  
JP Nagar, 1st Phase,  
BANGLORE - 560078.



Comprehensive Case Sheet Number

**CASE SHEET - HISTORY FORM**

**PERSONAL DETAILS**

<b>PATIENT'S NAME</b>					
<b>AGE</b>		<b>SEX</b>		<b>OPD NUMBER</b>	
<b>ADDRESS</b>					

**CHIEF COMPLAINT**


**HISTORY FOR PRESENT COMPLAINT**


**FOR PAIN, SWELLING**

<b>Location</b>
<b>Inception</b>
<b>Progression</b>
<b>Frequency</b>
<b>Intensity</b>
<b>Quality</b>
<b>Provoking factors</b>
<b>Relieving factors</b>

**PAST DENTAL HISTORY**


**MEDICAL HISTORY**


*Dr. Arjun*

**SOCIAL AND FAMILY HISTORY**

PRINCIPAL  
D.A. PANDU MEMORIAL  
R.V. DENTAL COLLEGE  
CA 37, 24th Main,  
J.P Nagar, 1st Phase,  
BANGLORE - 560 078.

## CASE SHEET - CLINICAL EXAMINATION FORM

### HEAD, NECK AND ORAL SOFT TISSUE EXAMINATION

#### ORAL HYGIENE SCORE

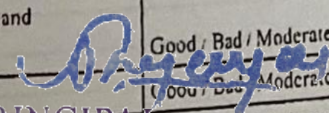
Plaque score	0	1	2	3	4
Calculus / stain score	0	1	2	3	-
Gingival bleeding score	0	1	2	3	-
<b>STATUS</b>	<b>GOOD/BAD/MODERATE</b>				

#### HABITS

Oral habits	Smoking / Alcohol / Tobacco / Betel nut / Chewing gum
<b>STATUS</b>	<b>GOOD/BAD/MODERATE</b>
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Dietary habits	Balanced diet / Frequent intake of snacks / sweets in between meals
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#### CARIES RISK ASSESSMENT

Susceptible age factor	Yes / No	Dietary habit	Good / Bad / Moderate
Past history of extractions of carious teeth	Yes / No	Presence of active carious lesions	Yes / No
Past history of restoration of carious teeth	Yes / No	Presence of root stumps in need of extraction	Yes / No
Medical history predisposing to caries	Yes / No	Presence of restorations done for carious reason	Yes / No
Family tendency	Yes / No	Salivary flow	High / low / moderate
Socio economic status and Dental awareness	Good / Bad / Moderate	Salivary pH	High / low / moderate
Oral habit status	Good / Bad / Moderate	Buffering capacity of saliva	High / low / moderate
Oral hygiene status	Good / Bad / Moderate	S. mutans count	High / low / moderate
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**R.V. DENTAL COLLEGE**  
 CA-37, 24th Main,  
 J.P. Nagar, 1st Phase,  
 BANGLORE - 560 078.



CASE SHEET - DENTAL EXAMINATION AND TREATMENT PLAN FORM

Tooth No	Existing condition	Clinical data	Signs & symptoms	Diagnostic tests	Test results	Diagnosis	Treatment plan
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*Arjun*  
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PREVENTIVE TREATMENT

*Praveen*

PRINCIPAL

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Comprehensive Case Sheet Number

**CASE SHEET - HISTORY FORM**

**PERSONAL DETAILS**

<b>PATIENT'S NAME</b>			
<b>AGE</b>		<b>SEX</b>	<b>OPD NUMBER</b>
<b>ADDRESS</b>			

**CHIEF COMPLAINT**


**HISTORY FOR PRESENT COMPLAINT**


**FOR PAIN, SWELLING**

<b>Location</b>
<b>Inception</b>
<b>Progression</b>
<b>Frequency</b>
<b>Intensity</b>
<b>Quality</b>
<b>Provoking factors</b>
<b>Relieving factors</b>

**PAST DENTAL HISTORY**


**MEDICAL HISTORY**


*Principals* **PRINCIPALS AND FAMILY HISTORY**

**PRINCIPAL**  
**D.A. PANDU MEMORIAL**  
**R.V. DENTAL COLLEGE**  
**CA 37, 24th Main,**  
**J.P Nagar, 1st Phase,**  
**BANGLORE - 560 078.**

## CASE SHEET - CLINICAL EXAMINATION FORM

### HEAD, NECK AND ORAL SOFT TISSUE EXAMINATION

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**PRINCIPAL**  
**B. A. PANDURANGA MEMORIAL**  
**R. V. DENTAL COLLEGE**  
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CASE SHEET - DENTAL EXAMINATION AND TREATMENT PLAN FORM

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28	D.A. PANDU MEMORIAL R.V. DENTAL COLLEGE CA 37, 24th Main, J.P Nagar, 1st Phase, BANGLORE - 560 078.						

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PREVENTIVE TREATMENT

*Praveen*

PRINCIPAL

D.A. PANDU MEMORIAL

R.V. DENTAL COLLEGE

CA 37, 24th Main,

J-P Nagar, 1st Phase,

BANGLORE - 560 078.

Comprehensive Case Sheet Number

**CASE SHEET - HISTORY FORM**

**PERSONAL DETAILS**

PATIENT'S NAME					
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**CHIEF COMPLAINT**

**HISTORY FOR PRESENT COMPLAINT**

**FOR PAIN, SWELLING**

- Location
- Inception
- Progression
- Frequency
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- Relieving factors

**PASTDENTAL HISTORY**

**MEDICAL HISTORY**

**PERSONAL AND FAMILY HISTORY**

*[Signature]*  
PRINCIPAL  
D.A. PANDU MEMORIAL  
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PREVENTIVE TREATMENT

*Praveen*

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**PAST DENTAL HISTORY**


**MEDICAL HISTORY**


**SOCIAL AND FAMILY HISTORY**


*D. A. Pandu*

PRINCIPAL  
D.A. PANDU MEMORIAL  
R.V. DENTAL COLLEGE  
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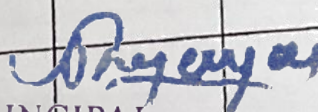
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PREVENTIVE TREATMENT

*Arjun*

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JP Nagar, 1st Phase,  
BANGLORE - 560 078.

**EXISTING CONDITIONS AND CLINICAL DATA  
GUIDELINES**

EXISTING CONDITION	CLINICAL DATA
MISSING TOOTH	<input type="checkbox"/> Extracted <input type="checkbox"/> Congenitally missing <input type="checkbox"/> Un erupted
PARTIALLY ERUPTED TOOTH	<input type="checkbox"/> Soft tissue covering present <input type="checkbox"/> Clinical crown partly visible
IMPACTED TOOTH	<input type="checkbox"/> Soft tissue impaction <input type="checkbox"/> Bony impaction <input type="checkbox"/> Tooth impaction
DRIFTED TOOTH	<input type="checkbox"/> Mesially and supra erupted <input type="checkbox"/> Distally and supra erupted <input type="checkbox"/> Supra erupted <input type="checkbox"/> Rotated <input type="checkbox"/> Labially placed <input type="checkbox"/> Lingually placed
SUPERNUMERARY TOOTH	<input type="checkbox"/> Mesio dens <input type="checkbox"/> Para molar
RETAINED DECIDUOUS TOOTH	<input type="checkbox"/> Firm <input type="checkbox"/> Mobile
ROOT STUMP	<input type="checkbox"/> Firm <input type="checkbox"/> Mobile
ANAMOLOUS TOOTH	<input type="checkbox"/> Peg shaped <input type="checkbox"/> Microdontic <input type="checkbox"/> Macrodontic
DIASTEMA	<input type="checkbox"/> Midline <input type="checkbox"/> Between --- and ---

**TRAUMATIC INJURIES**

EXISTING CONDITION	CLINICAL DATA
FRACTURED TOOTH	<input type="checkbox"/> Mesioangular fracture - involving only enamel / superficial dentin / deep dentin / pulp <input type="checkbox"/> Distoangular fracture - involving only enamel / superficial dentin / deep dentin / pulp <input type="checkbox"/> Incisal edge fracture with mesial angle involved - involving only enamel / superficial dentin / deep dentin pulp <input type="checkbox"/> Incisal edge fracture with distal angle involved - involving only enamel/superficial dentin/deep dentin/pulp <input type="checkbox"/> Incisal edge fracture with both the angles involved - involving only enamel/superficial dentin/deep dentin/pulp <input type="checkbox"/> Vertical fracture of crown - supra gingival <input type="checkbox"/> Vertical fracture - entire crown and root length <input type="checkbox"/> Cervical third root fracture - displaced / not displaced <input type="checkbox"/> Middle third root fracture - displaced / not displaced <input type="checkbox"/> Apical third root fracture - displaced / not displaced
DISPLACEMENT	<input type="checkbox"/> Extrusive <input type="checkbox"/> Intrusive
AVULSION	<input type="checkbox"/> Extra oral time - dry / or not <input type="checkbox"/> Storage done / not - <input type="checkbox"/> in water / saliva milk <input type="checkbox"/> Contaminated / not contaminated
CONCLUSION	<input type="checkbox"/> Tender / not <input type="checkbox"/> Mobile / not

*Principals*  
**PRINCIPAL**

**CARIOUS DISFIGUREMENT**

EXISTING CONDITION	CLINICAL DATA
D.A. PANDU MEMORIAL DENTAL COLLEGE CA 37, 24th Main J.P. Nagar, 1st Phase BANGLORE - 560 078.	<input type="checkbox"/> Non cavitated caries <input type="checkbox"/> Cavitated caries - superficial <input type="checkbox"/> Cavitated caries - deep <input type="checkbox"/> Cavitated caries - cuspal involvement

### NON CARIOUS DISFIGUREMENT


EXISTING CONDITION	CLINICAL DATA
ATTRITION, ABRASION, EROSION	<input type="checkbox"/> Generalized / localized <input type="checkbox"/> Superficial dentition exposed - symptomatic <input type="checkbox"/> Superficial dentition exposed - asymptomatic <input type="checkbox"/> Deep dentin involved - structurally compromised <input type="checkbox"/> Deep dentition involved - structurally compromised <input type="checkbox"/> Pulpally involved
DISCOLOURATION/DISFIGUREMENT	<input type="checkbox"/> Vital tooth discoloration without surface disfigurement and defect <input type="checkbox"/> Vital tooth discoloration with surface disfigurement and defect <input type="checkbox"/> Non vital tooth discoloration without surface disfigurement and defect <input type="checkbox"/> Non vital tooth discoloration with surface disfigurement and defect <input type="checkbox"/> Vital tooth only disfigurement <input type="checkbox"/> Non vital tooth only disfigurement

### ORAL HYGEINE CONDITION

EXISTING CONDITION	CLINICAL DATA
PLAQUE SCORE	<input type="checkbox"/> 0 - plaque free - no observable plaque with disclosant <input type="checkbox"/> 1 - slight plaque - 5 teeth or less <input type="checkbox"/> 2 - slight plaque - 6 teeth or more <input type="checkbox"/> 3 - moderate to heavy plaque <input type="checkbox"/> 4 - Gross plaque and debris
CALCULUS / STAIN SCORE	<input type="checkbox"/> 0 - none <input type="checkbox"/> 1 - very slight - lower linguals or upper buccals <input type="checkbox"/> 2 - moderate - requires definite scaling and polishing <input type="checkbox"/> 3 - heavy - requires ultrasonics or multiple sittings
GINGIVAL BLEEDING SCORE	<input type="checkbox"/> 0 - no observable inflammation or bleeding with probe or floss <input type="checkbox"/> 1 - slight inflammation and some bleeding with probe or floss <input type="checkbox"/> 2 - generalised inflammation, bleeding with pockets measuring 3mm or more. <input type="checkbox"/> 3 - periodontal disease

### EXISTING TREATMENT

EXISTING CONDITION	CLINICAL DATA
RESTORATION	<input type="checkbox"/> Amalgam - acceptable / defective <input type="checkbox"/> Composite - acceptable / defective <input type="checkbox"/> Composite - acceptable / defective <input type="checkbox"/> Glass ionomer - acceptable / defective <input type="checkbox"/> Pit and fissure sealant - acceptable / defective <input type="checkbox"/> PFM crown - acceptable / defective <input type="checkbox"/> Metal and composite facing crown - acceptable / defective <input type="checkbox"/> All ceramic crown - acceptable / defective <input type="checkbox"/> Metal inlay - acceptable / defective <input type="checkbox"/> Metal onlay - acceptable / defective
PROSTHESIS	<input type="checkbox"/> Pontic - acceptable / defective <input type="checkbox"/> Abutment - acceptable / defective <input type="checkbox"/> Cast pd - acceptable / defective <input type="checkbox"/> Acrylic pd - acceptable / defective
ENDODONTIC TREATMENT	<input type="checkbox"/> Improper RCT with improper post endodontic restoration <input type="checkbox"/> Improper RCT with acceptable post endodontic restoration <input type="checkbox"/> Improper RCT without post endodontic restoration <input type="checkbox"/> Acceptable RCT with improper post endodontic restoration <input type="checkbox"/> Acceptable RCT with acceptable post endodontic restoration <input type="checkbox"/> Acceptable RCT without post endodontic restoration <input type="checkbox"/> Acceptable RCT without post endodontic restoration
ORTHODONTIC TREATMENT	<input type="checkbox"/> Unacceptable removable appliance <input type="checkbox"/> Acceptable removable appliance <input type="checkbox"/> Unacceptable fixed appliance <input type="checkbox"/> Acceptable fixed appliance

  
 D.A. PANDU MEMORIAL  
 R.V. DENTAL COLLEGE  
 CA 37, 24th Main Rd,  
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 BANGLORE - 560 078.

## DIAGNOSTIC TESTS INTERPRETATION GUIDELINE

### X RAY INTERPRETATION

<b>CARIOUS AND NON-CARIOUS DISFIGUREMENT</b>	<input type="checkbox"/> Healthy - no lesion visible E0 <input type="checkbox"/> Lesion in the outer half of the enamel E1 <input type="checkbox"/> Lesion in the inner half of enamel - not entered in the dentition E2 <input type="checkbox"/> Lesion in outer one third of the dentin D1 <input type="checkbox"/> Lesion in the middle third of the dentin D2 <input type="checkbox"/> Lesion in the inner one third of the dentin D3
<b>ENDODONTIC CASES</b>	<input type="checkbox"/> Pulpally involved P1 <input type="checkbox"/> Pulp calcified P2 <input type="checkbox"/> Wide periodontal ligament space Pa1 <input type="checkbox"/> Periapical rarefaction Pa2 <input type="checkbox"/> Periapical radiolucency Pa3 <input type="checkbox"/> Periapical radio opacity Pa4 <input type="checkbox"/> Internal resorption R1 <input type="checkbox"/> External resorption R2 <input type="checkbox"/> Cervical third root fracture F1 <input type="checkbox"/> Middle third root fracture F2 <input type="checkbox"/> Apical third root fracture F3

### VITALITY TEST INTERPRETATION

<b>THERMAL - HEAT / COLD</b> (RECORD THE NUMBER OF SECONDS) EPT (RECORD THE NUMBER OF UNITS)	<input type="checkbox"/> Immediate response V11 <input type="checkbox"/> Delayed response V12 <input type="checkbox"/> No response V13
--	--

### PROBING TEST INTERPRETATION

<b>PROBE THE CAVITATED LESIONS ONLY</b> <b>DO NOT PROBE THE NON CAVITATED LESIONS</b>	<input type="checkbox"/> Probing positive - sensitive or painful <input type="checkbox"/> Probing negative - not sensitive or painful
--	--

### PERCUSSION TEST INTERPRETATION

<b>GENTLE PERCUSSION ONLY</b>	<input type="checkbox"/> Percussion positive - tender <input type="checkbox"/> Percussion negative - not tender
-------------------------------	--

*Praveen*

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**D.A.P.M.R.V. DENTAL COLLEGE  
&  
HOSPITAL**

DEPARTMENT OF PROSTHODONTICS

PRE-CLINICAL RECORD

NAME	: B. Ambarish Kamath
YEAR	: <u>II</u> BDS
REG. NO	: 19D0481
EXAMINATION CENTRE	:

*Prayasa*

PRINCIPAL  
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J.P. Nagar, 1st Phase,  
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DEPARTMENT OF PROSTHODONTICS  
R.V. DENTAL COLLEGE & HOSPITAL

J. P. NAGAR, BANGALORE - 560 078.



Certificate

*This is to Certify that*

*Mr./Ms. B. Ambarish Kamath*

*Reg. No. 19D0481*

*has satisfactorily carried out the practical exercise as  
Prescribed by the Rajiv Gandhi University of Health Sciences  
in the subject of Pre-Clinical Prosthodontics  
during the year 2020-2021*

Date :

*C. J.*  
Staff Incharge for Pre-clinical Prosthodontics

University Reg. No. : 19 D0481

Examination Centre :

Date of Practical Exam :

*Kelly*  
Internal Examiner

*[Signature]*  
External Examiner

*[Signature]*  
Dr. N. KATAVATH, MSc  
Professor and Head  
Department of Prosthodontics  
R.V. Dental College  
D.A.P.M.S.V. Dental College & Hospital  
CA 37, 24th Main, 1st Phase,  
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*[Signature]*  
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## INSTRUCTIONS TO THE STUDENTS

1. Students should enter the preclinical laboratory on time.
2. Students should wear clean and neatly ironed apon with name plates and should wear a head cap.
3. Students should observe silence in the department.
4. Students should have the relevant instruments for the specific practical exercise.
5. Students should keep the instruments clean in a tray.
6. Students should spread Mackintosh sheet on the table before starting work.
7. Students should avoid wastage of the materials and conserve the use of water.
8. Students should not put plaster, wax or other waste material in the sink.
9. Students should put off the Bunsen burner when not required.
10. Record book should be kept neat and in good condition.
11. This record book should be handed in for progress reports as and when required to the instructor.
12. **This record should be preserved till FINAL BDS and submitted during FINAL BDS CLINICAL EXAM**

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## ARMAMENTARIUM FOR PRECLINICAL EXERCISES

1. Mackintosh sheet
2. Rubber bowls
  - a) Flexible rubber bowl
  - b) Stiff rubber bowl
3. Straight Plaster spatula
4. Curved spatula (for mixing alginate)
5. Plastic spatula
6. Wax spatula
7. Wax knife
8. Lacron's carver
9. Stanley's knife
10. Plaster knife
11. Mean value articulator
12. Glass slab
13. Cement spatula / Broad bladed stainless steel spatula (for mixing ZnOE paste)
14. Half round file
15. Dental flasks with Clamps
16. Stainless Steel scale - 6 inch
17. Scissors - straight
18. Porcelain cup with lid
19. Soft Tooth brush
20. Impression tray, Stock Metal Alloys (Maxillary & Mandibular)  
Dental stainless steel perforated No. 1 to 4
21. Camel's hair brush  
Essential 4 perforated No. - 1 to 4

## INTRODUCTION TO PROSTHODONTICS

### DEFINITION OF PROSTHETIC DENTISTRY:-

Prosthetic dentistry is that branch of dentistry pertaining to the restoration and maintenance of oral function, comfort, appearance and health of the patient by the restoration of natural teeth and / or the replacement of missing teeth and craniofacial tissues with artificial substitutes.

### AIMS OF PROSTHETIC DENTISTRY:-

The aim of Prosthetic Dentistry is restoration of missing or lost dentition and associated structures with a view to preserve what remains of masticatory apparatus, restore function and aesthetics.

### BRANCHES OF PROSTHETIC DENTISTRY-

1. REMOVABLE PROSTHODONTICS :- Complete dentures  
Partial dentures  
Complete overdentures  
Partial overdentures
2. FIXED PROSTHODONTICS :- Crowns  
Bridges  
Laminates
3. MAXILLOFACIAL PROSTHODONTICS :- Obturators  
Stents  
Splints  
Extraoral prostheses-  
Eyes, ear, nose, etc.
4. IMPLANT PROSTHODONTICS :- Removable Prosthesis  
Fixed prosthesis.

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#### REMOVABLE PROSTHODONTICS :-

It is the branch of Prosthodontics concerned with the replacement of teeth and contiguous structures for edentulous or partially edentulous patients by artificial substitutes that are removable from the mouth.

#### FIXED PROSTHODONTICS:-

It is that branch of Prosthodontics concerned with the replacement and / or restoration of teeth by artificial substitutes that are not readily removed from the mouth.

#### IMPLANT PROSTHODONTICS:-

It is that phase of Prosthodontics concerning the replacement of missing teeth and / or associated structures by restorations that are attached to dental implants

#### MAXILLOFACIAL PROSTHODONTICS:-

It is that branch of Prosthodontics concerned with the restoration and / or replacement of the stomatognathic and craniofacial structures with prosthesis that may or may not be removed on regular or elective basis.

## COMPLETE DENTURE



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EXERCISE NO.1

COMPLETE DENTURES

DEFINITION:-

A dental prosthesis which replaces the entire dentition and associated structures of the maxilla and mandible.

SURFACES OF COMPLETE DENTURES:-

1. Impression surface / Tissue surface :-

That surface of the denture which is in contact with the denture bearing, denture stabilizing and border seal areas present in the edentulous mouth.

2. Polished surface :-

The external surface of the denture that is in contact with the mucosa of cheek lips and tongue.

3. Occlusal surface :-

It is the occluding surface of the denture.

QUESTIONS: -

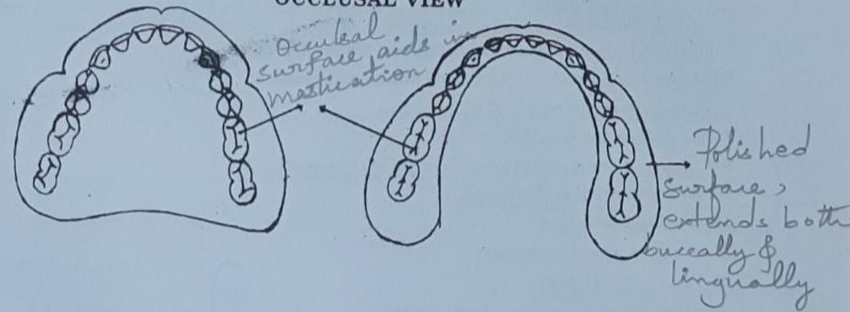
1. The surface of a complete denture that contacts the tissue is called as surface Impression Surface
2. A Prosthesis that replaces all the missing teeth and associated structure is called as Complete dentures

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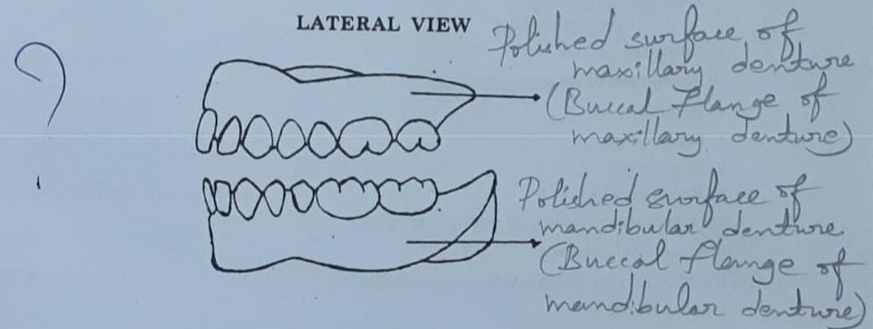
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# COMPLETE DENTURE

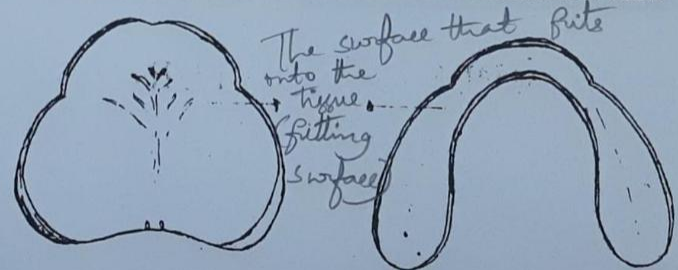
## OCCLUSAL VIEW



## LATERAL VIEW



## IMPRESSION SURFACE VIEW / TISSUE SURFACE VIEW



Label the Diagrams

*Prayasa*

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EXERCISE NO. 2

CLINICAL AND LABORATORY STEPS IN FABRICATION OF COMPLETE DENTURE

1. Examination, Diagnosis, Prognosis and Treatment Planning
2. Primary impression
3. Primary cast / Diagnostic Cast
4. Special/Custom tray
5. Final impression / Secondary impression / Master Impression
6. Final casts / Secondary impression / Master Impression
7. Temporary record base with occlusal rims
8. Jaw relation and selection of teeth
9. Transfer of jaw relation to the Mean Value articulator
10. Arrangement of artificial teeth
11. Waxing and carving
12. Try-in of waxed up dentures
13. Processing of dentures
  - a) Sealing of waxed up dentures to cast.
  - b) Flasking -base flasking  
-counter flasking
  - c) Dewatering
  - d) Application of separating media
  - e) Packing
  - f) Bench curing
  - g) Heat curing
  - h) Bench cooling
14. Laboratory remounting and selective grinding
15. Finishing and Polishing
16. Denture delivery and instruction to the patient.
17. Patients Recall

UNDERLINE THE LABORATORY STEPS IN RED (Pencil)

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EXERCISE NO. 3 (A)

ANATOMICAL LANDMARKS

ANATOMICAL LANDMARKS OF PATIENT'S MAXILLARY EDENTULOUS ARCH AND THEIR CORRELATION WITH THE MAXILLARY EDENTULOUS CAST

1. LABIAL FRENUM
2. LABIAL VESTIBULE
3. BUCCAL FRENUM
4. BUCCAL VESTIBULE
5. DISTOBUCCAL AREA
6. MAXILLARY TUBerosITY
7. HAMULAR NOTCH
8. FOVEA PALATINE
9. INCISIVE PAPPILLAE
10. RESIDUAL ALVEOLAR RIDGE
11. POSTERIOR PALATAL SEAL
12. MIDPALATINE RAPHAE
13. PALATAL RUGAE

9



QUESTIONS - Exercise No. 3 (A) :-

1. Mention the primary stress bearing areas in maxilla ?

- Alveolar ridge
- Slopes of hard palate on either side of palatal raphe
- Hard palate

2. Mention the primary relief areas in maxilla ?

- ▶ Incisive papilla
- ▶ Mid-palatine raphe
- ▶ Fovea palatine
- ▶ Palatine torus (Sharp bony prominence)
- ▶ Rugae and cuspoid eminence

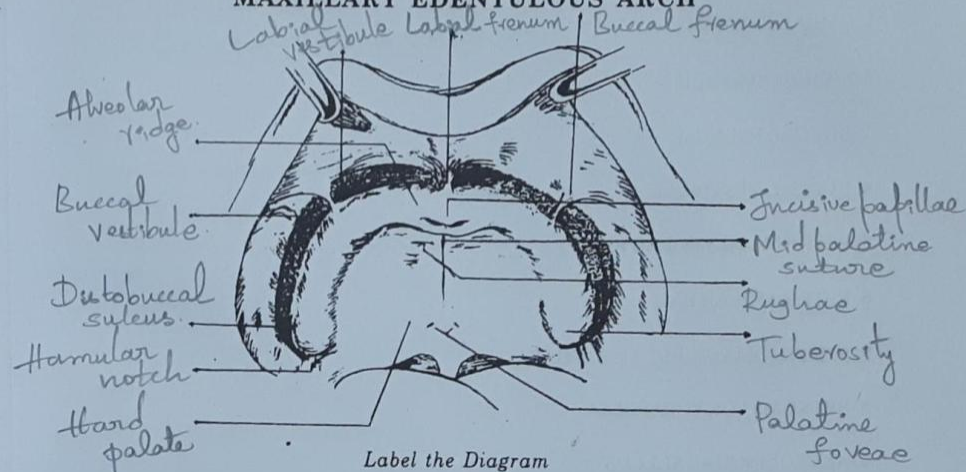
3. Mention the denture limiting areas in maxilla ?

- \* Labial frenum
- \* Labial vestibule
- \* Buccal frenum
- \* Buccal vestibule
- \* Hamular notch
- \* Posterior palatal seal area
- \* Fovea palatine

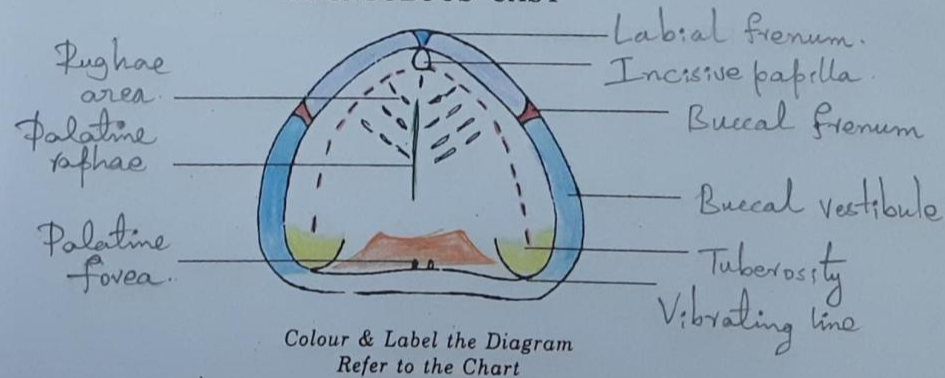
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INTRA-ORAL ANATOMICAL LANDMARKS OF THE MAXILLARY EDENTULOUS ARCH



SURFACE LANDMARKS OF THE MAXILLARY EDENTULOUS CAST



EXERCISE NO. 3 (B)  
ANATOMICAL LANDMARKS OF PATIENTS MANDIBULAR EDENTULOUS ARCH AND THE  
CORRELATION WITH THE MANDIBULAR EDENTULOUS CAST

1. LABIAL FRENUM
2. LABIAL VESTIBULE
3. BUCCAL FRENUM
4. BUCCAL VESTIBULE
5. RESIDUAL ALVEOLAR RIDGE
6. RETRO-MOLAR PAD
7. PTERYGOMANDIBULAR RAPHAE
8. RETROMYLOHYOID FOSSA
9. ALVEOLINGUAL SULCUS
10. LINGUAL FRENUM
11. BUCCAL SHELF AREA
12. PREMYLOHYOID EMINENCE
13. MASSETERIC NOTCH AREA
14. TONGUE

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QUESTIONS - Exercise No. 3 (B) :-

1. Mention the primary stress bearing areas in mandible ?

- \* Buccal shelf area.
- \* Retromolar pad.

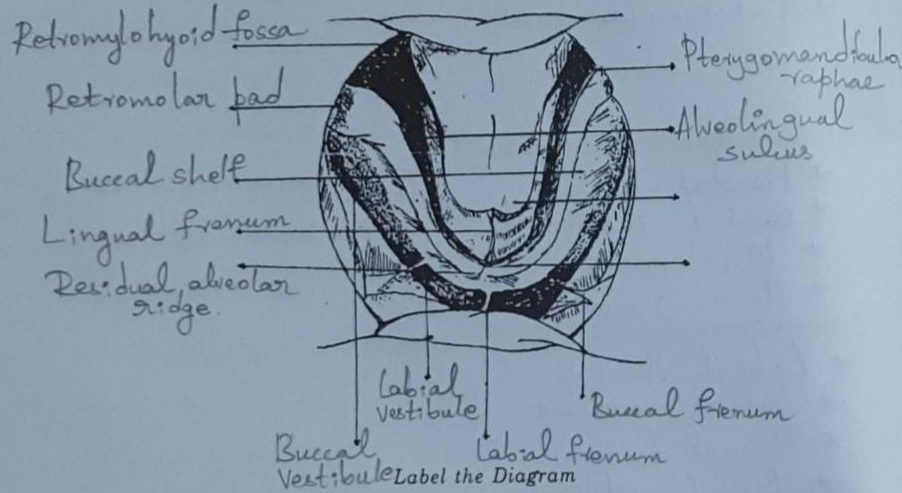
2. Mention the primary relief areas in mandible ?

- \* Mental foramen
- \* Gonial tubercle
- \* Mylohyoid ridge
- \* Torus mandibularis.

3. Mention the denture limiting areas in mandible ?

- \* Labial frenum
- \* Labial vestibule
- \* Buccal frenum
- \* Buccal vestibule
- \* Lingual frenum
- \* Alveolingual sulcus
- \* Retromolar pad
- \* Pterygomandibular raphe.

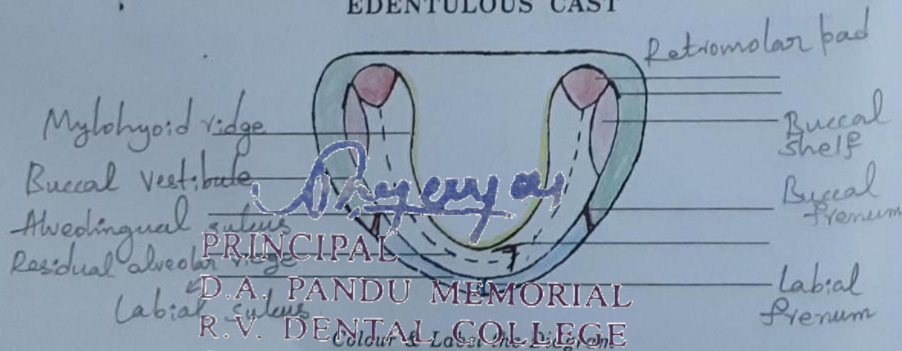
### INTRA-ORAL ANATOMICAL LANDMARKS OF THE MANDIBULAR EDENTULOUS ARCH



### EXERCISE 3 - C

Sl. No.	EXERCISE	GRADE	SIGNATURE
1.	Marking of anatomical landmarks on Maxillary and Mandibular cast		
2.	Marking of anatomical landmarks on Mandibular cast		

### SURFACE LANDMARKS OF THE MANDIBULAR EDENTULOUS CAST



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EXERCISE NO. 4  
PRIMARY IMPRESSION OF EDENTULOUS CAST

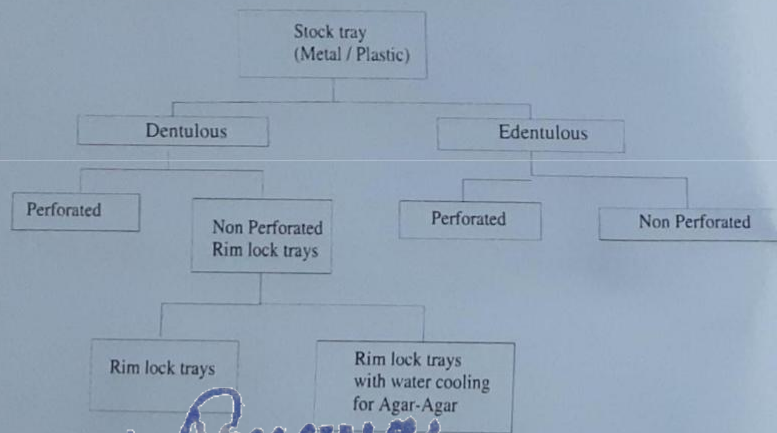
DEFINITION OF IMPRESSION :-

A complete denture impression is a negative registration of entire denture bearing, stabilizing and border seal areas present in the edentulous mouth which is recorded when the plastic material becomes relatively hard or set while it contact with tissues.

DEFINITION OF TRAY :-

A receptacle, usually made from metal that holds, directs and confines a impression material while impression is being made.

TYPES OF STOCK TRAYS :-



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MATERIALS AND INSTRUMENTS :-

1. 1 1/2 cake of medium fusing impression compound
2. Vaseline
3. Large rubber bowl
4. Hot water (not more than 65°C)
5. Wax knife
6. Edentulous non perforated stock trays
  - a) Maxillary
  - b) Mandibular

PROCEDURE FOR MAXILLARY IMPRESSION :-

1. Select a maxillary edentulous stock metal tray which covers most of the anatomical portion of the cast by keeping the tray 2mm away from tissue surface of the cast.
2. Lightly grease the surfaces of the cast with Vaseline.
3. Coat the under surface of hard rubber bowl with Vaseline to prevent the softened compound from sticking to the bowl.
4. Break the impression compound into small pieces and place it in the bowl with warm water to soften it.
5. Knead the material and load it on the tray.
6. Place the loaded tray on the cast and press it until material extends into the sulcus of the cast. Press the extruded material at the sulcus to the cast.
7. Allow the material to harden.
8. Remove the impression from the cast.

PROCEDURE FOR MANDIBULAR IMPRESSION :-

Follow the similar procedure for the mandibular impression in mandibular stock metal tray.

QUESTIONS :-

1. What material have you used for making primary impression of edentulous die?

Impression compound.

2. What do you mean by fusion temperature of impression compound?

Indicates definite reduction in plasticity of materials during cooling. When impression compound is heated in a hot water bath. The material loses its hardness at 39°C. On further heating ~ 45°C the material softens to plastic mass.

3. What is the temperature of water used for manipulating impression compound during primary impression making?

65°C

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Sl. No.	EXERCISE	GRADE	SIGNATURE
1.	Impression of Edentulous Maxillary model	} B	<i>[Signature]</i>
2.	Impression of Edentulous Mandibular model		
3.	Impression of Edentulous Maxillary model	} B	<i>[Signature]</i>
4.	Impression of Edentulous Mandibular model		
5.	Thumb Impression with impression compound	} B	<i>[Signature]</i>
6.	Lining of thumb impression with ZOE		

## EXERCISE NO. 5

### CAST

#### DEFINITION OF CAST :-

The positive reproduction of the form and shape of the denture bearing, denture stabilizing and border tissues of the maxilla / mandible usually made in a gypsum product. A cast is made from an impression (negative replica) of these tissues.

#### TYPES OF CASTS :-

1. Diagnostic cast / Primary cast / Preliminary cast (Type II Gypsum)
2. Master Cast / Final Cast (Type III Gypsum)

#### PARTS OF A CAST :-

1. Impression surface
2. Base
3. Land area / Lodge.

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### PREPARATION OF PRIMARY CAST FROM PRIMARY IMPRESSION

#### MATERIALS AND INSTRUMENTS :-

1. Edentulous Primary impression of the Primary cast.
2. Dental Plaster (Type II)
3. Large Black Stiff Rubber Bowl
4. Wax knife
5. Plaster Spatula
6. Plaster Knife
7. Ceramic tile

#### PROCEDURE :-

##### STEP 1 : POURING OF THE IMPRESSION BY INVERSION METHOD

1. In a large black stiff rubber bowl, take measured quantity of water, add dental plaster by sprinkling it gradually till no free water is visible and water is completely saturated with dental plaster.
2. Spatulate the mix with a straight plaster spatula and vibrate the bowl to release air entrapped in it. Spatulate till you get a creamy mix.
3. Pour the dental plaster from one end of the impression. Tap the impression while pouring to avoid entrapment of air. Continue to add plaster till it fills the impression.
4. Pile the remaining plaster in the bowl onto the tile and invert the poured impression over the pile of plaster.
5. Mould plaster around the impression to cover the borders of impression.
6. Allow initial set to take place. Remove the excess material beyond the borders of the impression and allow the material to set completely.

## STEP II : RETRIEVAL OF THE CAST.

1. Take warm water (not more than 65°C) in a black stiff rubber bowl.
2. Immerse the poured impression in warm water for 5 minutes.
3. Allow the compound to soften and remove the softened material from the cast.
4. Check the cast for anatomical details or defects.
5. Retrieve the mandibular cast in same manner.

## STEP III : FINISHING OF THE CAST

1. Using a hematiline pencil, outline the depth of sulcus (labial and buccal) of the maxillary cast. The posterior end of the maxillary cast, should be marked, from the depth of hamular notch on one side through the fovea palatine, to the hamular notch on the other side.
2. Mark the depth of sulcus (labial, buccal and lingual) of the mandibular cast. The posterior end is marked beyond the retromolar pad including these pads on both the sides of the arch.
3. After marking the depth of the sulcus, the cast is trimmed using a plaster knife in such a way that the ledge of the cast is 3-4 mm high and 3-4 mm wide.
4. The base of the cast is 15 mm thick and such that the ridge crest is more or less horizontal anteriorly and posteriorly.
5. Using a plaster knife, the cast is trimmed and smoothed.

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## QUESTIONS:-

1. What is the purpose of the primary cast ?

- ▷ To measure the depth and extent of undercuts
- ▷ Determine the path of insertion
- ▷ Evaluate size and contour of arch

2. Primary Cast is poured in which material ?

Dental plaster (Type II).

3. What should be the dimension of the base of the cast ?

The base of the cast is 15 mm thick and such that the ridge crest is more (or) less horizontal anteriorly and posteriorly.

SL. No.	Work.	Grade	Signature
①	Preliminary impression of dentulous maxillary & mandibular model using Alginate	(B+1)	Anusale
②	Polishing of master cast with dental stone.	(B+)	Anusale 10/3/21

**EXERCISE NO. 5**

**PREPARATION OF EDENTULOUS CASTS**

SL. NO.	WORK	GRADE	SIGNATURE
1.	a. MAXILLARY	(B)	[Signature]
	b. MANDIBULAR		
2.	a. MAXILLARY		
	b. MANDIBULAR		

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**EXERCISE NO. 6**

**SPECIAL TRAY**

**DEFINITION OF SPECIAL TRAY OR CUSTOM TRAY :-**

Special Tray is a Customized tray made on a Primary cast, that holds, directs and confines an impression material, to make a Definitive / Final impression.

**MATERIALS USED FOR SPECIAL TRAY :-**

1. Base Plate (Shellac)
2. Base Plate Reinforced with
  - a) Compound
  - b) Wire
  - c) Self-cured acrylic resin
3. Acrylic Resin----
  - a) Self cured
  - b) light cured



## CLASSIFICATION OF SPECIAL TRAYS :-

### I BASED ON TYPE OF SPACER

- a) WITH SPACER      \_\_\_\_\_ FULL SPACER  
   \_\_\_\_\_ PARTIAL SPACER
- b) WITHOUT SPACER (CLOSE FITTING TRAY)

### II BASED ON MATERIALS USED :-

1. Base plate (Shellac)
2. Base plate reinforced with
  - a) WIRE
  - b) COMPOUND
  - c) SELF CURED RESIN
3. ACRYLIC RESIN      \_\_\_\_\_ CHEMICAL CURED  
   \_\_\_\_\_ LIGHT CURED

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## SPECIAL TRAY IN BASE PLATE :-

### PROCEDURE:

1. Mark the outline on the maxillary and mandibular primary cast for the special tray i.e., 2mm short of the sulcus.
2. Immerse the cast in water for 5min , to prevent the base plate from sticking to it.
3. Soften and press the base plate to intimately contact the cast. Commence the adaptation from the center of the palate. Press the base plate at the periphery into the labial and buccal sulci.
4. Cut excess of base plate at the periphery beyond the sulcus outline and roll it. In the posterior area the base plate is not rolled. It is filed to maintain a thin periphery in the posterior area.
5. After the adaptation of the base plate is completed, check the peripheries to confirm the outline and provide enough relief in the frenum area.
6. Use the excess base plate to make the handle prepare a handle 15mm high, 10mm wide and 5mm thick. Attach the handle to the special tray in the midline with slight labial tilt.
7. Remove the tray from the cast and check the border extensions and place it back on the cast
8. To reinforce the special tray orthodontic wire can be adapted over the crest of the ridge and then base plate is adapted over that.

## SPECIAL TRAY IN SELF CURED ACRYLIC RESIN:

1. Mark the midline of the cast coinciding with labial frenum.
2. Mark the outline on the maxillary and mandibular primary cast for the special tray i.e., 2mm short of the sulcus.
3. For partial spacer :  
Maxilla : Draw a T shape space to outline the ridge crest and mid palatal raphae.  
Mandible : Spacer should be outlined only over the crest of the ridge.
- For full spacer :  
Maxilla : Draw a full spacer outline 2mm short of the outline marked.  
Posterior palatal seal area should not be covered.

Mandible : Draw a full spacer outline 2mm short of the outline marked. Buccal shelf area should not be covered.

4. Soften the wax spacer in lukewarm water and adapt it on the cast within the outline marked. Place a sheet of thin foil over the wax spacer. The foil facilitates the removal of wax spacer and also prevents the wax spacer from melting due to the exothermic heat generated during the polymerization of the acrylic resin.
5. Apply separating media with the camel hair brush on the exposed portion of the cast to form a layer which will prevent the acrylic resin from adhering to the cast.
6. Take measured quantity of self cured resin monomer in the cup. The self cured / tray powder is added to the liquid till it saturates. It is mixed using a wax knife to get a homogeneous mix. The cup is covered with the saucer, to prevent evaporation of monomer.
7. The mix is allowed to lose its stickiness before it is removed from the container. When mix reaches dough stage remove the material, knead and adapt well on the cast to form a tray. Take care to limit the material within the outline marked to prevent trimming of tray later on. Cut away any excess material beyond the peripheral outline with a sharp carver or scissors.
8. Mold the excess material to prepare a handle of 12mm height 10mm width and 5mm thickness and attach it in the centre of the tray coinciding with the midline. No tilt is given to the handle for mandible. For maxilla handle should be kept at 45°.
9. In case where tin foil is not used over the wax spacer, wax will melt due to the heat generation during polymerization. To prevent this, apply pressure on initial set tray on the cast by holding it and immersing it in a bowl of cold water.
10. Once the material is set, the tray is removed and if trimming is required carry out with an acrylic trimmer, such that the tray borders are smooth and just short of the peripheral outline.
11. The tray is placed back on the cast.

*D. Pandu*

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PREPARATION OF CUSTOM TRAY WITHOUT SPACER  
SHELLAC BASEPLATE

SL. NO.	WORK	GRADE	SIGNATURE
1.	a. MAXILLARY		
	b. MANDIBULAR		

**PREPARATION OF CUSTOM TRAY WITH PARTIAL SPACER IN  
CHEMICAL CURED ACRYLIC RESIN**

SL. NO.	WORK	GRADE	SIGNATURE
1.	a. MAXILLARY		
	b. MANDIBULAR		

**PREPARATION OF CUSTOM TRAY WITH FULL  
SPACER IN CHEMICAL CURED ACRYLIC RESIN**

SL. NO.	WORK	GRADE	SIGNATURE
1.	MANDIBULAR		

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EXERCISE NO. 7

PREPARATION OF FINAL CAST / MASTER CAST

DEFINITION OF FINAL CAST :-

An accurate replica of the residual ridge area and associated structures, reproduced from a final impression, upon which a dental prostheses will be fabricated.

CASTS ARE Poured IN DENTAL STONE BY TWO METHODS:-

- A) BOXING IN METHOD
- B) TWOSTAGE POURING METHOD

MATERIALS AND INSTRUMENTS :-

1. Final impression in special tray.
2. Stiff rubber bowl.
3. Straight Plaster spatula.
4. Plaster knife.
5. Beading wax.
6. Boxing wax.
7. Dental stone (Type III Gypsum)

## PROCEDURE :-

### A) BEADING & BOXING METHOD

1. The border of the impression are beaded with thin strips of beading wax which is placed 2mm beyond the sulcus extension. It is kept 4mm wide.
2. Boxing wax sheets are sealed to beading wax such that the entire impression is enclosed to form a box (Boxed-in).
3. Dental stone (type III Gypsum) is mixed in a stiff rubber bowl to form a creamy mix. It is poured from one end of the impression to gradually fill the impression to the height of the boxed wax. The assembly is vibrated to avoid air entrapment.
4. The dental stone is allowed to completely set.
5. In addition to the above mentioned procedure. In case of mandibular impression a tongue shaped form is placed along the lingual border to provide the tongue space.

### B) TWO STAGE POURING METHOD :-

1. Dental stone is mixed in a stiff rubber bowl to form a creamy mix.
2. A small quantity is poured from one end of the impression to gradually cover the entire impression surface. The assembly is vibrated to prevent air entrapment.
3. Remaining stone is poured to cover the border of the impression. Few elevations are made over the stone for anchorage of the base. ALLOW STONE TO SET completely.
4. Prior to pouring the base, the dental stone is made wet with water to allow the dental stone to adhere to it while forming the base. Mix the dental plaster / dental stone and pile it on the tile. The impression with the set dental stone is inverted over the plaster.
5. Shape the soft plaster to the desired height and width to form the base.
6. Once the base is set, the impression is immersed in warm water to retrieve the cast.
7. Trim the cast to the desired height of the base and height and width of ledge.

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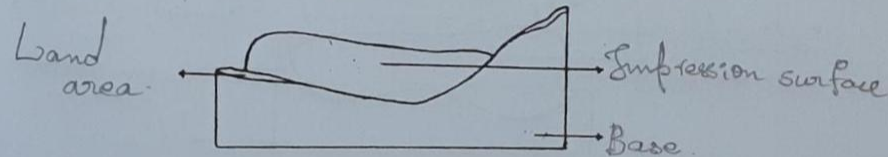
## FINAL CAST - MANDIBULAR

### OCCLUSAL VIEW



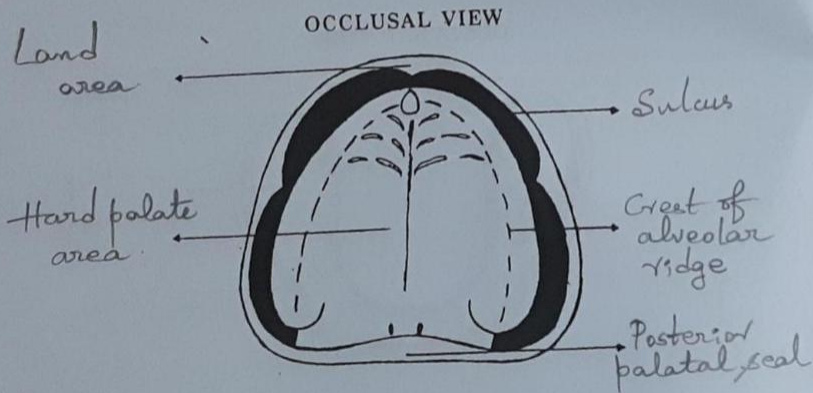
Label the Diagram

### LATERAL VIEW



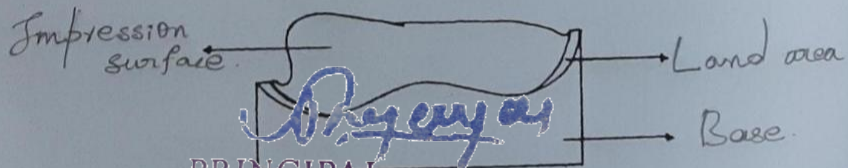
Label the Diagram

FINAL CAST - MAXILLARY



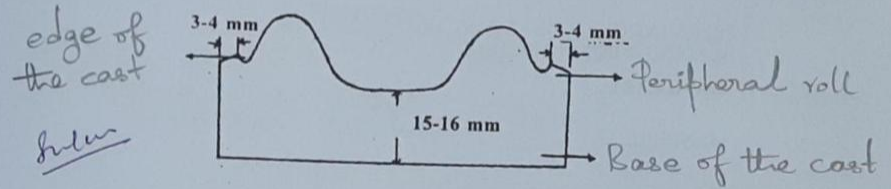
Label the Diagram

LATERAL VIEW

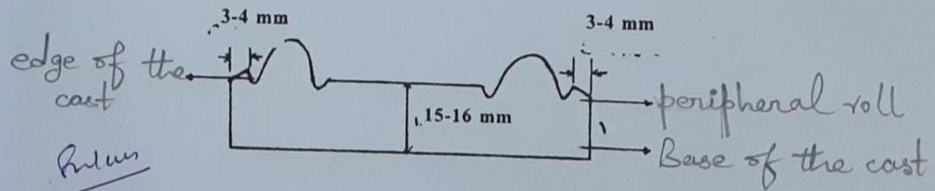


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PRIMARY CAST - MAXILLARY



PRIMARY CAST - MANDIBULAR



Label the Diagram

PREPARATION OF FINAL CAST :-

SL NO.	WORK DONE	GRADE	SIGNATURE
1.	PREPARATION OF FINAL CAST BY BEADING & BOXING METHOD MAXILLARY		
2.	MANDIBULAR		
1.	PREPARATION OF FINAL CAST BY TWO STAGE PRORING METHOD MAXILLARY		
2.	MANDIBULAR		

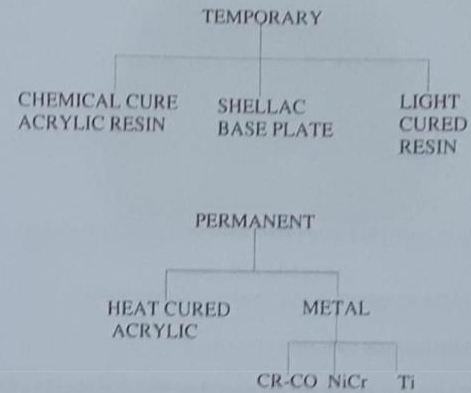
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EXERCISE NO. 8  
 FABRICATION OF RECORD BASES

DEFINITION :-

It is a temporary form, representing the base of a denture, that is used for making maxillomandibular (jaw) relation records for arranging teeth and taking try-in.

CLASSIFICATION:



## FABRICATION OF TEMPORARY DENTURE BASES:

### MATERIALS AND INSTRUMENTS :-

1. Master cast.
2. Shellac base plates.
3. Small scissors.
4. Wax knife.
5. Wax spatula.
6. Half round file.
7. Copying pencil.

### PROCEDURE :-

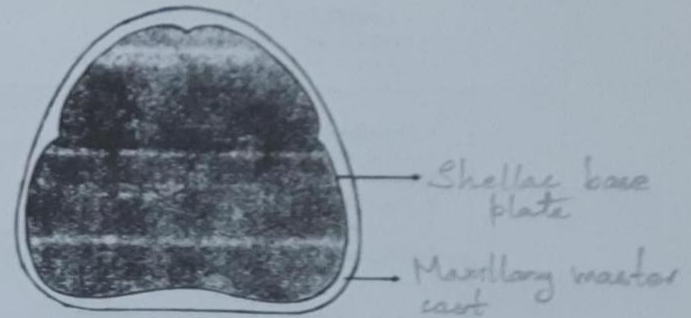
1. Soak the master casts in water, to prevent the shellac base plate from sticking to the casts.
2. Mark the extension of the temporary denture base on the master cast.
3. Soften and adapt the shellac base plate over the cast.
4. Cut the excess beyond the outline and roll the margin on the labial and buccal aspects.
5. File and flush the margins on the base plate on the posterior area of both maxillary mandibular record base.
6. Check the record bases properly for extension and adaptation.

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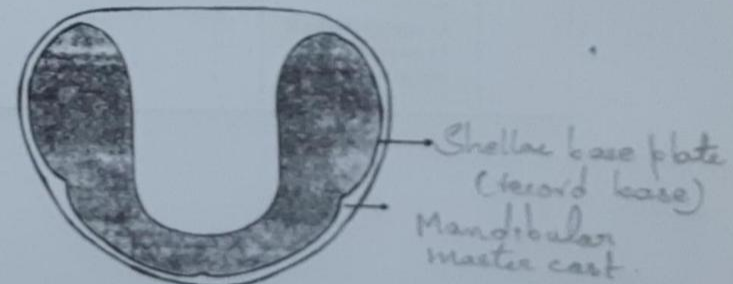
## TEMPORARY RECORD BASE

### MAXILLARY



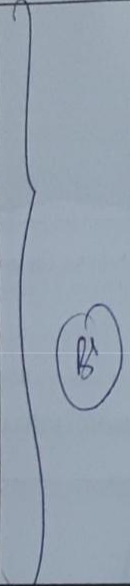
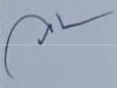
Label the Diagram

### MANDIBULAR



Label the Diagram

**PREPARATION OF RECORD BASE**

SL. NO.	WORK	GRADE	SIGNATURE
1.	a. MAXILLARY by using Shellac base plate b. MANDIBULAR by using Shellac base plate		
2.	a. MAXILLARY by using self cure acrylic b. MANDIBULAR by using self cure acrylic		
3.	a. MAXILLARY by using self cure acrylic b. MANDIBULAR by using self cure acrylic		
4.	a. MAXILLARY by using self cure acrylic b. MANDIBULAR by using self cure acrylic		

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EXERCISE NO. 9  
FABRICATION OF OCCUSAL RIMS

DEFINITION :-

Occusal rims are used as provisional substitutes for the planned complete dentures and are used to record jaw relation.

PURPOSE OF OCCUSAL RIMS:

They are used to establish :

- The level of occusal plane.
- The arch form.
- The maxillomandibular relation records  
(vertical and horizontal jaw relationship and estimated interocclusal distance)

MATERIAL AND INSTRUMENTS :

- Final casts with record bases.
- Modeling wax sheets.
- Wax knife.
- Straight plaster spatula.



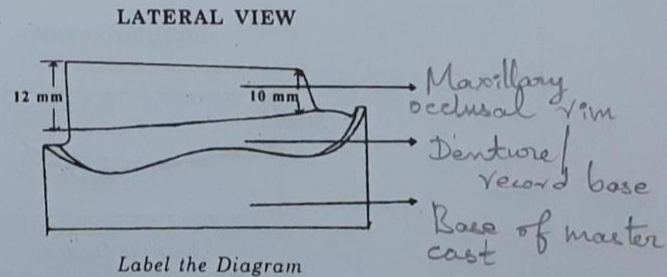
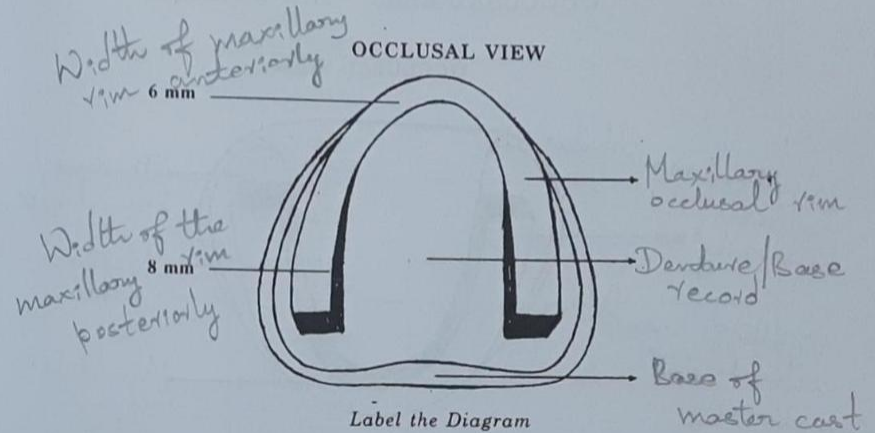
**PROCEDURE :-**

1. Use full length of the wax sheet for maxillary wax rims and 3/4th length of wax sheet for mandibular wax rims.
2. Soften the wax sheet from the edge and roll it gradually to form a soft roll.
3. Bend the soft roll of the wax in to a 'U' shaped form and place it over the ridge crest area of the record bases. Mould the wax onto the slopes of the ridge. Seal the wax all around the record bases with a wax knife.
4. Mark a vertical line at the base of both (maxillary and mandibular) casts at the midline and 2cms behind the buccal freni on both the sides. Measure and mark the height of the wax rim along these lines. Adjust the wax rims to get the specified height for normal teeth arrangement.
5. After the mandibular rim is prepared in the similar manner and its height adjusted to the specification, take care so that the height of the rim is not higher than anterior 2/3rd of retromolar pad.
6. The maxillary rim has a 2° - 5° labial tilt. The mandibular rim is straight anteriorly.
7. Polish the wax with soap and water to obtain a shine.

	ANTERIOR		POSTERIOR	
	HEIGHT	WIDTH	HEIGHT	WIDTH
MAXILLARY	22mm from the Sulcus	4-6mm	18mm from the Sulcus	6-8mm
MANDIBULAR	18mm from the Sulcus	4-6mm	2/3 <sup>rd</sup> of Retromolar pad	6-8mm

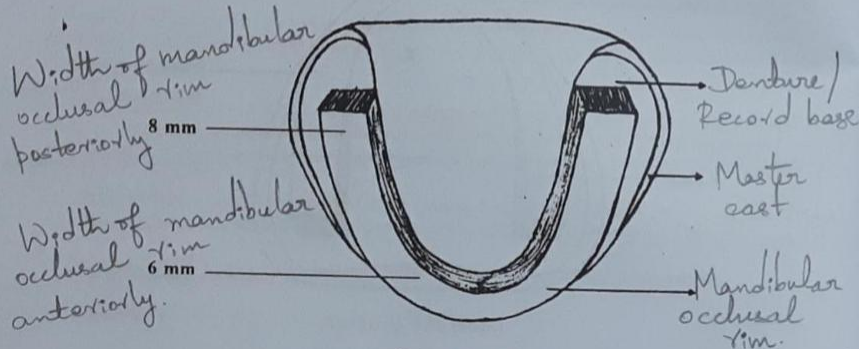
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**OCCLUSAL RIMS MAXILLARY**



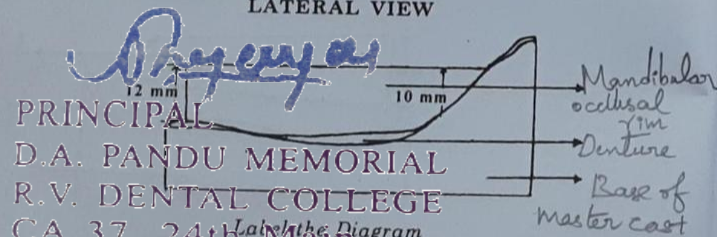
## OCCLUSAL RIMS - MANDIBULAR

OCCLUSAL VIEW



Label the Diagram

LATERAL VIEW



Label the Diagram

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## FABRICATION OF WAX OCCLUSAL RIMS:

SL NO	WORK DONE	GRADE	SIGNATURE
1	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
2	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
3	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
4	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
5	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
6	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
7	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
8	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
9	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		

FABRICATION OF WAX OCCLUSAL RIMS:

10	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
11	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
12	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
13	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
14	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
15	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		

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EXERCISE NO.10  
 ARTICULATORS

DEFINITION :-

An Articulator may be defined as a mechanical device that represents the temporo-mandibular joint and jaw members to which maxillary and mandibular casts may be attached to simulate jaw movements.

CLASSIFICATION:-

A. Based on theories of occlusion:

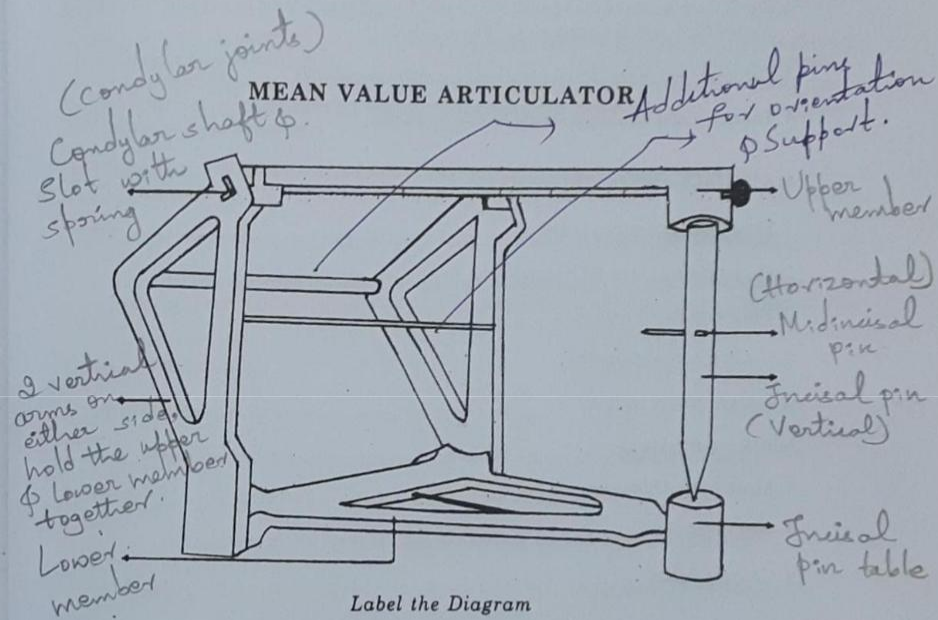
1. Bonwill Theory.
2. Conical Theory.
3. Spherical Theory.

B. Based on adjustability of articulators:

1. Non-adjustable
  - a. Simple hinge
  - b. Hinge with fixed condylar control
    - Mean value articulator by Gysi
2. Semi-adjustable
  - a. Arcon : Arcon articulators are those which contains the condylar path elements within its upper member and the condylar elements within the lower member.
    - Bergstorm derived the name ARCON from ARticulator and CONdyle.
    - examples : Hanau Arcon H2  
Whip mix.
  - b. Non Arcon : Non Arcon articulators contains condylar elements in its upper member.
    - examples : Hanau H2,  
Dentatus.
3. Fully-adjustable
  - examples : Denar  
TMJ

PARTS OF MEAN VALUE ARTICULATORS:

1. Upper member.
2. Lower member.
3. Vertical incisal pin.
4. Horizontal incisal pin.
5. Incisal table.
6. Condylar joints : a. Condylar guidance slots  
b. Condylar elements.
7. Condylar posts



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EXERCISE NO. 11


TRANSFER OF JAW RELATION TO THE ARTICULATOR

MAINTENANCE OF THE ARTICULATOR :

1. Clean and oil articulator.
2. Check the position of the vertical incisal pin. The upper end of the incisal pin should flush with the upper arm of the articulator.
3. The lower end of the incisal pin should touch the incisal table.
4. The horizontal incisal pin should be in its position.

MATERIALS AND INSTRUMENTS:-

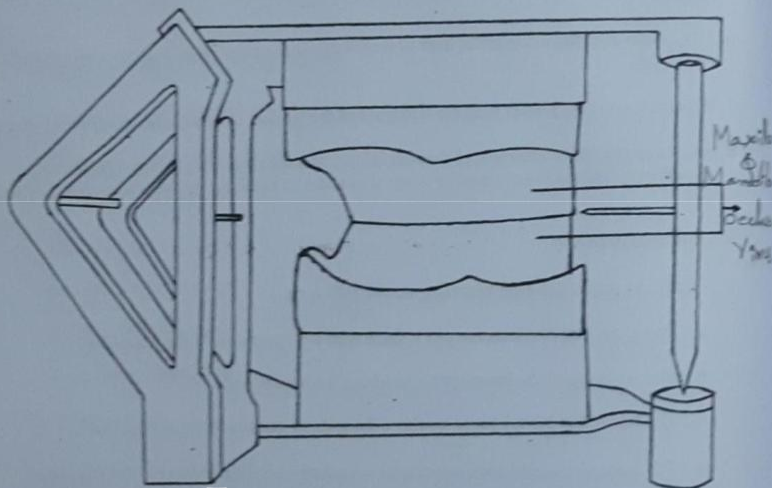
1. Final casts with occusal rims.
2. Dental plaster (Type II Gypsum)
3. Petroleum jelly Vaseline.
4. Carding or modeling wax.
5. Straight plaster spatula.
6. Black stiff rubber bowl.
7. Mean value Articulator
8. Half round file.
9. Copying Pencil.

  
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PROCEDURE :-

1. Prepare V- shaped notches in the base of the cast using a half round file to facilitate laboratory remounting procedures. The notches should be wide shallow and sharp.
2. Seal the occusal rims in a Class I relationship. Mark the midline, canine line and high lipline.
3. Seal the temporary bases to the cast to prevent the movement of the record base on the cast.
4. Lubricate the bases of both maxillary and mandibular casts with a thin layer of petroleum jelly.
5. Place lumps of soft carding wax or softened modeling wax at three points on the lower member and place the cast with sealed wax rims on the wax, support them such that they are centered when viewed from the top. When viewed from the side, the occusal plane of the occusal rims should be at the midplane of the articulator. The horizontal incisal pin should touch the midline marked on the occusal rims.
6. Mix plaster and place it over the base of maxillary cast to attach it to the upper member of the articulator.
7. Remove the excess plaster after the initial set of the plaster. Do the further contouring after final set.
8. Invert the articulator and remove the wax lumps. Mix the plaster and place it between the mandibular cast and lower member of the articulator in the same manner as that for the maxillary cast.
9. Clean the articulator.
10. Check the articulator after mounting for the following :
  - a. The upper end of the incisal pin is flush with the upper arm of the articulator.
  - b. The lower tip of the incisal pin is touching the incisal table.
  - c. The horizontal incisal pin is touching the midline marked on the occusal rim.
  - d. The occusal plane of the occusal rims coincides with the midplane of the articulator.
11. Separate the two occusal rims by breaking the seal. Transfer the midline onto the plaster attaching the cast to the articulator.
12. Inscribe your name and roll no. on plaster with copying pencil.

## TRANSFER OF JAW RELATION TO MEAN VALUE ARTICULATOR



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Principals Diagram

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## EXERCISE NO. 12

### SELECTION OF TEETH FOR COMPLETE DENTURES

#### MATERIALS USED FOR ARTIFICIAL TEETH

1. Acrylic
2. Composite
3. Ceramic

#### CUSP ANGULATION OF POSTERIOR TEETH

1. Anatomical (Above  $30^\circ$ )
2. Semi anatomical ( $20^\circ$ )
3. Non anatomical ( $0^\circ$ )

#### SELECTION OF TEETH FOR PRECLINICAL SET UP :-

Anterior teeth : Mesio-distal width- To fit within the canine line.

Inciso-cervial length- To fit within the high lip line and occlusal surface of the rim.

Posterior teeth : Mesio-distal width- To fit between distal surface of canine to

. Anterior portion of maxillary tuberosity in maxillary arch.

. Retromolar pad in mandibular arch.

Bucco-lingual width- Within the Parson's triangle which is from canine at apex and retromolar pad at the base of triangle.

## ARRANGEMENT OF ARTIFICIAL TEETH

## MATERIAL AND INSTRUMENTS :

1. Teeth set
2. Bowl with cold water
3. Wax knife
4. Wax spatula
5. Lacrons carver
6. Modeling wax

## SEQUENCE OF ARRANGEMENT OF TEETH

- |                          |            |
|--------------------------|------------|
| 1. Maxillary anteriors   | Right side |
| 2. Maxillary anteriors   | Left side  |
| 3. Mandibular anteriors  | Right side |
| 4. Mandibular anteriors  | Left side  |
| 5. Maxillary posteriors  | Right side |
| 6. Maxillary posteriors  | Left side  |
| 7. Mandibular posteriors | Right side |
| 8. Mandibular posteriors | Left side  |

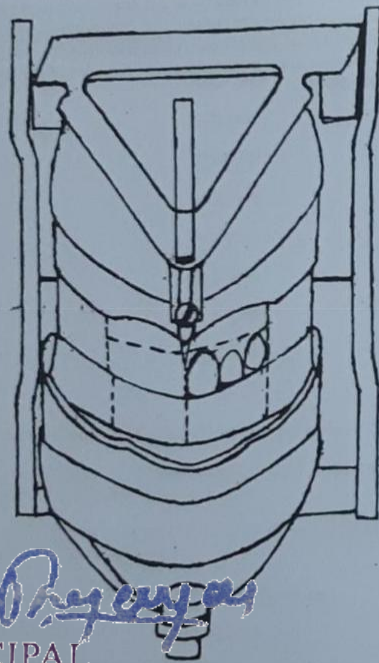
## PROCEDURE :-

1. Place the articulator with the mounted casts in cold water for 5 mins.
2. Remove the vertical incisal pin from the articulator and place it in a reverse position for clearer view while arranging the anterior teeth.
3. Remove half the height of the occusal rim and half of the labial aspect of each quadrant with a carver as you progress with teeth arrangement.
4. Soften the wax with a warm spatula to peel the wax in specific area.
5. Arrange the anterior teeth to follow the contour of occusal rim.
6. Position the central, lateral and canine keeping in mind their individual positions as shown in the chart.
7. Fix the position of each tooth by clipping it to the wax.
8. In the same manner arrange central, lateral and canine on the other side.
9. Check the individual position of the teeth in relation to the glass slab.
10. Reposition the incisal pin such that the upper end of incisal pin is flush with the upper arm of the articulator and tip is in contact with the lower arm.

11. Arrange the mandibular anteriors with the minimum of 2mm of vertical and 2mm of horizontal overlap following the arch form of the maxillary anteriors. Follow the position of the teeth according to the chart.
12. Arrange the maxillary posterior teeth following the positions as per the chart.
13. Arrange all the upper posteriors in a straight line with their central grooves following on the crest of mandibular ridge with the articulator in closed position.
14. Check the mesio-distal and bucco-lingual relation of the posterior teeth as per the chart.
15. In the same manner arrange the posterior teeth on the other side.
16. Arrange the mandibular 1st molar with its mesio-buccal groove coinciding with the mesio-buccal cusp of the maxillary 1st molar. Arrange the mandibular 2nd molar in relation to maxillary 2nd molar followed by the arrangement of 2nd premolar and lastly the 1st premolar. Occlusion of the maxillary posteriors is checked to see the maximum intercuspation from both buccal and lingual aspect.

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ANTERIOR VIEW OF THE MOUNTED OCCLUSAL RIMS ON MEAN VALUE ARTICULATOR

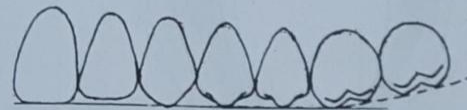


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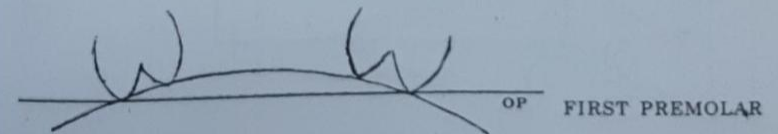
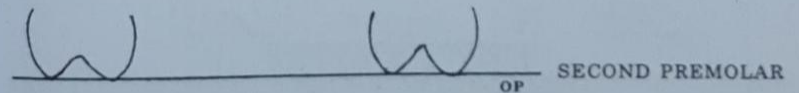
COMPENSATING CURVE

COMPENSATING CURVES when considered as a whole unit from two curves, an anteroposterior and a lateral curve.

ANTERO POSTERIOR CURVE : Compensating curves are the artificial curves introduced into dentures in order to facilitate the production of balanced articulation; they are the artificial counterparts of the curves of Spee and Monson which are found in natural dentition.



LATERAL CURVES : In the natural dentition, there are two lateral curves, one involving the molar teeth (the curve of Monson), and the other involving the teeth anterior to the second premolars.

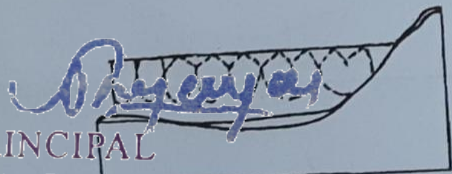




POUND'S TRIANGLE



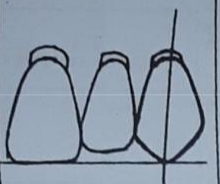
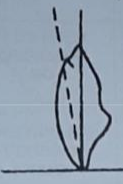

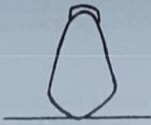
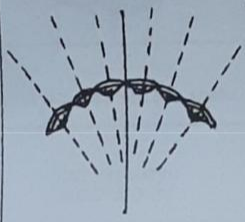
MAINTENANCE OF HEIGHT OF THE MANDIBULAR POSTERIOURS UPTO 2/3rd OF RETROMOLAR PAD




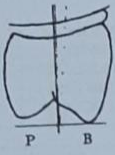

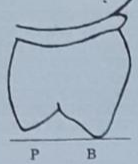
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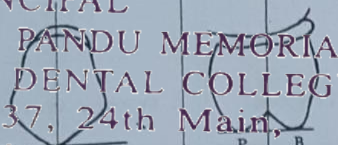

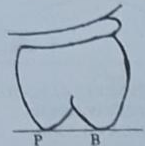
CHART OF NORMAL INDIVIDUAL POSITIONS OF TEETH :  
MAXILLARY ANETERIORS

	LABIO-LINGUAL INCLINATION	MESIO-DISTAL INCLINATION	RELATION TO OCCLUSAL PLANE	ROTATIONAL RELATIONSHIP
MAXILLARY CENTRAL 111	NO DEPRESSION AT THE NECK	PERPENDICULAR	ON THE OCCLUSAL PLANE TOUCH THE GLASS SLAB.	FOLLOW THE ARCH - FORM
MAXILLARY LATERAL 212	DEPRESSED AT THE NECK	DISTALLY TILTED	1mm ABOVE THE OCCLUSAL PLANE.	FOLLOW THE ARCH FORM.

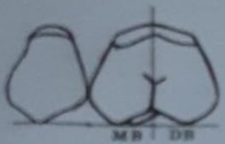



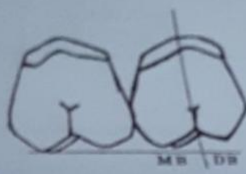

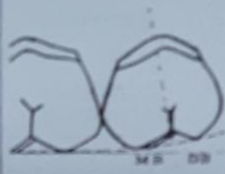

<p>MAXILLARY CANINES 2/2</p>	<p>PROMINENT NECK</p>	<p>STRAIGHT WITH NO TILT.</p>	<p>TIP OF CANINE CONTACTS THE OCCLUSAL PLANE</p>	<p>DISTAL HALF OF LABIAL FACE POINTING POSTERIORLY. ROTATED WITH MESIAL HALF IN LINE WITH THE LABIAL SURFACE OF LATERAL AND DISTAL HALF IN LINE WITH THE WAX RIM DISTALLY.</p>
				

MAXILLARY POSTERIORES

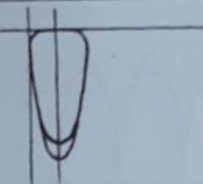


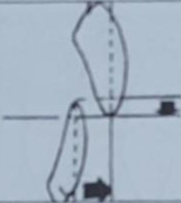

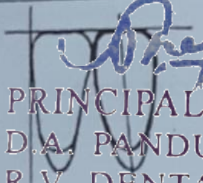

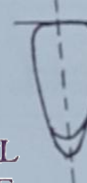
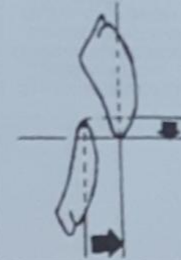

	<p>BUCCO-LINGUAL INCLINATION</p>	<p>MESIO-DISTAL INCLINATION</p>	<p>RELATION TO OCCLUSAL PLANE</p>
<p>MAXILLARY 1<sup>ST</sup> PREMOLAR 4/4</p>	<p>PALATALLY INCLINED</p>	<p>STRAIGHT</p>	<p>BUCCAL CUSP TOUCHES THE OCCLUSAL PLANE PALATAL CUSP 1 mm ABOVE THE OCCLUSAL PLANE</p>
			


<p>MAXILLARY 2<sup>ND</sup> PREMOLAR 4/5</p>	<p>PALATALLY INCLINED</p>	<p>STRAIGHT</p>	<p>BOTH THE CUSPS TOUCH THE OCCLUSAL PLANE</p>
			

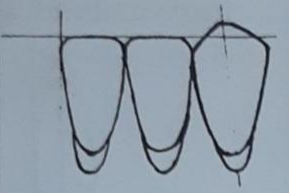


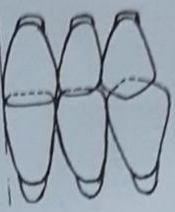

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<p>MAXILLARY 1<sup>ST</sup> MOLAR 6/6</p> 	<p>BUCCALLY INCLINED</p> 	<p>DISTALLY TILTED TO FOLLOW THE COMPENSATING CURVES</p> 	<p>BUCCALLY TILTED MESIOPALATAL CUSP TOUCH THE OCCLUSAL PLANE</p> 
<p>MAXILLARY 2<sup>ND</sup> MOLAR 7/7</p> 	<p>BUCCALLY INCLINED SLIGHTLY MORE THAN 1<sup>ST</sup> MOLAR</p> 	<p>DISTALLY TILTED TO FOLLOW THE COMPENSATING CURVES</p> 	<p>BUCCALLY TILTED - NO CUSP TOUCHES THE OCCLUSAL PLANE. - BUCCAL CUSPS ARE HIGHER THAN PALATAL CUSPS - DISTAL CUSPS ARE HIGHER THAN MESIAL CUSPS - MESIO-PALATAL CUSP IS THE LOWEST ON THE OCCLUSAL PLANE</p> 

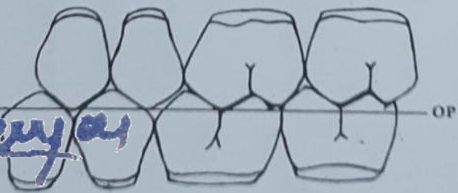
### MANDIBULAR ANTERIORS

	LABIO-LINGUAL INCLINATION	MESIO-DISTAL INCLINATION	RELATION WITH CORRESPONDING MAXILLARY TEETH	ROTATIONAL RELATIONSHIP
<p>MANDIBULAR CENTRAL 1/1</p> 	<p>DISTINCT LABIAL TILT</p> 	<p>PERPENDICULAR</p> 	<p>2mm OF HORIZONTAL AND VERTICAL OVERLAP.</p> 	<p>FOLLOWS THE CURVE OF ARCH</p> 
<p>MANDIBULAR LATERAL 2/2</p> 	<p>SLIGHT LABIAL TILT</p> 	<p>SLIGHTLY TO THE DISTAL AT NECK</p> 	<p>2mm OF HORIZONTAL AND VERTICAL OVERLAP</p> 	<p>FOLLOWS THE CURVE OF ARCH</p> 

  
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<p>MANDIBULAR CANINE 3 3</p>	<p>PROMINENT AT THE NECK</p>	<p>MESIAL TILT OF INCISAL TIP</p>	<p>2mm OF HORIZONTAL AND VERTICAL OVERLAP MANDIBULAR CANINE SHOULD BE HALF A CUSP MESIAL TO THE MAXILLARY CANINES</p>	<p>FOLLOWS THE ARCH FORM AND THE POSITION OF THE MAXILLARY ANTERIOR.</p>
				

MANDIBULAR POSTERIOURS

<p>MANDIBULAR POSTERIOURS 7654 4567</p>	<p>MESIOBUCCAL GROOVE OF MANDIBULAR 1<sup>ST</sup> MOLAR COINCIDING WITH MESIOBUCCAL CUSP OF MAXILLARY 1<sup>ST</sup> MOLAR. MANDIBULAR SECOND MOLAR, SECOND PREMOLAR AND FIRST PREMOLAR OCCLUDE HALF CUSP MESIAL TO ITS OPPOSING CORRESPONDING TEETH. THERE SHOULD BE MAXIMUM INTERCUSPATION FROM BOTH BUCCAL AND LINGUAL ASPECT.</p>
<p><i>Prayansh</i> PRINCIPAL</p>	

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ARRANGEMENT OF TEETH IN CLASS I MOLAR

RELATION

Set No: 02

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM	B <sup>+</sup>	AL 25/3/21
2	ARTICULATION Articulator Serial No: (2)	B <sup>+</sup>	AL 19/2/21
3	TEETH ARRANGEMENT		
	a. ANTERIORS	B <sup>+</sup>	Jurade
	MAXILLARY	}	}
	MANDIBULAR		
	b. POSTERIORS	}	}
	MAXILLARY		
	MANDIBULAR		
4	FINISHING AND POLISHING	B <sup>+</sup>	AL
5	DEMOUNTING		Jurade

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ARRANGEMENT OF TEETH IN CLASS I MOLAR

RELATION

Set No: 03

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM	B <sup>+</sup>	AL 29/7/21
2	ARTICULATION Articulator Serial No: (3)	B <sup>+</sup>	Jurade 20/1/21
3	TEETH ARRANGEMENT		
	a. ANTERIORS	B <sup>+</sup>	Jurade
	MAXILLARY	}	}
	MANDIBULAR		
	b. POSTERIORS	}	}
	MAXILLARY		
	MANDIBULAR		
4	FINISHING AND POLISHING	B <sup>+</sup>	AL 25/10/21
5	DEMOUNTING		Jurade

ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

*Final Inset*

Set No: 04

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM	B++	<i>[Signature]</i> 13/8/21
2	ARTICULATION Articulator Serial No:	B+	<i>[Signature]</i>
3	TEETH ARRANGEMENT		
	a. ANTERIORS		
	MAXILLARY		
	MANDIBULAR	B+	<i>[Signature]</i>
	b. POSTERIORES		
	MAXILLARY		
	MANDIBULAR		
4	PRINCIPAL FINISHING AND POLISHING		<i>[Signature]</i>
5	DEMOUNTING		

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ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 05

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM	B++	<i>[Signature]</i> 6/9/21
2	ARTICULATION Articulator Serial No: 2	B+	<i>[Signature]</i>
3	TEETH ARRANGEMENT		
	a. ANTERIORS		
	MAXILLARY	B+	<i>[Signature]</i> 14/9/201
	MANDIBULAR		
	b. POSTERIORES		
	MAXILLARY		
	MANDIBULAR	B+	<i>[Signature]</i>
4	FINISHING AND POLISHING		
5	DEMOUNTING		<i>[Signature]</i>

ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

*For processing* Ser No: 06

SL NO	WORK DONE	GRADE	SIGNATURE		
1	OCCLUSAL RIM	B <sub>1</sub>	<i>AL</i>		
2	ARTICULATION Articulator Serial No: 3	B <sub>1</sub>	<i>AL</i>		
3	TEETH ARRANGEMENT  a. ANTERIORS MAXILLARY MANDIBULAR  b. POSTERIORs MAXILLARY MANDIBULAR	}	<i>AL</i>		
4	FINISHING AND POLISHING				
5	DEMOUNTING				

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ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 07

SL NO	WORK DONE	GRADE	SIGNATURE		
1	OCCLUSAL RIM	B <sub>1</sub>	<i>AL</i>		
2	ARTICULATION Articulator Serial No: 1	B <sub>1</sub>	<i>Praveen</i>		
3	TEETH ARRANGEMENT  a. ANTERIORS MAXILLARY MANDIBULAR  b. POSTERIORs MAXILLARY MANDIBULAR	}	<i>AL</i>		
4	FINISHING AND POLISHING				
5	DEMOUNTING				<i>Praveen</i>



ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 08

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM	(B1)	CL
2	ARTICULATION Articulator Serial No: (2)	(B1)	Jurasti
3	TEETH ARRANGEMENT	}	
	a. ANTERIORS		
	MAXILLARY		
	MANDIBULAR		
	b. POSTERIORs		
	MAXILLARY	(B1)	CL
	MANDIBULAR		
4	FINISHING AND POLISHING		
5	DEMOUNTING		R. S. / 9/20

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ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 09

Final Exam

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM	(B1)	CL
2	ARTICULATION Articulator Serial No:	(B1)	Jurasti
3	TEETH ARRANGEMENT		
	a. ANTERIORS		
	MAXILLARY		
	MANDIBULAR		
	b. POSTERIORs		
	MAXILLARY		
	MANDIBULAR		
4	FINISHING AND POLISHING		
5	DEMOUNTING		

ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 10

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM		
2	ARTICULATION Articulator Serial No:		
3	TEETH ARRANGEMENT  a. ANTERIORS  MAXILLARY  MANDIBULAR  b. POSTERIORs  MAXILLARY  MANDIBULAR		
4	PRINCIPAL FINISHING AND POLISHING		
5	D.A. PANDU MEMORIAL DEMOUNTING R.V. DENTAL COLLEGE		

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ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 11

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM		
2	ARTICULATION Articulator Serial No:		
3	TEETH ARRANGEMENT  a. ANTERIORS  MAXILLARY  MANDIBULAR  b. POSTERIORs  MAXILLARY  MANDIBULAR		
4	FINISHING AND POLISHING		
5	DEMOUNTING		

ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 12

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM		
2	ARTICULATION <small>Articulator Serial No:</small>		
3	TEETH ARRANGEMENT  a. ANTERIORS  MAXILLARY  MANDIBULAR  b. POSTERIORIORS  MAXILLARY  MANDIBULAR		
4	FINISHING AND POLISHING		
5	DEMOUNTING		

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ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION


Set No: 13

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM		
2	ARTICULATION <small>Articulator Serial No:</small>		
3	TEETH ARRANGEMENT  a. ANTERIORS  MAXILLARY  MANDIBULAR  b. POSTERIORIORS  MAXILLARY  MANDIBULAR		
4	FINISHING AND POLISHING		
5	DEMOUNTING		

ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 14

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM		
2	ARTICULATION Articulator Serial No:		
3	TEETH ARRANGEMENT  a. ANTERIORS MAXILLARY  MANDIBULAR  b. POSTERIORIORS MAXILLARY  MANDIBULAR		
4	FINISHING AND POLISHING		
5	DEMOUNTING		

  
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ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 15

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM		
2	ARTICULATION Articulator Serial No:		
3	TEETH ARRANGEMENT  a. ANTERIORS MAXILLARY  MANDIBULAR  b. POSTERIORIORS MAXILLARY  MANDIBULAR		
4	FINISHING AND POLISHING		
5	DEMOUNTING		

ARRANGEMENT OF TEETH IN CLASS II MOLAR  
RELATION

CLASS II

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM		
2	ARTICULATION Articulator Serial No:		
3	TEETH ARRANGEMENT  a. ANTERIORS MAXILLARY MANDIBULAR  b. POSTERIOR MAXILLARY MANDIBULAR		
4	FINISHING AND POLISHING		
5	DEMOUNTING		

*D. Pandu*  
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ARRANGEMENT OF TEETH IN CLASS III MOLAR  
RELATION

CLASS III

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM		
2	ARTICULATION Articulator Serial No:		
3	TEETH ARRANGEMENT  a. ANTERIORS MAXILLARY MANDIBULAR  b. POSTERIOR MAXILLARY MANDIBULAR		
4	FINISHING AND POLISHING		
5	DEMOUNTING		

EXERCISE NO. 15

FLASKING OF WAXED DENTURE

DEFINITION OF FLASK :-

A metal case, usually made up of brass, used in the investing procedure for dental prosthesis.

DEFINITION OF FLASKING :-

It is the process of investing a waxed up denture in a dental flask.

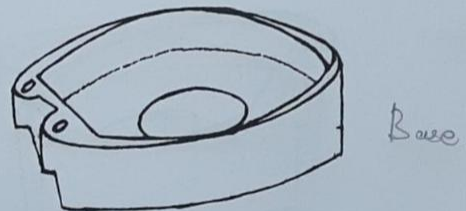
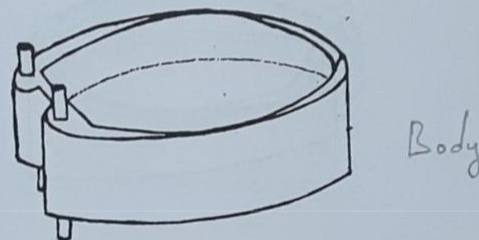
MATERIALS AND INSTRUMENTS :-

1. Large black stiff rubber bowl
2. Straight plaster spatula
3. Wax knife
4. Upper and lower dental flask and clamps
5. Cotton

PROCEDURE :-

1. Check the fit of three components of the dental flasks. The base, body and lid should fit snugly in each other with rim contact without being too tight.
2. Apply Vaseline on the inner surface and edge of flask.
3. Apply Vaseline to the base of flask.
4. Seal the waxed-up dentures to their respective cast to prevent ingress of plaster during flasking.
5. Pour mixed dental plaster in the base of the flask and place the cast with waxed up denture on it such that the ledge of the cast is at the level of the rim of the flask once it is in final position. Make sure that the heels of the mandibular cast is well supported with plaster.
6. After the initial set of the plaster remove the excess and produce a sloping surface. Smoothen the plaster surface with a straight plaster spatula and clean any remnants of plaster adhering to the teeth surface.
7. Apply Vaseline on the plaster and any exposed surface of stone.
8. Place the body of flask in position and check for clearance all around the walls of the flask body.
9. Pour a creamy mix of dental plaster into the flask. Tap it gently to prevent air entrapment.
10. Place the lid and position it under a bench press/ clamp and allow the dental plaster to set completely.
11. Clean the flask.

MAXILLARY FLASK



Label the Diagram

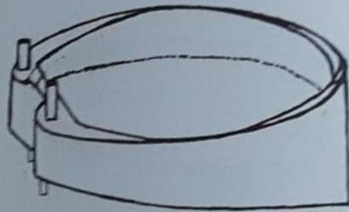
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MAXILLARY FLASK

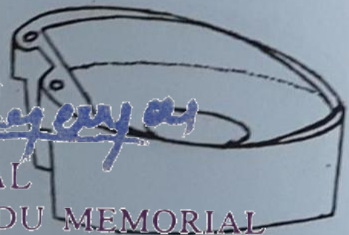
Lid



Body



Base



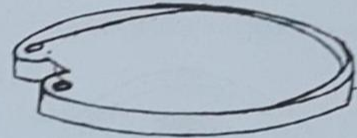
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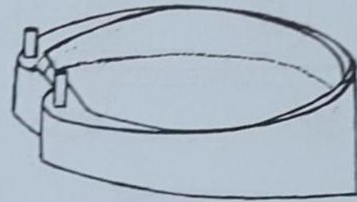
Label the Diagram

MANDIBULAR FLASK

Lid



Body

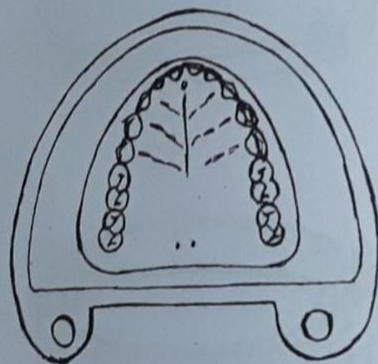


Base

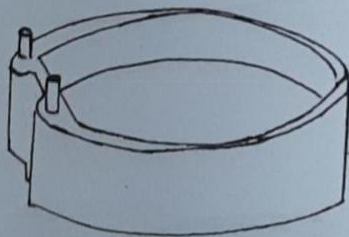


Label the Diagram

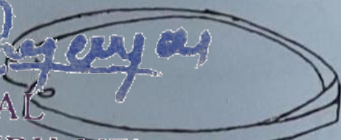
## BASE FLASKING



Base



Body



Lid

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## EXERCISE NO. 16

### DEWAXING OF THE DENTURE MOULDS

#### DEFINITION :-

Procedure of removal of softened wax and base plate to get a mould space for packing the acrylic resin.

#### MATERIALS AND INSTRUMENTS :-


1. Plaster knife
2. Wax knife
3. Lacrons carver
4. Napkin
5. Camel's hair brush
6. Separating medium (sodium alginate)

#### PROCEDURE :-

1. Allow the water to boil. Place the flask carrier and immerse them in boiling water for 5 mins only. If prolonged heating is carried out the molten wax may soak into the mould plaster and shellac may adhere to tooth surface.
2. Remove the hot flask from the water bath and place it on the table top. Place flask upside down i.e. flask base on the upper side.
3. Grip flask by its sides with a napkin. Ply between rims of the base and body with tip of plaster knife on any one side. Insert wax knife to slightly lift the base on another side and leave the tip of knife in position between base and body of flask.
4. Grip the entire base of flask with the napkin and with a very gentle wriggling action lift up the base vertically.



5. Lift the softened shellac base plate from the mould. Grip the body of flask with a napkin and tilt it to allow the molten wax to be drained.
6. Hold the flask under hot running water to flush the wax from the mould and the cast.
7. With the camel's hair brush apply sodium alginate as a separating medium.
8. Do not allow the separating medium to pool on the teeth. Allow the separating medium to dry to form an impervious layer on the plaster.

  
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## EXERCISE NO. 17

## PACKING OF HEAT CURED ACRYLIC RESIN IN THE DEWAXED PLASTER MOULD

## DEFINITION :-

The act of filling and compressing a denture base material into a mould in a flask.

## MATERIALS AND INSTRUMENTS :-

1. Separating medium (sodium alginate)
2. Heat cured acrylic resin - polymer  
- monomer
3. Camel's hair brush
4. Ceramic cup and saucer- for mixing heat cured acrylic resin.
5. Wax knife
6. Wax spatula
7. Lacrons carver
8. Small rubber bowl.
9. Cellophane sheets


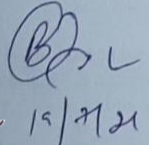
## PROCEDURE :-

1. Apply separating medium on the mould & the cast with camel hair brush & allow it to dry.
2. Wipe the cervical portion of the teeth with cotton dipped in monomer.
3. Pack one mould at a time.
4. Take the heat cured acrylic liquid (monomer) in the ceramic cup. Sprinkle the acrylic powder (polymer) into the liquid till it is saturated. Mix the powder and the liquid thoroughly with the rounded end of a clean wax knife. Cover the mix in the cup with a saucer.

Check the consistency of the mix for the following :-

- a. Wet sand stage
- b. Cob - web stage (Sticky)
- c. Dough stage (Stickiness lost)

5. Pack the mould with heat cured acrylic resin in the dough stage.
6. Place a moist cellophane sheet over the acrylic.
7. place the base of the flask over it. Close the flask and place it under a Bench Press.
8. Apply gradual pressure while tightening. As the clamp tightens over the flask, excess material flows out between the rims of flask. Avoid rapid closure of flask as it may result in fracture of the cast.
9. Release the Bench Press, remove the flasks and open them.
10. Peel off the cellophane sheet. Trim away the excess material, i.e. the Flash, beyond the denture borders using a lacrons carver or a wax knife.
11. Repeat the procedure of trial closure with a fresh moist cellophane sheet.
12. After the second trial closure, keep the cellophane sheet in position to prevent evaporation of monomer.
13. Apply a fresh layer of separating medium (sodium alginate) on the casts and surrounding plaster surface using a soft camel's hair brush. Remove the cellophane sheet.
14. Close the flask base and place the entire assembly in it's clamp with flask base resting on the base of the clamp.
15. Close the clamp as tight as possible and make sure that the two rims of the flask are in complete contact.
16. After the final closure of the flasks, keep them at room temperature for 30-60 mins. This is called as 'BENCH CURING'.

Work Done	Signature
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## EXERCISE NO. 18

### CURING OF DENTURES

#### DEFINITION OF CURING CYCLE:-

Curing or polymerization cycle is the technical name for the heating process employed to control the initial propagation of polymerization in the denture mould.

The curing cycle selected should depend on the thickness of the resin.

Curing is done in an ACRYLIZER, where temperature can be adjusted for the various curing cycles.

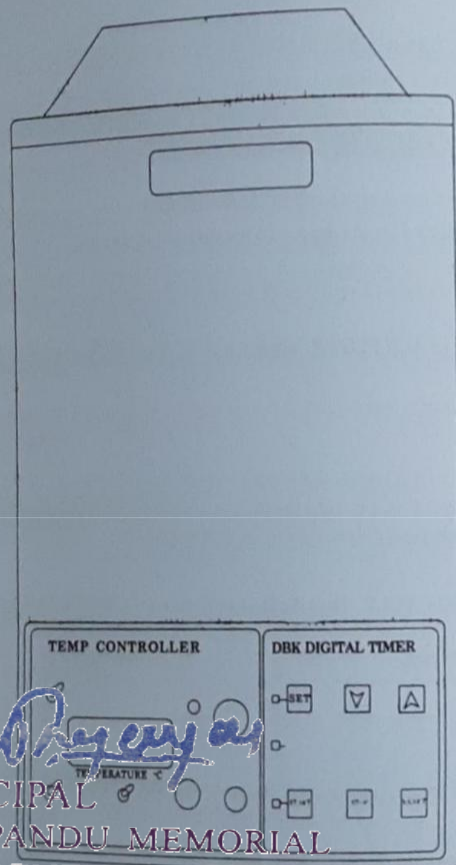
#### Curing Cycles :-

1. SHORT CURING CYCLE: Heat the flask in water at 65<sup>o</sup> C for 90 mins then boil the water for 1 hour for adequate polymerization in thinner portions.
2. LONG CURING CYCLE : Heat the flask in water at 60<sup>o</sup> C to 70<sup>o</sup> C for 9 hours.

#### PROCEDURE :-

1. Place the flask in an acrylizer to carry out the curing following the short curing cycle.
2. After curing remove the flasks from the acrylizer and 'Bench Cool' them for 30 mins, to prevent warpage of denture.

## ACRYLISER



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## EXERCISE NO. 19

### DEFLASKING

#### DEFINITION :-

Retrieval of the cured denture from the flask.

#### INSTRUMENTS :-

1. Plaster knife
2. Wax knife
3. Mallet or small hammer
4. Saw

#### PROCEDURE :-

1. Once the flasks have cooled to room temperature remove them from their respective clamps.
2. Tap the flasks on the outside using a hammer to release the plaster from the sides of the flasks. Remove the lid and eject the plaster block with the acrylised denture out of the flasks.
3. Break the plaster carefully to retrieve the denture alongwith the casts. You could use a saw for sectioning the plaster.
4. Clean the occlusal and polished surface off any investing plaster. Take care that the dentures do not separate from their respective casts.

EXERCISE NO. 20  
LABORATORY REMOUNT

Processing of the dentures may lead to occlusal discrepancy which requires to be corrected prior to denture insertion.

This is accomplished by carrying out LABORATORY REMOUNT procedure.

DEFINITION OF LABORATORY REMOUNT :-

To place a prosthesis back on the articulator to perfect the occlusal harmony by Selective Grinding.

MATERIALS AND INSTRUMENTS :-

1. Micromotor
2. Straight handpiece
3. Suitable abrasive points.
4. Articulating paper
5. Sticky wax

PROCEDURE :-

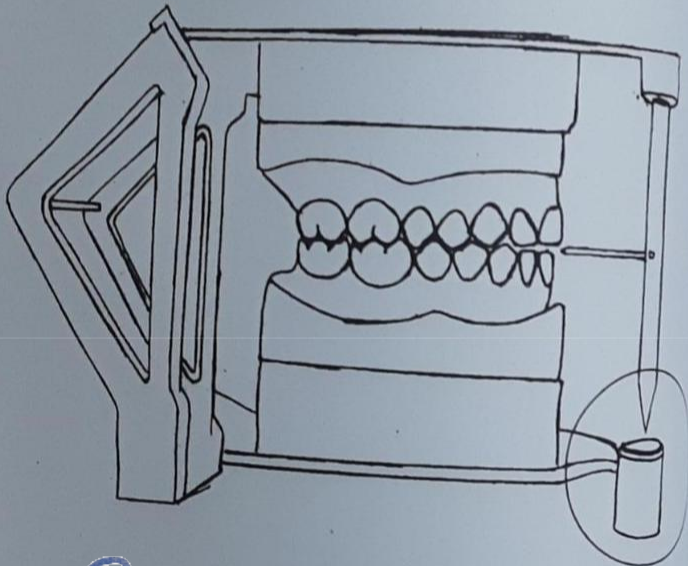
1. Reposition the maxillary and mandibular casts on the articulator mounting to see that the notches on the cast fit accurately on the elevations of the articulator mounting.
2. Fix them with the sticky wax.
3. Close the articulator to check for occlusal discrepancy and vertical pin position.

*Principals*

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4. If the vertical pin does not contact the incisal table, it shows that there is an increase in vertical relation which requires to be corrected by selective grinding.
5. Place the articulating paper over the mandibular teeth. Close the upper member of the articulator over it and tap on the articulating paper keeping the condylar elements in its anterior position, i.e. in the correct centric relation.
6. Open the articulator to check for the high points on the occlusal surfaces of the teeth.
7. Modify these high points by grinding with abrasive points. This process of correcting the occlusion is called 'SELECTIVE GRINDING'.
8. Repeat the procedure until the vertical incisal tip comes in contact with the incisal table.
9. Lightly polish the abraded cusps and surfaces.

REMOUNTED CAST PRIOR  
TO SELECTIVE GRINDING

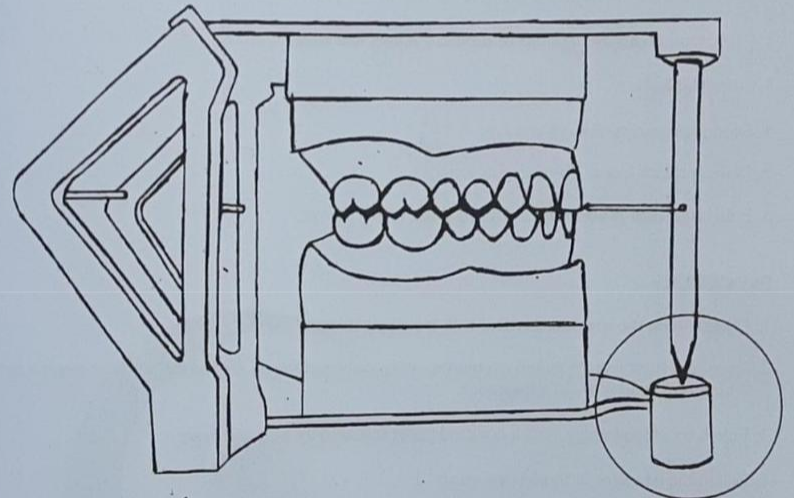


Pin not touching the  
incisal table

*D. A. Pandu*

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REMOUNTED CAST AFTER  
SELECTIVE GRINDING



Pin touching the  
incisal table after  
selective grinding

EXERCISE NO. 21  
FINISHING AND POLISHING OF ACRYLIC COMPLETE DENTURES.

FINISHING :- To put a final coat or surface on the refinement of form prior to polishing or  
Process of achieving the final perfection of the form of the polished surfaces of a denture.

POLISHING :- To make apt - 1 smooth and glossy, usually by friction to give lustre to;

Act or apt - 2 process of making a denture smooth and glossy.

INSTRUMENTS :-

1. Steel or Carbide Acrylic trimming metal burs
2. Carborundum abrasive points of different shapes and sizes.
3. Strip Mandrils
4. Sand paper strips- Rough and Fine
5. Polishing Felt Cone- Pumice with water
6. Polishing Mop Wheel (buff)- French chalk with Vaseline

PROCEDURE :-

1. Grossly trim the irregular borders with metallic trimmer.
2. Carry out finer reduction and contouring using carborundum points and alpine stone to get a surface which is ground glass in appearance.
3. Finish by smoothening with a dry sand paper followed by wet sand paper.
4. Polish the denture in three steps using:

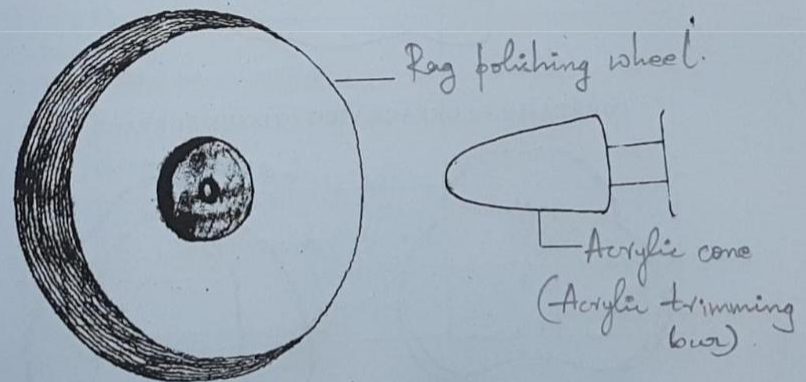
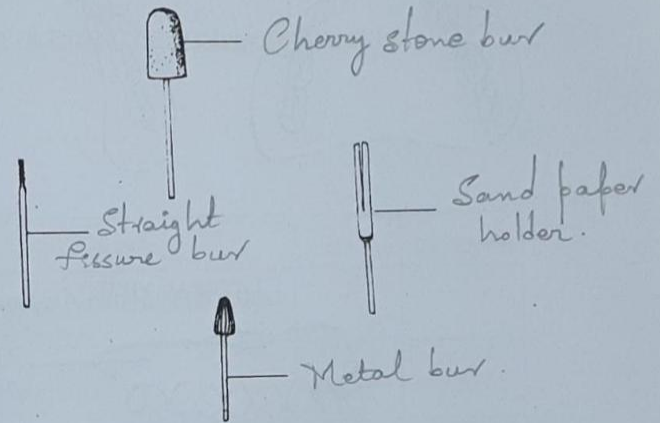
a. Felt cone

b. Mop wheel

c. French chalk and Vaseline or polishing cake

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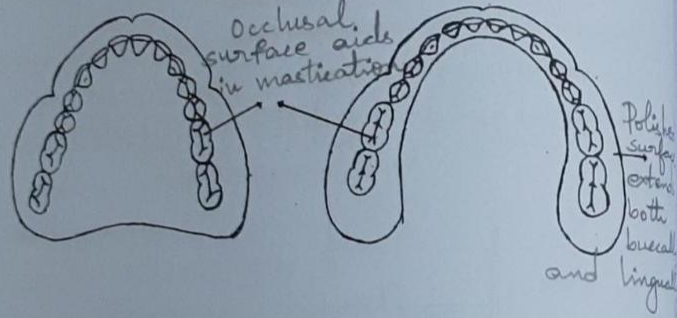
FINISHING AND POLISHING KIT



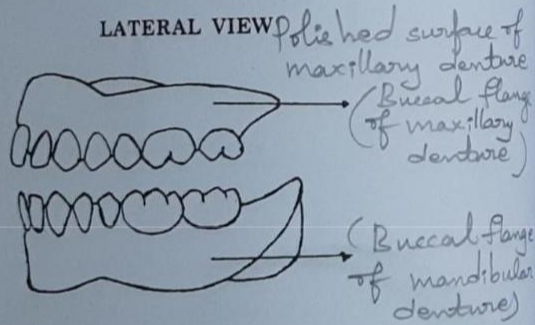
Label the Diagram

## COMPLETE DENTURE

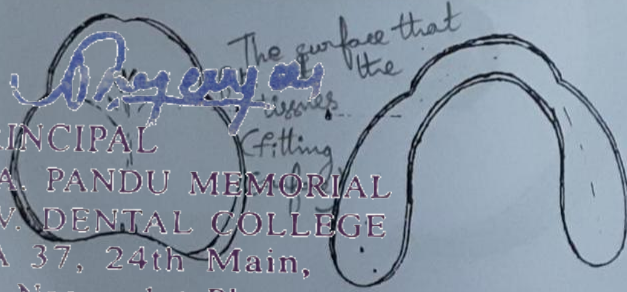
### OCCLUSAL VIEW



### LATERAL VIEW



### IMPRESSION SURFACE VIEW / TISSUE SURFACE VIEW



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## PROCESSING OF COMPLETE DENTURE

SL. NO.	WORK	GRADE	SIGNATURE
1.	FLASKING IN TWO POUR TECHNIQUE		
2.	DEWAXING	(B)	AL
3.	PACKING AND CURING	(B)	AL
4.	TRIMMING AND POLISHING		
5.	REMOUNTING		
6.	OCCLUSAL CORRECTION		
7.	FINISHING AND POLISHING	(B)	AL

## EXERCISE NO. 22

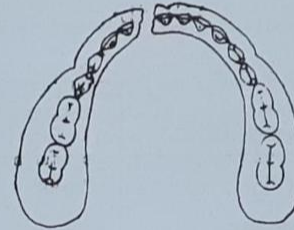
### REPAIR OF ACRYLIC DENTURES

1. Align the broken pieces together. Observe that they fit accurately without any space between the broken parts.
2. Join the broken pieces with sticky wax or low fusing compound. Stabilize the broken pieces with a match stick across the fracture line using sticky wax or low fusing compound.
3. Apply vaseline to the impression surface to prevent plaster from sticking to the denture.
4. Pour dental plaster into the impression surface of the denture.
5. Allow the plaster to set to form a cast.
6. Remove the denture from the cast.
7. Using an acrylic trimmer prepare the broken surfaces, reducing 2mm on either side of the fracture line. Form a step for the addition of acrylic resin on either sides of the prepared portion. With a fissure bur prepare grooves in the broken portions for anchorage (this increases the area for contact with the self cure acrylic resin).
8. Apply separating medium on the cast & seat the broken pieces on the cast.
9. Sprinkle self cure acrylic powder in the space between the fracture portion of the denture and add this until the space is completely filled with the resin. Slightly overfill the space to allow bulk for polishing.

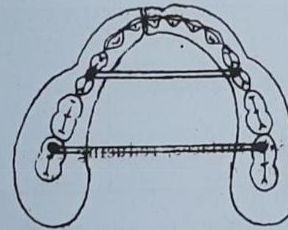
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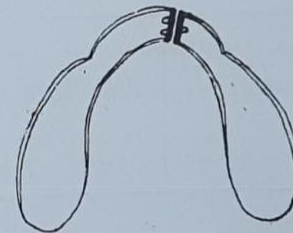
### REPAIR OF DENTURE



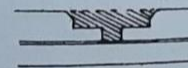
FRACTURED MANDIBULAR DENTURE



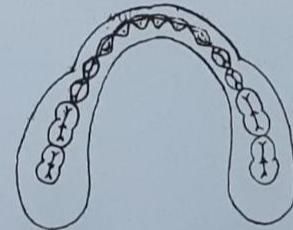
ALIGNMENT OF THE FRACTURED DENTURE



PREPARATION OF BEVELS AND SLOTS



STEP PREPARATION



REPAIRED DENTURE



## REPAIR OF ACRYLIC DENTURES

SL.NO	NATURE OF WORK DONE	GRADE	SIGNATURE
1.	MAXILLARY		
2.	MANDIBULAR		

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## EXERCISE NO. 23

### RELINING RESIN DENTURE BASES

Relining involves replacement of tissue surface of an existing denture, whereas rebasing involves replacement of the entire denture base. If the denture is to be relined, the impression material is removed from the denture. The tissue surface is cleaned to enhance bonding between the existing resin and the relining material.

Following this sequence, an appropriate resin is introduced and shaped using a COMPRESSION-MOULDING TECHNIQUE.

For relining, a **LOW POLYMERISATION TEMPERATURE** is desirable to minimise distortion of the remaining denture base. Hence a chemically activated resin is chosen. Materials used for relining dentures must comply with **SPECIFICATION NO 17**, which places limits on the rate of temperature rise and maximum acceptable temperature.

### DEFINITION:

The procedures used to resurface the tissue side of the denture with new base material, thus producing an accurate adaptation to the denture foundation area.

### INDICATIONS:-

1. Immediate dentures after 3-6 months where maximum residual ridge resorption would have occurred.
2. When the adaptation of the denture to the ridge is poor due to residual ridge resorption.
3. Economical reasons where the patient cannot afford a new denture.
4. Geriatric or chronically ill patients who cannot withstand physical and mental stress of construction of new dentures.

### CONTRA-INDICATIONS-

1. When the residual ridge is resorbed excessively.
2. Abused soft tissues due to ill fitting denture.
3. Temporomandibular joint problems.
4. Patient dissatisfied with the appearance of the existing denture.
5. Unsatisfactory jaw relationships in the denture.
6. Denture causing major speech problems.
7. Severe osseous undercuts.

### MATERIALS USED-

- Zinc oxide eugenol
- Resins - chemically activated
- Heat activated
- Micro-wave energy

### RELINING PROCEDURE:

#### 1. CLINICAL PROCEDURES-

- Static method- open mouth technique
  - Closed mouth technique
- Functional methods

Chair side technique

1. LABORATORY PROCEDURES-

- Articulator method
- Jig method
- Flask method

A. CLINICAL PROCEDURES-

a. STATIC METHOD-

OPEN MOUTH TECHNIQUE-  
PROCEDURE-

1. Maxillary and mandibular impressions are made independently without using the existing centric occlusion.
2. The dentures are used as special trays for making the secondary impression.
3. Borders & tissue surface of the denture is trimmed about 2mm leaving 4 tissue stops in canine & molar region.
4. Record borders & make final impression by using green stick compound & zinc oxide eugenol respectively.
5. After the maxillary and mandibular impressions are made a new centric relation record is accomplished. All these procedures are done in one appointment.

ADVANTAGES-

1. Selective trimming helps to make a selective pressure impression
2. Making a separate inter- ocusal record will allow the operator to concentrate on recording the jaw relation
3. It is possible to verify the centric relation record if necessary.

DISADVANTAGES-

1. It requires more clinical and laboratory time.

B. CLOSED MOUTH TECHNIQUE-

Maxillary and mandibular relining / rebasing can be done separately.

Various techniques are

1. Technique A
2. Technique B
3. Technique C
4. Technique D

TECHNIQUE A-

PROCEDURE-

1. It is a two step technique in which the centric relation is recorded using a inter-occlusal record and is used to guide the denture in position while making the relining impression.
2. Inter-occlusal record is recorded using wax or compound
3. 1.5- 2 mm deep groove is made in the wax to large undercuts.
4. The centric portion of the palate in the denture can be removed for visibility positioning the maxillary denture during impression making.
5. Zinc - oxide eugenol is the impression of the inter-occlusal record.
6. During impression making, patient is asked to close lightly into the newly - made inter-occlusal record.

ADVANTAGES-

1. Palatal opening in the wax better seating of the denture and alleviate the increase in vertical dimension

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2. Pre-made inter- Occlusal record helps to position the denture during impression making.

3. It also helps in orienting dentures in an articulator.

4. It is a two step procedure and it reduces the possibility of moving the maxillary denture forward during final impression making. Hence, it is more reliable.

DISADVANTAGES-

1. This procedure cannot be used to reline or rebase the dentures simultaneously.
2. Wax inter- Occlusal record is not very accurate.

TECHNIQUE B-

1. No new centric relation record is made here. Denture is prepared as explained above.

2. IMPRESSION WAX (IOWA WAX) is the material of choice for making impressions.

3. Impression is made in two steps. In the first step, all areas except the labial flange and the alveolar crest in between the canines are recorded. The labial flange and the alveolar crest between the canines are recorded in the second step.

ADVANTAGES-

-It will reduce the possibility of extreme forward movement of the maxillary denture.

DISADVANTAGES-

-Wax impression materials are difficult to work with and can distort easily. If the existing centric relation record is wrong then the impression becomes inaccurate.

TECHNIQUE C

-Centric relation is obtained as in technique B. the denture is prepared as in technique A.

- Also, labial flange and palatal flange are perforated to decrease the pressure inside the dentures during impression making.

-This technique is a combination of technique A and technique B.

TECHNIQUE D-

-Existing centric relation record is used here. Denture is prepared as described above. The borders are shortened and made flat.

-A large opening is made in the mid palatal region.

-Adhesive tape is attached over the buccal and labial surfaces of both dentures 2mm above the denture borders.

-Dental plaster or zinc oxide eugenol is suggested for recording most areas and plaster of Paris is used to record the palatal portion.

-After impression making, a deep groove is cut into labial and buccal surfaces of the dentures at the junction of the impression material and is filled with molten wax.

-The wax at the edge of the denture is used to record the sulcus.

- This technique shares the advantages of technique A. The disadvantage mainly being existing centric occlusion that may cause some pressure points and faulty impressions.

FUNCTIONAL METHOD-

1. It was suggested by WINKLER. Here, the patient need not be without dentures unlike previous techniques. (i.e dentures are not required for laboratory procedures).
2. Fluid resins (tissue conditioners) are used as impression material.

PROCEDURE-

1. The patient is advised to avoid nightwear of the dentures.

- Occlusal errors in the dentures are corrected to obtain centric occlusion that coincides with the centric relation.
- Flange over extensions/ under extensions and posterior palatal seal areas should be corrected.
- The tissue surface should be reduced to accommodate the tissue conditioning material.
- The tissue surface of the denture is dried and the material is placed.
- The denture is then inserted and the patient's mandible is guided to centric relation in order to stabilize the denture and the material is allowed to set. Once the material is set, the impression is removed and excess is trimmed.
- Unsupported areas in the dentures will show the over flow of the liner and poor recording of the borders. This indicates the need for localised border moulding with green stick compound
- After making the corrections, the dentures are inserted with the material and the patient is dismissed.
- After 3-5 days, dentures are examined for denuded (depressed) areas, which should be relined. The material should be renewed periodically (once a week) till the tissue healing is complete.
- Once the tissues are normal, impression made with zinc oxide eugenol or a light body elastomer over the tissue conditioner material and the cast is poured immediately
- During one of the previous visits an accurate orientation record of the maxillary denture should be recorded using a face bow.
- The tissue conditioner material undergoes some physical changes during its use which help the dentist to use it for different purposes. In its plastic and elastic stages it is used as a tissue conditioner, where as in its firm stage it is used as a reline impression material. Hence, for relining procedures it should be left in place for about 10-14 days to allow them to become firm and then reline procedure is carried out.

#### CHAIR SIDE PROCEDURE-

This method makes use of acrylic that could be added to the denture and allowed to set in the mouth to produce instant relining/ rebasing.

#### DISADVANTAGES-

- Material produces a chemical burn in oral mucosa.
- Material is porous and develops a bad odour.
- Poor colour stability.
- Material is not easily placed correctly.

#### LABORATORY PROCEDURE

Articulator method, jig and flask methods. It is common for both relining and rebasing except for differences.

Once the impression is recorded, it is poured immediately. Maxillary mounted on a semi adjustable articulator with the help of a face bow tracing. A jig can be used for this purpose, but additional occlusal adjustments will be required.

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- Mandibular denture is mounted using an inter - Occlusal record. If occlusal discrepancy exists, selective grinding is done before the denture with the impression is separated from the casts.

The procedure is common for both relining and rebasing up to this stage. For relining, the required amount of tissue surface of the existing denture is trimmed away using an acrylic bur.

If rebasing is to be done, the denture base should be trimmed to just leave 2mm of acrylic around the existing teeth. After trimming, the dentures are placed in the articulator and waxed up without altering the vertical height.

#### JIG METHOD-

Here the impression is boxed and a cast is poured, a reline jig is used in this method. There are two types of jigs for this purpose:

- Hopper's duplicator
- Jectron jig

- These jigs function to maintain the occluso-mucosal relation. The cast along with the impression is mounted on the upper member of these instruments.
- Hooper's duplicator is an instrument that has two triangular parts connected by three pillars in each corner. Whereas, jectron jig uses only two pillars.
- A plaster index is made on the lower platform with the denture teeth penetrating the depth of about 2mm. when the plaster sets the indentations made by the denture teeth can be repeatedly positioned to maintain a fixed distance and relation between the cast and the Occlusal surfaces.
- When the key has set, the top and the bottom members are separated. Denture is removed from the cast.
- All of the impression material is removed from the denture and the denture is prepared(trimmed) according to the treatment selected ( relining / rebasing)
- If rebasing is selected, the entire denture base is removed from the teeth (if they are porcelain), and all but a small connecting bridge of acrylic is removed (if the teeth are plastic)
- The trimmed dentures are then set into the plaster key and the top of the instrument is replaced. The denture is waxed to the cast, processed and finished as usual. The cured denture should be repositioned on the jig to correct the occlusion prior to insertion.
- If relining is opted, auto-polymerising resin is used on the tissue surface of the denture and the upper member of the jig is closed. The denture is cured in a pressure container of warm water at 15psi for 30 minutes.

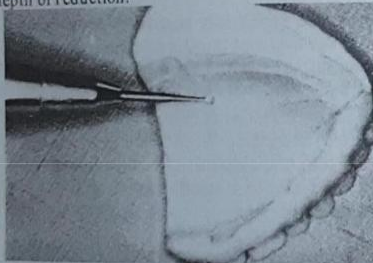
#### FLASK METHOD-

- The poured impression along with the denture is invested into the base of the flask.
- A silicone mould material is painted over the denture prior to investing the body. This is done to create a flexible mould. Flasking is completed as usual.
- Since silicone provides a flexible mold, the denture can be removed carefully after opening the flask.
- The denture base is trimmed as required (a portion of the tissue surface in relining and the entire denture base in rebasing) and placed back in the mould.
- The invested stone present in the base of the flask is the cast for the denture. if it is a maxillary denture then the posterior palatal seal should be marked using sharp instrument on the invested stone

1. Separating medium is painted over the mould space of the denture.
2. The resin is packed, cured, finished and polished as described in compression moulding technique.
3. The finished dentures are remounted to check for occlusal disharmony.

#### SUGGESTED PROCEDURE-WINKLER

1. The basal surface of the denture is marked with a number 6 round bur to indicate the depth of reduction.



2. The basal surface is reduced to allow room for the tissue conditioning material.



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1. A minimum thickness of tissue conditioner material is placed over the tissue surface of the denture. The denture is inserted in the mouth. The patient is instructed in the care of the resilient lining before being dismissed.
2. When the patient returns to the dentist after 3- 5 days, denture is examined for denuded areas.
3. Under extended borders should be corrected with impression compound before the next application of tissue conditioning material.



4. Zinc oxide eugenol wash impression made over tissue conditioning material after one week of use.



5. Impression made with tissue conditioning material for relining a maxillary denture.
6. LABORATORY PROCEDURE-  
 ✓ After the final impression is made, a cast must be poured immediately.

- ✓ Mount the maxillary cast on a semi-adjustable articulator using a face-bow transfer record. A jig could also be used. Even though this is easier than the use of an articulator, it is less accurate, especially when additional occlusal adjustment is required.
- ✓ Relate the mandibular denture to the maxillary denture, which is already mounted on the articulator, using an inter-Occlusal record.
- ✓ If an Occlusal discrepancy exists, it should be corrected before separating the impressions from the casts, by using a selective grinding procedure.
- ✓ The procedures of relining and rebasing are the same until this stage. During the laboratory phase of a rebasing procedure, the entire old denture base is replaced by a new material without changing the arrangement of the teeth. The presence of all the porcelain teeth greatly facilitates a rebasing procedure. If the resin teeth are present, relining is usually indicated, as it is difficult to rebase a denture with resin teeth.
- ✓ When the dentures are finished, plaster remount casts are made and the maxillary cast mounted on the articulator.



#### INSERTION PROCEDURES-

1. Use a pressure-indicating paste to locate the pressure areas. They are carefully relieved by grinding with mounted stones.
2. A new inter-Occlusal record is made with the lower denture in centric relation.
3. It is necessary to verify the mounting before adjusting the occlusion.
4. If necessary, the procedure, the occlusion can be perfected at the correct occlusal vertical dimension.
5. If a discrepancy is noted at the initial placement visit, check the occlusion once again.

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### REBASING OF RESIN DENTURES

DEFINITION: The laboratory process of replacing the entire denture base material on an existing prosthesis.

#### INDICATIONS -

1. Immediate dentures after 3-6 months where maximum residual ridge resorption would have occurred.
2. When the adaptation of the denture to the ridge is poor due to residual ridge resorption.
3. Economical reasons where the patient cannot afford a new denture.
4. Geriatric or chronically ill patients who cannot withstand physical and mental stress of construction of new dentures.

#### CONTRA-INDICATIONS-

1. When the residual ridge is resorbed excessively.
2. Abused soft tissues due to ill fitting denture.
3. Temporomandibular joint problems.
4. Patient dis-satisfied with the appearance of the existing denture.
5. Unsatisfactory jaw relationships in the denture.
6. Denture causing major speech problems.
7. Severe osseous undercuts.

#### MATERIALS USED

- Zinc oxide eugenol
- Resins - chemically activated
- Heat activated
- Micro-wave energy

#### PROCEDURE-

1. The steps needed for rebasing are very similar to relining of dentures.
2. An accurate impression of the soft tissues is obtained using existing denture as a custom tray.
3. Subsequently, a stone cast is fabricated in the impression. The cast and denture are mounted in a device, the relining jig, designed to maintain the correct vertical and horizontal relationships between the stone cast and surfaces of prosthetic teeth.
4. The denture is removed and teeth are separated from existing denture base. The denture base is waxed to designed form.
5. The completed tooth arrangement is sealed to the cast, and the assembly is invested.
6. After elimination of the wax and removal of the base-plate, resin is introduced into mold cavity.
7. The material subsequently is processed; the denture is recovered. The denture is finished and polished.
8. Hence the prosthesis consists of a *new denture base in conjunction with teeth from the patient's previous denture.*

### SHORT TERM AND LONG TERM SOFT LINERS

The purpose of a soft liner is to absorb energy produced by the masticatory impact. Hence, a soft liner serves as a "shock absorber" between the occlusal surfaces of a denture and underlying oral tissues.

The most commonly used liners are **PLASTICISED ACRYLIC RESINS**. These resins may be heat activated or chemically activated.

Chemically activated usually employ poly (methyl methacrylate) as principal components. These polymers are supplied in powder form and are mixed with a plasticizer. The plasticizer is usually **DIBUTYL PHTHALATE**. the distribution of large plasticizer molecules minimizes entanglement of polymer chains and thereby permits individual chains to slip past one another. This slipping motion permits rapid changes in the shape of the soft liner and provides a cushioning effect for the underlining tissues. The liquids used in such applications do not contain acrylic monomers. Thus the resultant liners are considered **SHORT TERM SOFT LINERS** or **TISSUE CONDITIONERS**. Plasticizers are not bound within the resin mass and therefore may be leached out of soft liners. As this occurs, soft liners become progressively more rigid. The most successful materials for soft liners have been silicone rubbers.

#### MATERIALS USED AS SOFT LINERS:-

1. Plasticized acrylic resin
2. Vinyl resins
3. Silicone rubbers- most successful
  - Chemically activated
  - Heat activated
4. Other polymers-
  - Polyurethanes
  - Polyphosphazine

#### LONG TERM LINERS:-

Unlike chemically activated soft liners, heat activated materials generally are more durable and may be considered **LONG TERM LINERS**. Nonetheless, these materials degrade over time and should not be considered permanent.

The greatest difficulty with short and long term liners is that they cannot be cleaned easily. The most common fungal growth being that of *Candida albicans*.

*D. Pandu*


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Sl. No.	WORK DONE	GRADE	SIGNATURE
1.	Relining of Mandibular denture base		
2.	Repairing of maxillary denture base		

*Prayasa*

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## REMOVABLE PARTIAL DENTURE

  
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## REMOVABLE PARTIAL DENTURE

The branch of prosthodontics concerned with the replacement of teeth & contiguous structure for edentulous or partially edentulous portion by artificial substitutes that are removable from the mouth.

### DEFINITION :-

A removable partial denture is a prosthesis that replaces some teeth in a partially dentate arch, which can be removed from the mouth and replaced at will.

### TYPES OF REMOVABLE PARTIAL DENTURES :-

1. Acrylic partial denture
  - a. RIGID
  - b. FLEXIBLE
2. Cast partial denture

### PARTS OF AN ACRYLIC PARTIAL DENTURES :-

1. Artificial teeth
2. Denture base
3. Clasp

### COMPONENTS OF CAST PARTIAL DENTURE :-

1. Direct Retainer
2. Indirect Retainer
3. Auxillary Rests ( Canine, Incisal and occlusal)
4. Minor Connector
5. Major Connector
6. Denture Base
7. Artificial Teeth



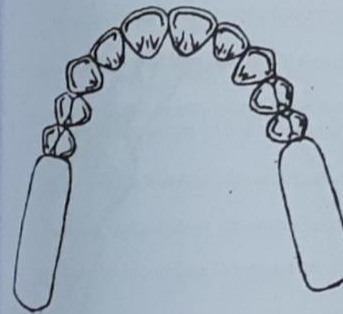
## KENEDDY'S CLASSIFICATION

- CLASS I - Bilateral edentulous areas located posterior to the remaining natural teeth.
- CLASS II - A unilateral edentulous area located posterior to the remaining natural teeth.
- CLASS III - A unilateral edentulous area with natural teeth remaining both anterior and posterior to the edentulous area.
- CLASS IV - A single, but bilateral (crossing the midline), edentulous area located anterior to the remaining natural teeth.

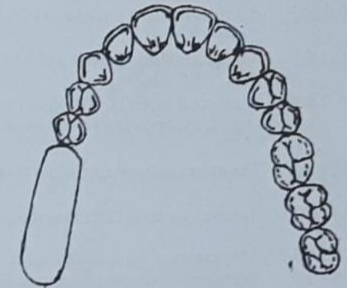
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## KENEDDY'S CLASSIFICATION



CLASS - I



CLASS - II



CLASS - III



CLASS - IV

## APPELLATE RULES GOVERNING THE KENNEDY'S CLASSIFICATION

Appellate provided 8 rules governing the application of Kennedy's method of classification :-

- RULE 1** :- Classification should follow rather than precede any extraction of teeth that might alter the original classification.
- RULE 2** :- If a third molar is missing and not to be replaced, it is not considered in the classification.
- RULE 3** :- If a third molar is present and is to be used as an abutment it is considered in the classification.
- RULE 4** :- If a second molar is missing and is not to be replaced, it is not considered in the classification. (e.g., if the opposing second molar is likewise missing and is not to be replaced for occlusion).
- RULE 5** :- The most posterior edentulous area ( or areas) always determines the classification.
- RULE 6** :- Edentulous areas other than those determining the classification are modification areas.
- RULE 7** :- The extent of the modification is not considered, only the number of additional edentulous areas should be taken into consideration.
- RULE 8** :- There can be no modification area in class IV arches.

(Other edentulous areas lying posterior to the single bilateral areas crossing the midline would instead determine the classification).

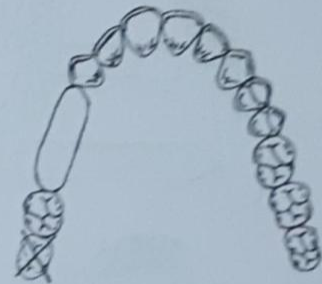
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## RULES GOVERNING THE KENNEDY'S CLASSIFICATION



RULE - 1



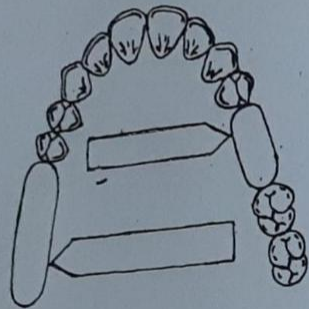
RULE - 2



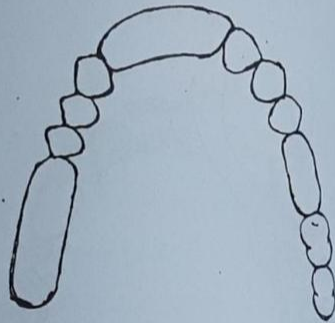
RULE - 3



RULE - 4



RULE - 5



RULE - 6

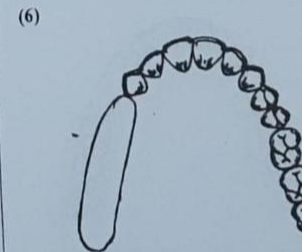
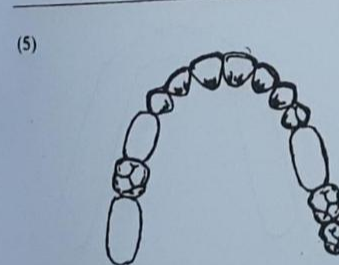
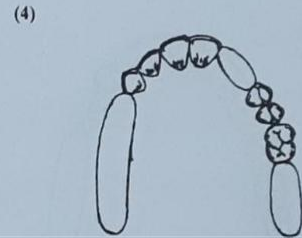
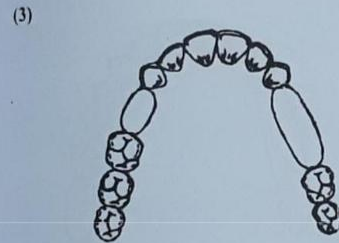
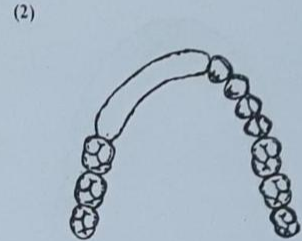
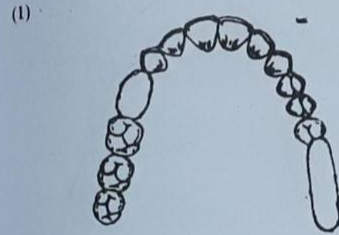


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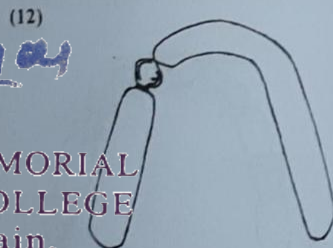
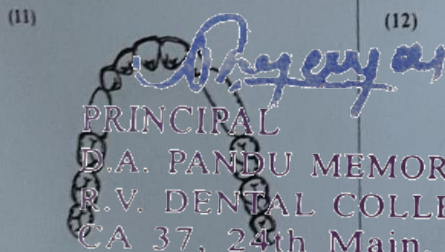
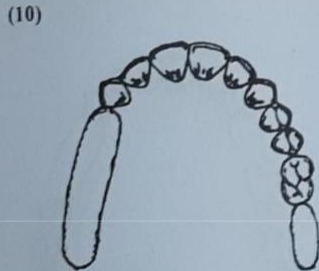
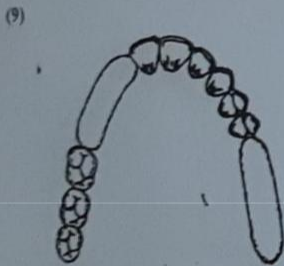
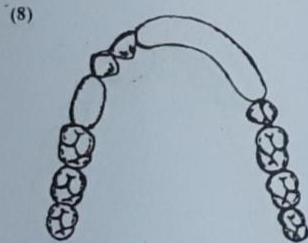
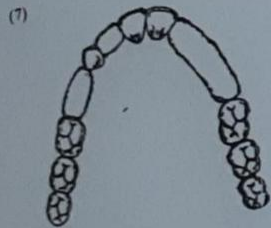
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RULE - 8

CLASSIFY THE FOLLOWING CONDITION



CLASSIFY THE FOLLOWING CONDITION



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COMPONENTS OF CAST PARTIAL DENTURE

**DIRECT RETAINER :-** A direct retainer is that component of a removable partial denture that engages an abutment tooth to resist displacement of the prosthesis away from basal seat tissues and to provide retention, stability and support.

**INDIRECT RETAINER :-** An indirect retainer is that component of a removable partial denture which prevents the movement of the distal extension base away from the tissue along the fulcrum line.

**REST AND REST SEAT :-** a component of a removable partial denture on a tooth surface that provides vertical support is called Rest.

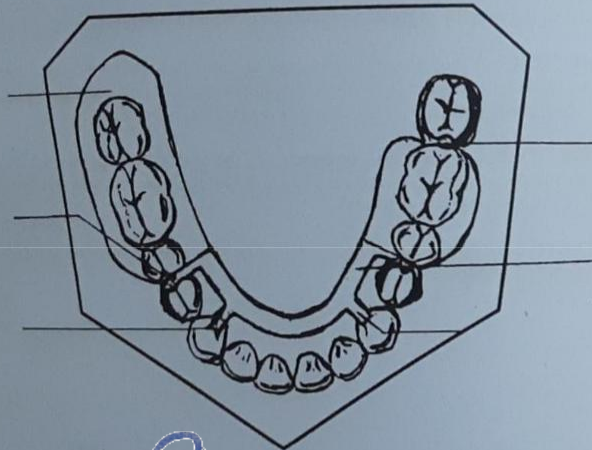
**MAJOR CONNECTOR :-** A major connector is that component of a removable partial denture that connects the parts of the prosthesis located on one side of the arch with those on the opposite side.

**MINOR CONNECTOR :-** A minor connector is that component of a removable partial denture that serve as the connecting link between the major connector or base of a removable partial denture and the other components, indirect retainer, occlusal rests, or cingulum rests etc.

**DENTURE BASE :-** Denture base is that component of a removable partial denture which supports the artificial teeth and consequently receives the functional forces from occlusion and transfers functional forces to supporting oral structures.

**ARTIFICIAL TEETH :-** Teeth that are replaced on partial denture which fulfill the function of mastication, aesthetics and phonetics.

## COMPONENTS OF REMOVABLE CAST PARTIAL DENTURE



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## CLINICAL AND LABORATORY STEPS OF ACRYLIC PARTIAL DENTURE

1. Examination, diagnosis, treatment plan & prognosis.
2. Mouth preparation - recontouring of teeth.
3. Making the impression and teeth / tooth selection.
4. Pouring the cast.
5. Marking the outline on the cast.
6. If required fabricating special tray for final impression.
7. Making the final impression
8. Pouring the final cast.
9. Temporary record base and wax rims
10. Jaw relations
11. Transferring the jaw relation to the articulator
12. Teeth arrangement & establishing occlusal relation
13. Try-in of waxed denture
14. Processing of acrylic denture base & finishing and polishing
15. Denture insertion - initial placement, adjustment of denture & instructions
16. Recall

UNDERLINE THE LABORATORY STEPS IN RED

### PROCEDURE :-

1. With a copying pencil draw the outline of the denture base and the position of the clasp on the teeth adjacent to the edentulous area (Abutment Teeth) on the cast.
2. Use a Stainless steel wires of 21 gauge thickness for preparation of the clasps. Adapt the clasps in position on the cast.
3. Adapt the base plate on the cast according to the outline drawn. Use a half round file to get the interdental contouring of the base plate.
4. Add modeling wax on the edentulous area and place the artificial teeth on it following the alignment of the adjacent teeth. In maximum intercuspation with opposing teeth seal their position and immerse the cast in cold water for 2mins. Later seal the baseplate to the cast to prevent the ingress of plaster while flasking.
5. Complete the Waxing and Carving procedure.
6. Prepare cast for Flasking
7. Trim the stone teeth to the level of the base plate
8. Trim the stone below the clasps with a bur to make space for the plaster to hold the position of the clasp while flasking

### 9. Flasking :-

Pour a creamy mix of plaster in the base of the flask and place the cast such that the ledge of the cast is in line with rim of flask. Cover all the stone teeth with plaster keeping the artificial teeth and the wax exposed both on lingual and buccal side.

Check that there are no undercuts.

Allow the plaster to set completely.

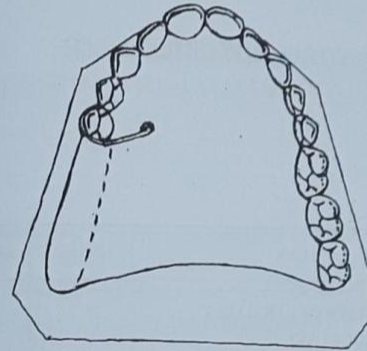
Apply Vaseline on all exposed portion of plaster and cast.

Place the counter and pour mixed plaster into it to fill it completely and place the lid. Place it under clamps until the plaster is set.

10. Carry out Dressing, Finishing, Curing, Deflasking, Finishing and Polishing procedures as followed for the complete denture prosthesis.

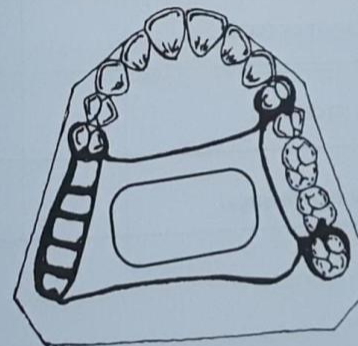
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## ACRYLIC PARTIAL DENTURE



Colour & Label the Diagram

## CAST PARTIAL DENTURE METAL FRAME WORK



Colour & Label the Diagram

CONSTRUCTION OF IDEAL RPD

SL. NO.	WORK	GRADE	SIGNATURE
1.	PREPARATION OF PARTIALLY EDENTULOUS CAST		
2.	FABRICATION OF TRIAL DENTURE BASE		
3.	PREPARATION OF OCCLUSION RIM		
4.	ARRANGEMENT OF TEETH		
5.	WAXING AND CARVING		
6.	FINISHING AND POLISHING		

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PROCESSING OF REMOVABLE PARTIAL DENTURE

SL. NO.	WORK	GRADE	SIGNATURE
1.	FLASKING IN REVERSE TECHNIQUE		
2.	DEWAXING		
3.	PACKING AND CURING		
4.	FINISHING AND POLISHING		

## FIXED PARTIAL DENTURES

Any dental prosthesis that is luted, screwed or mechanically attached or otherwise securely retained to natural teeth / tooth roots or dental implant abutments that furnish the primary support for the dental prosthesis.

### DEFINITION :-

A fixed partial denture is a restoration which replaces few of the natural teeth and which can not be readily removed by the patient or dentist, it is permanently cemented to the natural teeth or roots which furnish the primary support.

### TYPES OF FIXED PARTIAL DENTURES :-

1. CROWNS :- A crown is cemented extracoronal restoration that cover, or veneers, the outer surface of the clinical crown which reproduce the morphology and contours the damaged coronal portions of a tooth while performing it's function and also protecting the remaining tooth structure from further damage.
2. BRIDGES :- It may be defined as a partial prosthesis cemented to one or more teeth and replacing one or more but not all natural teeth.

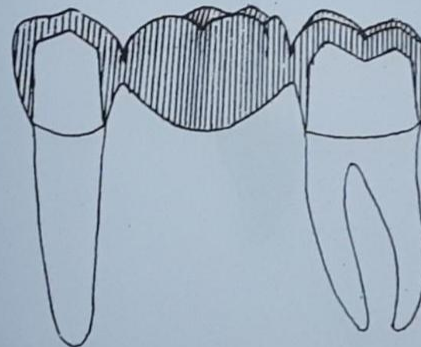
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## CROWN



## BRIDGE





## TYPES OF CROWN

### 1. ANTERIOR CROWNS

- a) Partial  
Metal  
Ceramic  
Composite  
Ceromer

- b) Complete  
Ceramic  
Composite  
Metal Ceramic  
Metal Composite  
Acrylic

### 2. POSTERIOR CROWNS

- a) Partial  
Metal  
Ceramics  
Composite  
Ceromer  
Metal Ceramic  
Metal Composite

- b) Complete  
Metal  
Ceramic  
Composite  
Ceromer  
Metal Ceramic  
Metal Composite  
Polymethyl Methacrylate

### 3. RADICULAR / DOWEL CROWNS

#### TYPES OF BRIDGES :-

1. Fixed - Fixed
2. Fixed Movable
3. Cantilever
4. Compound
5. Adhesive
6. Spring

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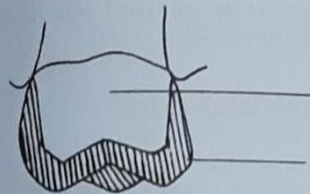
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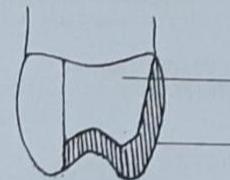
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## TYPES OF CROWN

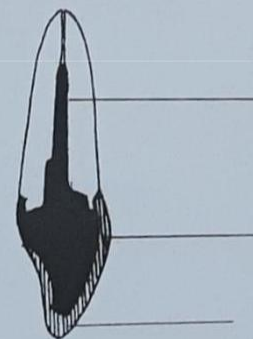
### FULL CROWN



### PARTIAL CROWN



### RADICULAR CROWN



*Label the Diagram*

## COMPONENTS OF A FIXED PARTIAL DENTURE

1. **RETAINER :-**  
Any type of device used for stabilisation or retention of a prosthesis
2. **PONTIC :-**  
An artificial tooth on a CP Dental Prosthesis that replaces a missing natural tooth, restore its function, & usually fills the space previously occupied by the clinical crown.
3. **CONNECTOR :-**  
The portion of the fixed dental prosthesis that unites the retainer & pontic.

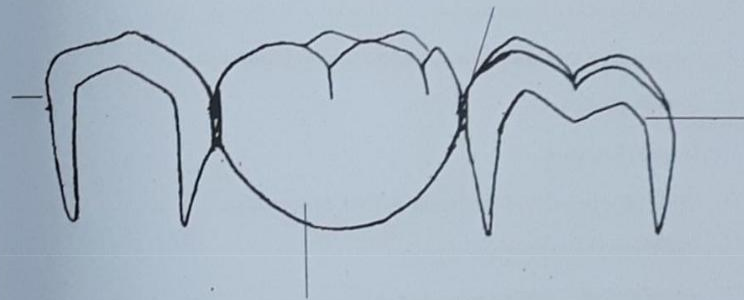
### ABUTMENT :-

The part of a structure that directly receives thrust or pressure, on average a tooth or a portion of tooth, that portion of a dental implant that serves to support or retain a prosthesis.

### PIER ABUTMENT :-

Pier abutment / intermediate abutment :- A natural tooth located between terminal abutments that serve to support a fixed or removable dental prosthesis.

## COMPONENTS OF FIXED PARTIAL DENTURE



*Colour & Label the Diagram*

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## STEPS IN FABRICATION OF FIXED PARTIAL DENTURE - SINGLE TOOTH CERAMOMETAL CROWN

1. Examination, Diagnosis, Evaluation and Treatment Planning
2. Impression for Diagnostic cast and Shade selection.
3. Diagnostic cast.
4. Intra occlusal record and face Bow.
5. Cast Transfer to the Articulator
6. Duplication of Diagnostic cast and Mock Preparation
7. Preparation of Provisional Restoration (if desired at this stage)
8. Impression for Provisional Restoration prior to tooth preparation.
9. Tooth Preparation
10. Gingival Retraction
11. Final Impression, Interocclusal record & Work Authorization
12. Preparation of Provisional Restoration
13. Cementation of Provisional Restoration
14. Preparation of Working Model
15. Application of Die spacer and fabrication of Wax pattern, Investing and Casting
16. Finishing of casting

UNDERLINE THE NAME OF THE COLLEGE

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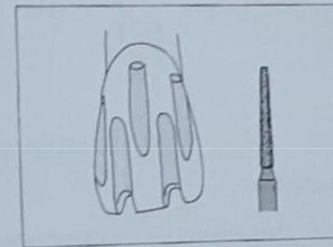
## Steps in the preparation of an all ceramic crown/ Porcelain jacket crown

### Armamentarium

1. Handpiece
2. Flat-end tapered diamond
3. Small wheel diamond
4. H158-012 radial fissure bur
5. RS-1 biangle chisel

### 1. Labial reduction

- Depth orientation grooves: Placed on labial and incisal surfaces with flat-end diamond bur
- Grooves are 1.2 to 1.4mm deep on the labial and 2.0mm deep on the incisal
- Three labial grooves are cut with the diamond held parallel to the gingival one-third of the labial surface

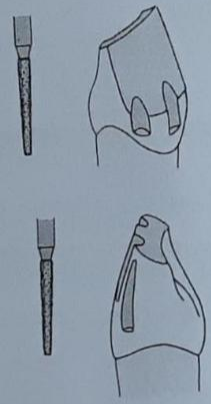


Depth orientation grooves; flat end diamond bur

- The labial surfaces of an all ceramic preparation are done in two planes to achieve adequate clearance for good esthetics without encroaching the pulp.

2. Incisal reduction

Incisal reduction is done with a flat end tapered diamond bur to a depth of 1.2 to 1.4mm



Incisal reduction; flat end diamond bur

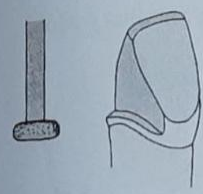
3. Axial and lingual reduction

- > The flat end tapered diamond bur will form the shoulder finish line while the axial reduction is done with sides of diamond.
- > Shoulder should be minimum of 1mm wide.

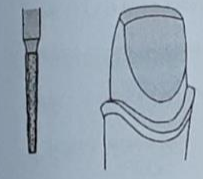
The lingual shoulder is atleast 1mm wide and should be a smooth continuation of labial and proximal radial shoulders

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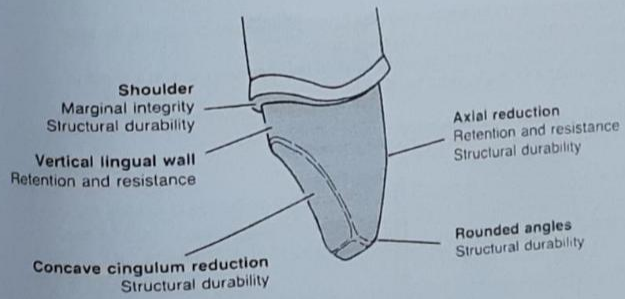
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Lingual reduction: small wheel diamond

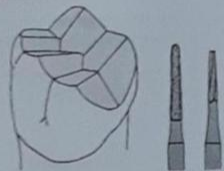


Lingual axial reduction: flat end diamond bur



## Steps in the Preparation of Full Metal Crown in Maxillary Molar

### 1. Occlusal Reduction



Round end tapered diamond and No. 171 bur

Use round end tapered bur to make depth orientation grooves on the triangular ridges and in the primary developmental grooves.

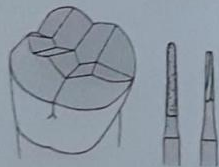
Minimum clearance on non-functional cusps (Maxillary facial and Mandibular lingual cusps);

1mm

Minimum clearance on Functional cusps (Maxillary lingual and Mandibular buccal cusps);

1.5mm

### 2. Functional cusp bevel



Round end tapered diamond and No. 171 bur

Place depth-orientation grooves for a functional cusp bevel. It should be made with the same round end tapered diamond bur used in the preceding steps.

It should parallel the inward facing inclines of the cusps of the opposing tooth, at a depth of 1.5mm, usually forming a 45° angle with a facial plane.

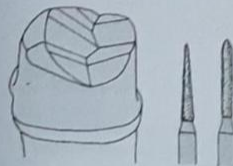
### 3. Buccal and lingual axial reduction

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GA 37, 24th Main,  
 The facial axial reduction is done with a round end tapered diamond, producing a definite chamfer finish

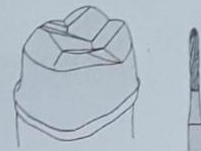
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### 1. Proximal Axial reduction



Short Needle and Torpedo Diamond burs

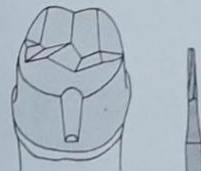
### 2. Chamfer and axial finishing



Torpedo diamond bur

Reduction performed parallel to long axis

### 3. Seating groove



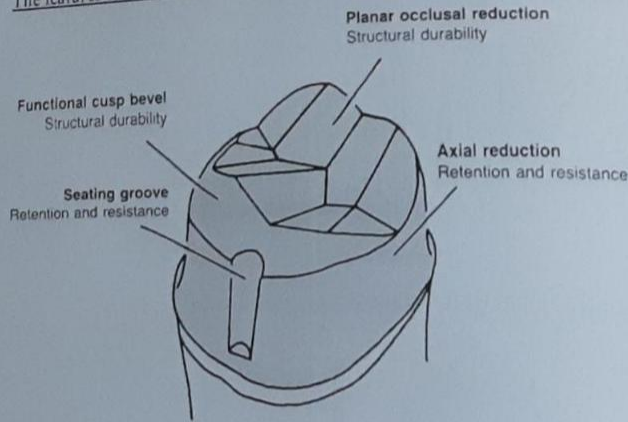
No. 171 L bur

A seating groove is placed on the axial surface. The groove should be cut to the full diameter of the bur, and it should extend gingivally to a point just 0.5mm above the chamfer. This groove mainly helps to guide the crown into place during cementation.

### 4. Finishing

Round of all sharp line angles to facilitate impression making, die pouring, waxing and casting.

The features of a full metal crown preparation and the function served by each.



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Sl. No.	EXERCISE	GRADE	SIGNATURE
1.	Preparation for full veneer crown on plaster model of molar tooth		
2.	Preparation for porcelain jacket crown on plaster model of central incisor tooth		
3.	Preparation for full veneer crown on molar typhodont tooth.		
4.	Preparation for porcelain jacket crown on Maxillary central incisor typhodont tooth		

## IMPRESSIONS IN FIXED PARTIAL DENTURE

Because it is neither possible nor desirable to make patterns for fixed prosthesis in the mouth, an impression, or negative likeness of the teeth and the surrounding structures is necessary to obtain a cast. This cast is then used to make a restoration in the laboratory. To obtain the cast, an elastic impression material is mixed and loaded in a tray that is inserted into the patient's mouth. When the material has set, it remains elastic, the impression is then poured and a positive likeness or definitive cast is obtained.

An acceptable impression must be an exact record of all aspects of the prepared tooth. The impression must be free of air bubbles, tears, thin spots and other imperfections that might produce inaccuracies.

### DEFINITION OF AN IMPRESSION:

A negative likeness or a copy in reverse of the surface of an object, an imprint of the teeth and adjacent structures for the use in dentistry

The various materials used are:

1. Reversible hydrocolloid.
2. Polyether
3. Polysulphide polymer
4. Condensation silicone
5. Addition silicone

### REVERSIBLE HYDROCOLLOID:

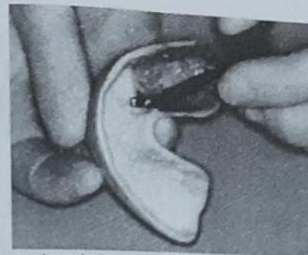
#### PROCEDURE:

1. Select the correct size of water cooled impression tray.
2. Place prefabricated stops across the posterior of the tray to prevent over seating and provide retention.
3. Displace the gingival tissues with the gingival retraction cord.
4. Fill the tray with heavy body material. Add wash material to the surface of the hydrocolloid tray material in the area of preparation and on adjacent tooth.
5. Carefully remove the cord from the sulcus and flood it with warm water.
6. Remove the impression tray from the tempering bath and seat the tray in the mouth. After seating, initiate and maintain the flow of room temperature water through the tray.
7. Hold the tray firmly in the patient's mouth while it sets.
8. Remove the tray with rapid motion, wash it and disinfect it.
9. Pour immediately.

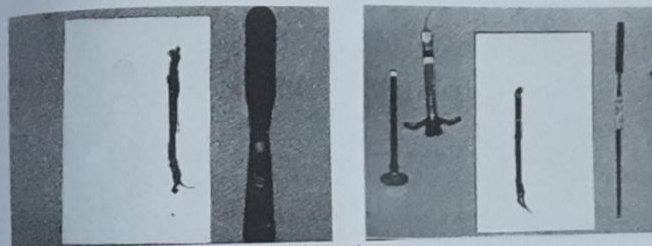
### HEAVY BODY AND LIGHT BODY COMBINATION:

1. Displace the gingival tissues with the cord and seat the tray in the mouth.
2. Apply tray adhesive on to the tray.

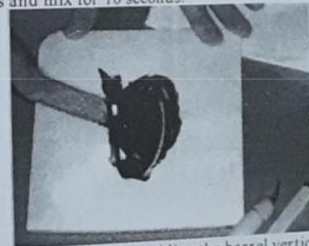
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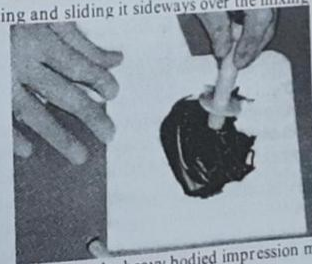
3. Isolate the abutment teeth and place gingival displacement cord in the sulcus.
4. On separate pads (one for the tray and one for syringe material), disperse equal amounts of base and accelerator



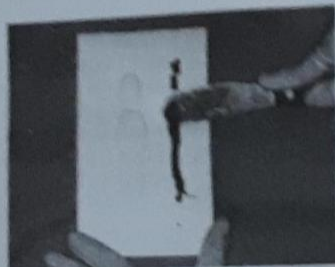
5. Blend the two pastes and mix for 10 seconds



6. Load the syringe, this can be done by holding the barrel vertically, pushing it through the mix, and then angling and sliding it sideways over the mixing pad.



7. Meanwhile, the assistant mixes the heavy bodied impression material.



8. Remove the displacement pad and gently dry the preparation with compressed air.  
 9. Place the tip of the syringe nozzle so that it touches the margin and inject the material. The tip should be inserted into the most distal embrasure first. When all the margins and axial surfaces have been covered the material is air blown into a thin layer



10. Seat the tray filled with heavy body. It must remain immobile while the material undergoes polymerisation (6-12 minutes)



#### SINGLE MIX TECHNIQUE:

As the name indicates only one mix is used from the syringe and fill the tray. Most materials and the tray are used as a caulking gun like device. The tray is filled with a slightly shorter working time.

#### AUTO MIX

Most manufacturers use impression materials in pre-packaged cartridges with a displacement pad. The material is applied with a caulking gun like device, in which mixing occurs as the material is dispensed. The high viscosity incorporated material can be directly applied to the impression tray. Advantage is the elimination of mixing and mixing of voids in the impression. Auto

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mix material is not available for polysulphides, because these materials are too sticky for proper mixing with existing cartridge tips.

#### POLYETHER AND POLYSULPHIDE IMPRESSION MATERIAL- CLOSED MOUTH IMPRESSION TECHNIQUE:

Also known as DUAL ARCH or TRIPLE TRAY TECHNIQUE.

It is popular for making impressions for single units. The impression is made at maximum intercuspation with a high viscosity polyether or polyvinyl siloxane impression material supported by a thin mesh in a frame. The impression includes the prepared tooth, adjacent teeth and opposing teeth and record their maximum intercuspation relationship (hence the name triple tray).

#### PROCEDURE:

1. Select and evaluate closed mouth tray.
2. Apply adhesive to the tray walls. Load both sides of the tray with a high viscosity elastomer.
3. Remove the cord and using a syringe apply the material onto critical areas.
4. Place the tray into position and have the patient close properly in maximum intercuspation.
5. Remove the polymerised impression helping the patient open the mouth by applying pressure to the set material or tray border on the non-prepared side.



## Preparation of Working cast and Die

Working cast is the cast that is mounted on an articulator.

The die is the model of the individual prepared tooth on which the margins of the wax pattern are finished.

Steps in the preparation

1. Dowel pins are positioned over the impression with bobby pins. Stabilize the dowel in the bobby pins, and the bobby pin itself against the straight pins with sticky wax.

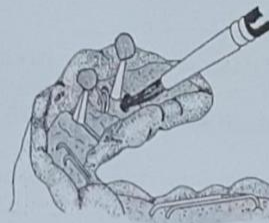


2. Pour die stone into the impression, filling the impression of the teeth and covering the knurled end of the dowel pin. Paper pins are added to non-removable parts of the unset first pour to provide retention for the second pour of stone.

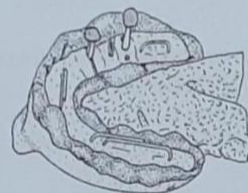


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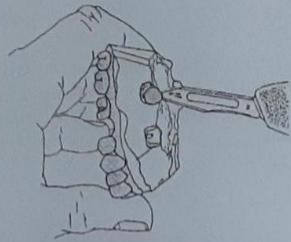
1. When the stone has set, remove the straight pins and bobby pins from the impression. Place a small ball of soft utility wax on the top of each dowel. The stone around the dowel pins is lubricated with a thin coat of petrolatum or commercially available separating medium to permit easy separation of the dies from the working cast later.



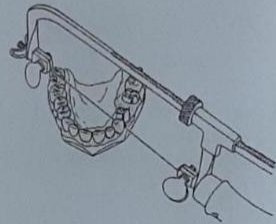
2. Place a wet paper towel into the open lingual space. This will enable a complete base for the cast to be poured. When the base is poured, leave peaks and curls of stone projecting from the top of it to provide retention for the mounting plaster later.



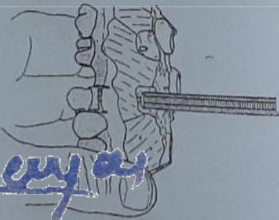
3. After the stone has set, remove the cast from the impression and trim the excess on a model trimmer. Use a sharp knife to uncover the spheres of utility wax and to remove them. Make certain that all wax is removed and that no stone chips are left around the apex of the dowel pin. Allow the stone to harden for 24 hrs.



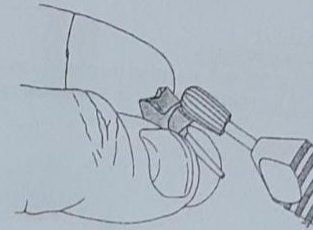
1. When the stone is hard and dry, use a saw frame with a thin blade to cut through the layer of die stone. There should be a cut on the mesial and distal side of each die, and the cuts should taper towards each other slightly from occlusal to gingival.



2. After the dies have been separated from the cast, the ends of the dowel pins are tapped to loosen the dies from the cast.



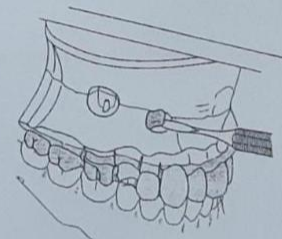
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1. Dies are reinserted into the cast to make certain that they will seat completely and will be stable.



2. Place utility wax back into the wells around the tips of dowels to protect them from plaster contamination. Soak the cast in water and mount it on the articulator using mounting stone. When the stone has set, remove the wax covering the tips of the dowels.



### FABRICATION OF WAX PATTERN

Two accepted ways of fabricating a wax pattern

1. The direct technique: in which the pattern is waxed on the prepared tooth in the mouth
2. The indirect technique: in which the pattern is waxed on a stone cast made from accurate impression of the prepared tooth

1. PKT(Thomas ) waxing instruments
2. Beavertail burnisher
3. Stable brush
4. No.2 pencil
5. Laboratory knife with no.25 blade
6. Cotton pliers
7. Bunsen burner
8. Inlay casting wax
9. Zinc stearate powder
10. Die lubricant

#### 1. COPING FABRICATION

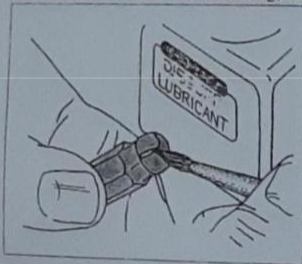
It's the first step in making a wax pattern

To prevent the wax from sticking to the die stone coat the die thoroughly with die lubricant and soak in for several minutes.

Flow wax over surface of the preparation using a no.7 hot spatula

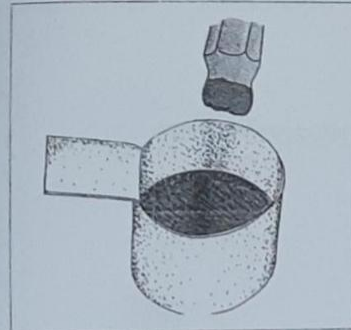
The coping can also be formed by dipping the die in molten wax

To ensure the finished restoration will have adequate proximal contact with the teeth adjacent to it wax pattern should be oversized mesiodistally. This will provide adequate bulk in contact areas to allow casting, finishing and polishing.



The die is lubricated before waxing.

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The coping can also be formed by dipping the die in molten wax.

#### 1. AXIAL CONTOURS

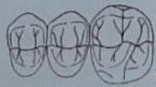
- Proximal contacts and facial and lingual axial contours of the wax pattern established at this time.
- Proximal contacts of posterior teeth are located in the occlusal third of the crowns except for the contact between the maxillary first and second molars which are located in the middle third.
- The contact should not encroach on the gingival embrasure
- Lingual embrasures are slightly larger than the facial embrasures.
- Facial contours of restoration should be in harmony with those of adjacent teeth.
- Height of contour of facial surface of posterior teeth usually occurs in the cervical third
- Facial contours of both maxillary and mandibular posterior teeth extend 0.5mm beyond the outline of the root at the CEJ.

Proximal contours on adjacent teeth are lightly scraped

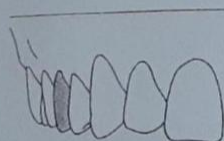


Occlusogingival dimension of proximal contours

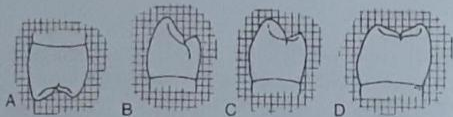




Faciolingual dimension of proximal contacts



Facial contours of restoration should be in harmony with those of adjacent teeth



Height of contour on the facial surface of all posterior teeth extends horizontally 0.5mm beyond plane of the root.

A, B height of contour extends 0.5mm on lingual surface of maxillary teeth and mandibular first premolars

C, D height of contour extends 0.75mm on mandibular second premolars and 1mm on mandibular molars

### 3. Occlusal Morphology

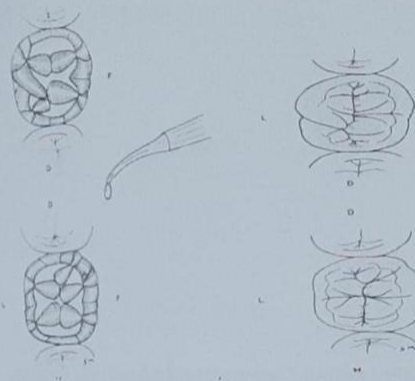
Waxing of occlusal surface is done after axial surface is completed.

Wax pattern fabrication - posterior teeth

Biomechanically designed tooth preparation maintains the original position of all cusp tips, facilitating the development of functional occlusion.

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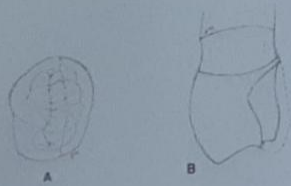


→ Wax cones are placed representing the cusp tips.  
Place functional cusp (stamp) tips first followed by non-functional cusps.

→ Close the articulator regularly to ensure that cusps pass between one another without interference.

→ Wax is added gradually to form buccal lingual mesial and distal cusp ridges.  
Evaluate centric and eccentric occlusion with each wax addition.

→ Check the occlusal contacts with zinc stearate and occlusal contact is adjusted.



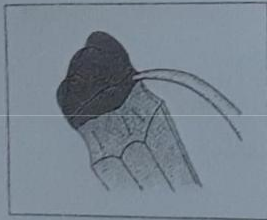
A

B



C

- A: wax is cut away for ceramic veneer after the contours and occlusion is finalized  
 B: proximal view of cut-back for a maxillary molar with a metal occlusal surface  
 C: proximal view of cut-back for a maxillary first molar with a ceramic occlusal surface  
 The marginal ridge is supported with metal



- Cut away the wax where ceramic veneers are planned and readapt the wax to finish lines.
- Burnish the marginal wax with a beaver-tail burnisher and smooth and polish all surfaces with a die bur.
- Wash the wax pattern in warm water.

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### Wax pattern fabrication for anterior teeth:



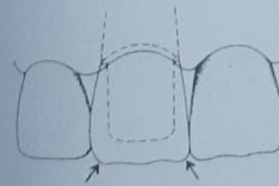
Labial



Incisal

Wax cones are determining the position of the incisal corners.

Functional and esthetic morphology is developed consistent with the desired anterior guidance

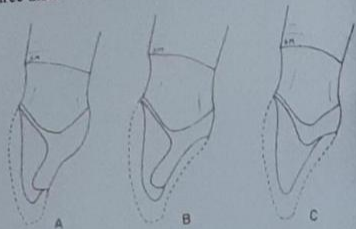


Labial



Incisal

Gingival and incisal embrasures, incisal edge position, occlusal relation, axial contours and esthetic form are definitively established in wax.  
Three distinct cut backs are employed for anterior teeth.



- A: proximal and occlusal contact for anterior metal crown  
B: proximal contact in metal and occlusal contact in porcelain  
C: proximal and occlusal contact in porcelain

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## INVESTMENT MATERIALS AND INVESTING PROCEDURE

### DEFINATION-

An investment can be described as a ceramic material which is suitable for forming a mold into which a metal or alloy is cast. The procedure for forming the mold is described as INVESTING.

### TYPES OF INVESTMENT MATERIALS

Three types of investment materials are available. They all contain silica as refractory constituent. Difference lies only in the binder.

1. GYPSUM BONDED INVESTMENT
2. PHOSPHATE BONDED INVESTMENT
3. SILICA BONDED INVESTMENT

### GYPSUM BONDED INVESTMENT

ADA. Specification no. 2 is casting investment for dental gold alloys.

They are used for casting gold alloys. They can withstand temperature up to 700 degree centigrade.

### COMPOSITION

1. BINDER- Gypsum (alpha- calcium sulphate hemihydrates)  
Accounts for 25%- 45%  
Function- imparts strength to the mold  
- compensates for expansion of the mold by setting expansion
2. REFRACTORY- Silica  
Available in four allotropic forms  
- quartz  
- Tridymite  
- Cristobalite  
- fused quartz  
Function - to regulate thermal expansion
3. MODIFIERS-  
Reducing agents - carbon and powdered copper are added to provide non- oxidizing atmosphere in the mold.  
Colouring agents are added.  
Modifying chemicals- regulate setting expansion and setting time, also prevents shrinkage of gypsum when heated above 300 degree centigrade.  
Eg. Boric acid and sodium chloride

### IDEAL REQUIREMENTS OF AN INVESTMENT MATERIAL-

1. Controllable expansion to compensate precisely for shrinkage of the cast alloy during cooling.
2. The ability to produce smooth castings with accurate surface reproduction and without nodules.
3. Chemical stability at high casting temperatures.
4. Adequate strength to resist casting forces.
5. Sufficient porosity to allow space for gas escape.
6. Easy recovery of the casting.

### PROPERTIES-

1. GYPSUM BONDED INVESTMENTS-

- They satisfy most of the requirements of ideal material, although they are not suitable for casting metal-ceramic alloys because the gypsum is unstable at high temperatures required and sulphide contamination of the alloy can occur. In addition with some materials obtaining adequate expansion may be difficult. This can be critical in casting complete crowns.

### 1. PHOSPHATE BONDED INVESTMENTS-

- They are more stable at high temperatures and thus are the materials of choice for casting metal-ceramic alloys, and their expansion can be conveniently and precisely controlled.

**SETTING TIME** - According to ADA. Specification no.2 for inlay casting investments, the setting time should not be less than 5 minutes and not more than 25 minutes. The modern inlay investments set initially in 9-18 minutes.

### SETTING EXPANSION-

The purpose of setting expansion is to aid in enlarging the mold to compensate partially for the casting shrinkage of the gold.

Setting expansion are of 3 types-

1. Normal setting expansion.
2. Hygroscopic setting expansion
3. Thermal expansion.

#### 1. NORMAL SETTING EXPANSION-

A mixture of silica and gypsum hemihydrates results in setting greater than that of the gypsum product when it is used alone. The silica particles probably interfere with the intermeshing and inter-locking of the crystals as they form. Thus, the thrust of the crystals is outward during growth and therefore more effective in the production of an expansion. ADA specification no.2 for type I investment permits a maximum setting expansion in air of 0.5%. Modern investments show setting expansion of 0.4%.

#### 2. HYGROSCOPIC SETTING EXPANSION-

When gypsum products are allowed to set in contact with water, the amount of expansion exhibited is much greater than normal setting expansion. The increased amount of expansion is because; water helps the outward growth of crystals. This additional expansion is known as hygroscopic setting expansion. The investment should be immersed in water before initial set is complete. ADA specification no.2 for type-II investments requires a minimal of 1.2% and maximum of 2.2% expansion.

#### 3. HYGROSCOPIC THERMAL INLAY CASTING INVESTMENT-

A new inlay casting investment that can be used as a hygroscopic or thermal type is a mixture of silica and gypsum which contains a blend of quartz and gypsum. In the hygroscopic casting technique, the investment is heated to 482 degrees centigrade (900 degree F) after setting in water. In the normal water immersion technique. When used in the thermal casting technique, the investment is not immersed in water but after setting in water, it is heated to 482 degrees centigrade (900 degree F) so that the appropriate expansion is achieved.

### INVESTMENT FOR CASTING HIGH MELTING ALLOYS

The alloys used for metal ceramic restorations and cobalt-chromium alloys for partial dentures are high melting alloys. The investment used for this purpose are-

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- Phosphate bonded investment
- Ethyl silica bonded investment

### PHOSPHATE BONDED INVESTMENT

#### COMPOSITION

**BINDER**- magnesium oxide (basic) and a phosphate that is acid in nature  
**REFRACTORY**- silica in the form of cristobalite, quartz, or a mixture of the two in concentration of approximately 80%.

### ETHYL SILICA BONDED INVESTMENT

#### COMPOSITION

**REFRACTORY**- Silica  
**BINDER**- Silica derived from ethyl silicate or aqueous dispersion of colloidal silica or sodium silicate.

#### INVESTING PROCEDURE-

##### ARMAMENTARIUM-

- Vacuum mixer and bowl
- Vibrator
- Investment powder
- Water or colloidal silica
- Spatula
- Brush
- Surfactant
- graduated cylinder
- Crucible former
- Casting ring and liner

##### STEP BY STEP PROCEDURE-

In this technique, the pattern is first painted with surface tension reducer; the surface must be wet completely.

1. The mixing bowl can either be wiped completely dry or shaken dry. If shaken dry, remember that the residual water adds about 1ml to the mix. Add investment powder to the liquid in the mixing bowl and quickly incorporate it by hand. Residual material from the spatula is wiped onto the mechanical mixing blade, which helps maintain the correct water powder ratio, crucial for accurate control of expansion.
2. Attach the vacuum hose to the bowl, evacuate the bowl, and mechanically spatulate. The mixing should be carefully timed in accordance with the manufacturer's instructions and the type of mixing bowl used (high speed versus low speed). If phosphate bonded investments are used, additional vibration under vacuum helps minimize nodules.
3. Coat the entire pattern with investment, pushing the material ahead of the brush from a single point. Gently vibrate throughout the application of investment, being especially carefully to coat the internal surface and the margin of the pattern
4. A finger positioned under the crucible former on the vibrator minimizes the risk of excessive vibration and possible breaking of the pattern from the sprue. After the pattern has been completely coated, the ring is immediately filled by vibrating the remaining investment out of the bowl.

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1. Place the lined casting ring over the pattern and with the aid of vibration; pour the investment down the side of the ring. Fill the ring slowly, starting from the bottom and moving upwards.
  2. When the investment reaches the level of the pattern, tilt the ring several times to cover and uncover the pattern, thereby minimizing the possible entrapment of air. Investing must be performed quickly within the working time of the investment. If the investment begins to set too soon, rinse it off quickly with cold water. The wax pattern can then be replaced on the die, and its margins can be reflowed again.
  3. After the ring is filled to the rim, allow the investment to set.
  4. If hygroscopic technique is used, place the ring in 37 degree centigrade (100 degree F) water bath for 1 hour.
- VACUUM TECHNIQUE-**
1. First, hand spatulate the mix.
  2. With the crucible former and the pattern in place, attach the ring to the mixing bowl.
  3. Attach the vacuum hose and mix according to the manufacturer's recommendations.
  4. Invert the bowl and fill the ring under vibration.
  5. Remove the vacuum hose before shutting off the mixer.
  6. Remove the filled ring and crucible former from the bowl.
  7. Immediately clean the bowl and the mixing blade under running water.

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## CASTING PROCEDURES FOR DENTAL ALLOYS

The objective of casting process is to provide a metallic duplication of missing tooth structure, with as much accuracy as possible.

### STEPS IN CASTING

1. Tooth preparation- prepare tooth or teeth to receive a cast restoration
2. Impression – make the impression of the prepared tooth.
3. Die preparation
4. Wax pattern make wax pattern from type II inlay casting wax
5. Sprue former
6. Casting ring liner
7. Investing
8. Wax elimination and heating (burnout)
9. Casting- casting machines  
-Fuel used
10. Quenching
11. Recovery of casting
12. Sand blasting
13. Pickling
14. Polishing

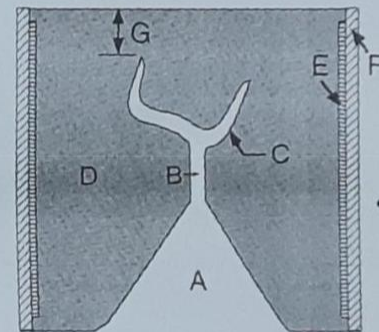


Fig. 12-15 Diagrammatic representation of a dental casting mold: A, crucible former; B, sprue; C, cavity formed by wax pattern after burnout; D, investment; E, liner; F, casting ring; G, recommended maximum investment thickness of approximately 6 mm between the end of the mold cavity and the end of the invested ring to provide pathways for sufficient gas escape during casting.

... position for vacuum pressure casti

### DESCRIPTION IN DETAIL

#### SPRUE FORMER

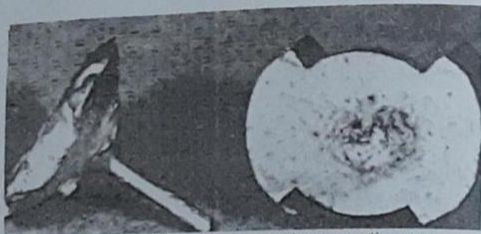
**DEFINITION OF A SPRUE-** A sprue is the channel IN REFRACTORY INVESTMENT mold through which molten metal flows.

After the wax pattern has been made, either directly on a prepared tooth or on a die replica of the tooth, a sprue former is attached to it, and it is surrounded with investment.

#### SELECTION OF SPRUE FORMER IS BASED ON FIVE PRINCIPLES

1. The sprue diameter is approximately the same size as the thickest area of the wax pattern. If the sprue diameter is too small then, this area will solidify before the casting itself and localised shrinkage porosity may develop. Reservoir sprues are used to help overcome this problem.





Localised shrinkage caused by using sprue of improper diameter

- The sprue former should be attached to the portion of the pattern with the largest cross section area. It is best for the molten metal to flow from thick section to surrounding thin portions and not reverse. This design minimises the risk for turbulence.
- Adjust the length of the sprue to 3/8" to 1/2" so that the wax pattern will be approximately 1/4" from the top of the ring.
- Wax sprue formers are more common than plastic.
- Patterns may be sprued directly or indirectly. For direct spruing, sprue forms a direct connection between pattern area and crucible former area. With use of indirect sprue, a connector or reservoir bar is placed between wax pattern and the crucible former.



Fig. 12-12 Left, Primary sprue oriented directly toward the wax pattern. Note the spherical reservoir on the vertical sprue. Right, Indirect sprue design showing a horizontal reservoir runner bar that is positioned near the heel center of the invested ring.

Other considerations are

**SPRUE FORMER POSITION:** Clinicians prefer proximal surface, others pre proximal surface or just below the proximal surface.

**SPRUE FORMER DIRECTION:** 5 degrees to the proximal surface is satisfactory.

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**SPRUE FORMER LENGTH**-it should be adjusted such that the top of the wax pattern is within 6mm of the open end of the ring for gypsum bonded investment and 3-4 mm for phosphate bonded investment.

#### CASTING RING LINERS.

A ring liner is placed on the inner side of the casting ring.

- TYPES** -
- Fibrous ceramic aluminous silicate.
  - Cellulose paper
  - Ceramic - cellulose combination

Asbestos has been discontinued as its fibres when inhaled are carcinogenic.

#### FUNCTIONS-

- Allows for mold expansion.
- When the ring is transferred from the furnace to the casting machines, it reduces loss of heat as it is a thermal insulator.
- Permits easy separation of the investment from the ring after the casting is over.

#### INVESTING

Apply wetting agent on the wax pattern. Seat the casting ring into the crucible former taking care that there is uniform space around the wax pattern. The pattern should be located near the centre of the ring.

Mix the investment as per the recommended water - powder ratio and vibrate. Take some investment on the brush and apply it on the wax pattern pushing it forwards from an edge to the deeper parts of the pattern to avoid air bubbles. The ring is resealed on the crucible former and placed on vibrator and gradually filled with the remaining investment mix. Allow it to set for one hour.

#### WAX ELIMINATION AND HEATING (BURN-OUT)

The purpose of burnout is the elimination of wax from the mould cavity and achieving thermal expansion. Separate the crucible former from the ring. If metallic sprue former is used, it should be removed before burnout. Plastic sprue formers require double burnout.

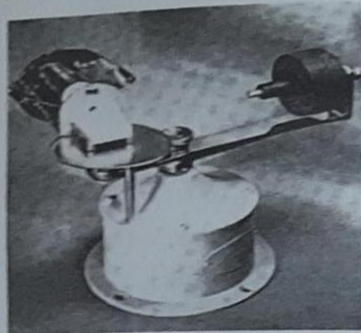
Burnout is started when the mould is wet. Store it in humidator if burnout is to be delayed. Heating should be gradual. Rapid heating causes formation of steam which causes the walls of the mould cavity to flake. In extreme cases an explosion can occur. Fast or too rapid heating causes cracks in the investment due to uneven expansion.

For burnout, the ring is heated gradually to 400 degrees in 20 minutes and then maintained for 30 minutes. In the next 30 minutes, raise the temperature to 700 degrees and maintain it for 30 minute.

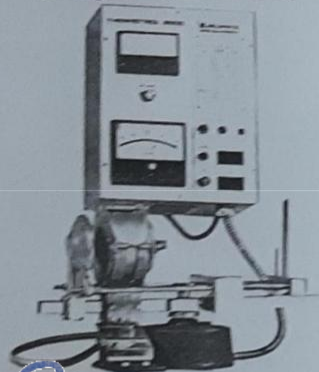
## CASTING MACHINES

### 1. CENTRIFUGAL FORCE TYPE-

- It is spring driven or motor driven.
- Alloy is fused by electric resistance or induction furnace or on a refractory tray by blow torch.

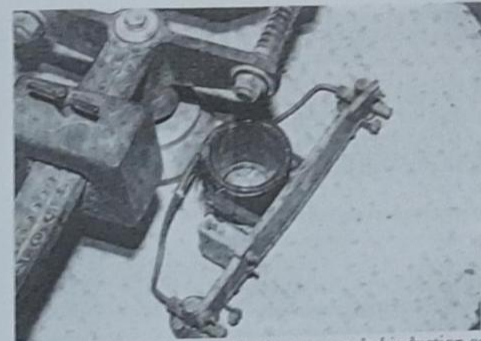


Centrifugal casting machine, spring wound

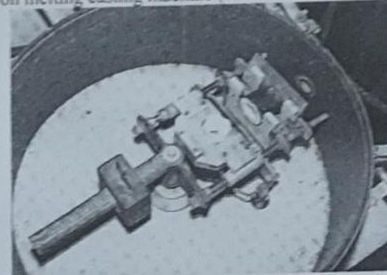


Spring wound casting machine with electrical resistance melting furnace

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Induction melting casting machine (water - cooled induction coil)



Induction melting casting machine (vertical crucible positioned within the induction coil)

### 2. AIR PRESSURE TYPE-

- Either compressed air or gases like carbon dioxide or nitrogen can be used to force the molten metal into the mould. This type of machine is satisfactory for making small castings.

### FUELS USED

- Blow torch
- Electrical resistance or induction

**BLOW TORCH**-used in combination natural gas or artificial gas and air or oxygen and acetylene gas (high fusion alloys)

### ZONES OF A FLAME-

1. **MIXING ZONE**-air and gas are mixed here. No heat is present. It is dark in colour.
2. **COMBUSTION ZONE**- this surrounds the inner zone. Green in colour. It is a zone of partial combustion and is oxidizing in nature.
3. **REDUCING ZONE**-blue in colour and is just beyond the green zone. It is the hottest part of the flame. This zone is used for fusion of casting alloy.
4. **OXIDIZING ZONE**-outer most zone in which final combustion occurs. This zone is not used for fusion.

### QUENCHING -

It is done by immersing in a container of water. This leaves the casting metal in an annealed state and also helps to fragment the investment.

### PICKLING -

The surface oxide from the casting is removed by pickling in 50% hydrochloric acid. HCl is heated but not boiled with the casting in it.

### CAUSES OF DEFECTIVE CASTINGS

Classified under 4 headings-

1. *Distortion*

2. *Surface roughness and irregularities*

3. *Porosity* - A. *Solidification defects* -

- Localised shrinkage porosity
- micro porosity

B. *Trapped gases* -

- pin-hole porosity
- Gas inclusions
- Subsurface porosity

C. *Residual air*

4. *Incomplete or missing details*

*Shreyas*

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### Finishing of the Cast Restoration

Steps involved:

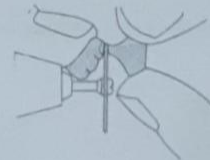
1. The internal margin is inspected to confirm that the casting accurately reproduces the prepared tooth and is intimately adapted to the prepared surfaces of the margin.



2. The casting is checked for the instability and rocking, adjustments are made using small stones and carbide burs.



3. The sprue is removed from the casting using a separating disc.



4. The area of sprue attachment is reshaped.
5. The proximal contacts are adjusted.



1. On the cast, proximal contacts can be left slightly tight before the clinical evaluation.
2. The occlusal surfaces are evaluated and adjusted. No centric or excursive interferences should remain.

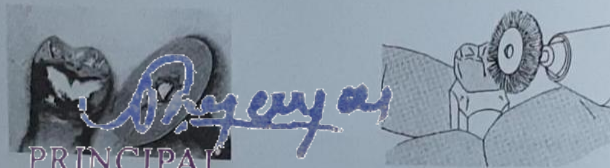


Grooves are finished with a small finishing bur.



Cusp Ridges are finished with a small sulci disc.

3. The axial surfaces are finished and polished. Finishing the cervical aspect of the axial walls on the metal-ceramic restorations is postponed until after final glazing and characterization.



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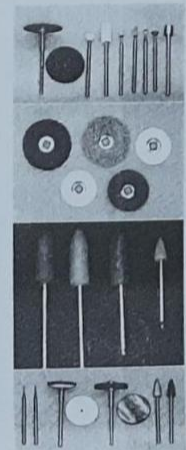
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## ABRASIVES USED FOR FINISHING

A sequence of progressively finer grades is used to attain the desired surface.

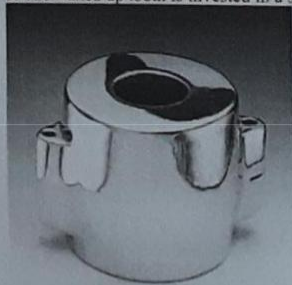
- A. Carborundum disks and stones of varying degrees of coarseness.
- B. Garnet paper and sandpaper disks.
- C. Rubber points and white Arkansas stones.
- D. Rubber wheels and points along with small carbide burs for nodules.



## HEAT POLYMERIZED ACRYLIC CROWN ARMAMENTARIUM

- Diagnostic cast
- Utility wax
- No.7 spatula
- Rubber bowl
- Spatula
- plaster
- Laboratory knife no.25 blade
- Large camel hair brush
- Dappen dish
- Separating media
- Monomer polymer
- Medicine dropper
- Straight handpiece
- Acrylic burs
- Abrasive discs and moore mandrel

1. After tooth preparation an initial impression is used for construction of acrylic tooth
2. Trim the cast with the mesial and distal ends at right angles to the line of the teeth. The cast is curedt in areas of intercrevicular tooth preparation to expose the margins.
3. Mock tooth preparation is performed on a second set of diagnostic cast.
4. The desired occlusion and contact areas in wax on the mounted casts is formulated
5. The waxed up tooth is invested in a separable flask.



6. The wax is eliminated with a sharp stone surface is cooled and coated with tin foil substitute.
7. Acrylic polymer and monomer is mixed in the ratio of 3:1 by volume
8. Packing of the flask is done by the flask is closed in an appropriate press with a sheet of cellophane or trial pack separating film.
9. The flask is separated and washed with water.
10. The flask is closed and held tightly together with a surgical clamp or press.

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11. The resin is polymerized by subjecting it to a polymerization cycle of 74 c for 8 hours or 74 c for 2hours then increasing the temperature of the water bath to 100 °C and processing for 1 hour

Sl. No.	EXERCISE	GRADE	SIGNATURE
1.	Making an impression for fabrication of full veneer crown on molar typhodont tooth		
2.	Preparation for working Cast & Die		
3.	Fabrication of wax pattern		
4.	Investing, casting & finishing of cast restoration.		
5.	Investing, Dewaxing, finishing of heat polymerized acrylic crown on prepared maxillary central incisor typhodont tooth.		

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## COMPLETE DENTURE PROSTHODONTICS

### 1. DEFINE PROSTHODONTICS.

Prosthodontics is the dental speciality pertaining to the diagnosis, treatment planning, rehabilitation and maintenance of the oral function, comfort & appearance and health of patients with clinical conditions associated with missing or deficient teeth and/or maxillofacial

### 2. WHAT IS A PROSTHESIS?

Substitutes using biocompatible substance. An artificial replacement of part of human anatomy restoring form, function and esthetics.

### 3. WHAT IS A DENTURE PROSTHESIS?

The replacement of natural teeth in the arch and their associated parts by artificial substitutes.

### 4. WHAT ARE THE OBJECTIVES OF PROSTHETIC DENTISTRY?

Restoration of missing or lost dentitions and associated structures with a view to preserve what remains in masticatory apparatus, restore function and esthetics.

### 5. MENTION THE BRANCHES OF PROSTHODONTICS.

- ① Removable prosthodontics.
- ② Fixed prosthodontics
- ③ Maxillofacial prosthodontics
- ④ Implant prosthodontics.

### 6. WHAT IS AN IMMEDIATE DENTURE PROSTHESIS?

Any fixed or removable denture prosthesis fabricated for placement immediately following the removal of natural teeth/tooth.

### 7. WHAT ARE THE ANATOMICAL LANDMARKS OF SIGNIFICANCE IN THE EDENTULOUS MAXILLARY FOUNDATIONS, THEIR APPLICATION AND SIGNIFICANCE?

Residual alveolar ridge → Secondary stress bearing area → Porous  
Palatine rugae → 2<sup>o</sup> stress bearing area → Support denture  
Inisive papilla → stress relieving area → Exit point for nasopalatine vessels

Frenum → limiting area → Accomodated by groove in denture  
 Vestibule → Limiting area → Houses flanges of denture base.  
 Mid-palatal raphae → Stress relieving area → Relief compensates for movement of denture base

8. WHAT ARE THE ANATOMICAL LANDMARKS OF SIGNIFICANCE IN THE EDENTULOUS MANDIBULAR FOUNDATION, THEIR APPLICATION AND SIGNIFICANCE?

Stress bearing Area	Relief Area	Limiting areas
1) Buccal shelf area	1) Mylohyoid ridge	1) Labial frenum
2) Residual alveolar ridge	2) Mental foramen	2) Labial vestibule
	3) Genial tubercle	3) Buccal frenum
	4) Torus mandibularis	4) Buccal vestibule
		5) Retromolar pad
		6) Alveolingual sulcus
		7) Lingual frenum

9. WHAT IS A DENTAL IMPRESSION?

A negative likeness or copy in reverse of the surface of an object, an imprint of the teeth and adjacent structures for uses in dentures.

10. WHAT IS A COMPLETE DENTURE PROSTHESIS?

A removable dental prosthesis that replaces the entire dentition and associated structures of maxilla and mandible.

11. WHAT ARE THE IMPRESSION MATERIALS USED FOR MAKING THE PRELIMINARY IMPRESSION?

- \* Stock tray
  - \* The following impression materials can be used.
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- Impression compound
  - S.D. ANE PANDU MEMORIAL
  - Polyvinyl silico-phosphate

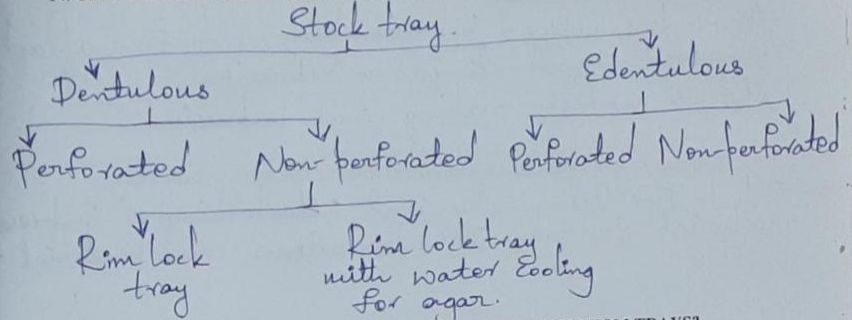
12. WHY IS THE IMPRESSION COMPOUND A BETTER MATERIAL FOR MAKING A PRELIMINARY IMPRESSION?

- Easy to manipulate
- Material can be correlated
- Impression can be correlated
- Easy to load and box.

13. WHAT IS AN IMPRESSION TRAY?

A receptacle or device used to carry the impression material to the mouth. Confine the material in apposition to the surface to be recorded and control the impression material where it sets to form the impression.

14. GIVE THE CLASSIFICATION OF IMPRESSION TRAYS.



15. WHAT ARE THE MATERIALS USED IN PREPARATION OF CUSTOM TRAYS?

- 1) Autopolymerising resins
- 2) Light polymerated resins
- 3) Thermoplastic resins.

16. WHAT ARE THE METHODS OF PREPARING THE CAST? WHICH METHOD IS BETTER & WHY?

Beading and Boxing.

- Allows to control thickness of material
- Minimum wastage of material

17. WHAT ARE THE FUNCTIONS OF AN IMPRESSION TRAY?

Functions

- Carry impression material
- Confine impression material
- Control impression material while making an impression.

### 18. WHY THERMOSTATICALLY CONTROLLED WATERBATH IS USED FOR SOFTENING IMPRESSION COMPOUND?

Compound is placed in hot water (60°C) and is kneaded to achieve uniform consistency, without wrinkle and folds. Excessive heating leads to leakage of plasticiser from impression compound. One heating will lead to mass which cannot be kneaded properly.

### 19. WHAT IS A CUSTOM TRAY?

An individualised impression tray made from a cast recovered from preliminary impression. It is used in making final impression.

### 20. WHAT IS THE PURPOSE OF PERFORATIONS IN THE IMPRESSION TRAY?

It is for the mechanical interlocking of impression material to tray. It also allows excess material to flow.

### 21. WHAT ARE THE METHODS OF PREPARATION OF ACRYLIC TRAY?

- Sprinkle on method
- Dough method.
- Vacuum adapted/pressure form method.

### 22. WHAT ARE THE OBJECTIVES OF A FINAL IMPRESSION?

- Retention
- Stability
- Support
- Esthetics
- Preserving of remaining material

### 23. CLASSIFY IMPRESSION TECHNIQUES

- 1) Border moulding tray
  - 2) One border moulding tray.
  - 3) Borderless modelling compound tray.
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- \* Depend on the technique of impression making
- 1) Mucostatic technique.
  - 2) Mucocompressive technique.
  - 3) Selective pressure technique.

### 24. WHAT IS MEANT BY BORDER MOULDING?

The shaping of impression material along the border-areas of the impression tray by functional or removal manipulation of soft tissue adjacent to borders to duplicate the contour and size of vestibule.

### 25. WHAT ARE THE MATERIALS USED FOR BORDER MOULDING?

- ① Green stick compound
- ② Putty or heavy body elastomeric impression material.

### 26. MENTION THE MATERIALS USED FOR OBTAINING FINAL IMPRESSION.

- 1) Medium/Regular body elastomeric impression material
- 2) ZnOE impression paste.

### 27. DEFINE RETENTION?

The quality inherent in dental prosthesis acting to resist the forces of dislodgement along the path of placement.

### 28. DEFINE STABILITY?

The quality of complete or removable partial dentures to be firm, steady or constant, to resist dislodgement by functional horizontal or rotational stresses.

### 29. WHERE DO YOU LOCATE THE POSTERIOR BORDER OF MAXILLARY COMPLETE DENTURE?

- Posterior palatal seal area
- Posterior vibrating line.

### 30. WHERE DO YOU LOCATE THE POSTERIOR BORDER OF MANDIBULAR COMPLETE DENTURE?

Denture should cover retromolar pad and mandibular complete denture under should extend posteriorly to contact retromylohyoid curtain.



31. WHAT DO YOU MEAN BY POSTERIOR PALATAL SEAL AREA?

The soft tissue are limited posteriorly by distal demarcation of movable and immovable tissue of soft palate and anteriorly by junction of hard and soft palate on which pressure within physiological limits can be placed, this seal can be applied by a removable complete denture to avoid in its retention.

32. WHAT IS VIBRATING LINE?

Vibrating line is an imaginary line across the posterior part of the palate making the division between the movable and immovable tissues of the soft palate. This can be identified when the movable tissues are functioning.

33. WHAT ANATOMICAL LANDMARKS INFLUENCES DISTOBUCCAL AREA OF MAXILLARY DENTURE?

An imaginary line across posterior part of the soft palate marking the divisions between immovable and non-movable tissues; this line can be identified when movable tissues are functioning.

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34. WHAT ANATOMICAL LANDMARKS INFLUENCES DISTOBUCCAL AREA OF MANDIBULAR DENTURE?

Masseter muscle process, Anterior border of coronoid process, Ramus of mandible.

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35. WHAT ANATOMICAL LANDMARKS INFLUENCES DISTOLINGUAL BORDER OF MANDIBULAR DENTURE?

Pteryomylahoid curtain containing Superior constrictor muscle and medial pterygoid muscle whose fibers are arranged in vertical dimension. Whenever pterygoid contracts it pushes pteryomylahoid anteriorly. Hence distobuccal border of mandible, buccal border of maxilla and mandible, distolingual border of mandible are influenced.

36. WHAT IS A RECORD BASE?

An interim structure / denture base used to support the record rim material for recording maxillomandibular records.

37. WHAT ARE THE MATERIALS USED FOR CONSTRUCTION OF RECORD BASE COMPARE AND CONTRAST THE MOST COMMONLY USED ONES.

Temporary bases.	Permanent bases.
- Autopolymerising acrylic resin	- Heat cure acrylic resin
- Light curing resin	- Fluid resin
- Thermoplastic resin	- Metal bases.
- Shellac base plate	

38. WHAT ARE THE MATERIALS USED FOR PERMANENT DENTURE BASE?

- 1) Heat curing acrylic resins.
- 2) Fluid resins
- 3) Metal bases → Ni-Cr  
→ Co-Cr.

39. WHICH MUSCLES INSERT IN THE MAXILLARY & MANDIBULAR BUCCAL FRENUM?

Maxillary buccal frenum → Orbicularis, buccinator  
Mandibular buccal frenum.

40. WHAT ARE THE DISADVANTAGES OF USING HEAT CURED ACRYLIC AS TEMPORARY DENTURE BASE?

- Due to tedious procedure
- Time consuming
- We will end up with breaking/spoiling the cast.

41. WHAT IS AN OCCLUSION RIM? WHAT ARE THE FUNCTIONS OF AN OCCLUSION RIM?

occluding surface fabricated on interim or final denture base for purpose of making maxillo-mandibular relations: records and arranging teeth.

42. WHAT ARE THE MATERIALS USED FOR THE PREPARATION OF OCCLUSION RIM?

- 1) Modelling wax
- 2) Base plate wax.
- 3) Rarely impression compound.

43. NAME THE VARIOUS MANDIBULAR MOVEMENTS.

- 1) Basic movements - Rotations, translations
- 2) Excursive movement - Opening & closing, protrusion
- 3) Border movements and retraction, lateral excursion
- 4) Functional movements - Chewing, speech, swallowing

44. WHAT IS THE IMPORTANCE OF MANDIBULAR MOVEMENTS?

- 1) Recording jaw relations
- 2) Designing, selection and adjustment of articulator
- 3) Developing tooth form for dental restorations
- 4) Understanding basic principles of occlusion
- 5) Preserving periodontal health.

45. WHAT IS A FACE BOW?

An instrument used to record the spatial relationship of the maxillary arch to some anatomic reference point and then transfer this relationship to an articulator. It orients the dental casts to the same relationship to the occluding axis of the articulator, customarily the anatomic reference point is the anterior reference point.

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46. WHAT ARE THE DIFFERENT TYPES OF FACE BOW?

- ① Arbitrary face bow
- ② Kinematic face bow.

47. GIVE DIFFERENCES BETWEEN ARBITRARY AND KINEMATIC FACE BOWS.

- Arbitrary hinge axis is recorded arbitrarily, bite fork is attached to the maxilla
- Kinematic is used to record accurate hinge axis and bite fork is attached to mandible.

48. WHAT ARE PARTS OF A FACE BOW?

- (i) U - Shaped frame
- (ii) Condylar rods
- (iii) Bite fork.
- (iv) Locking device
- (v) Orbital pointer pin.

49. WHAT ARE THE USES OF A FACE BOW?

To record the orientation jaw relation.

50. WHAT IS AN ARTICULATOR?

A mechanical instrument that represents temporomandibular joints and jaws to which maxillary and mandibular casts are attached to simulate some or all mandibular movements.

51. GIVE SIMPLE CLASSIFICATION OF ARTICULATORS.

- \* Based on adjustability
  - (i) fully adjustable
  - (ii) Semi adjustable
  - (iii) Non-adjustable.
- Based on position of condylar elements
  - (i) Arcon.
  - (ii) Non-Arcon.

52. NAME THE PARTS OF AN ANATOMIC ARTICULATOR.

- Condylar guidance
- Condylar elements
- Inisal guide table
- Inisal guide pin
- Inisal guidance
- Orbital indicator
- Mounting plates
- Upper & Lower member
- Gender locks

53. WHAT ARE THE FUNCTIONS OF AN ARTICULATOR?

- ① To hold the maxillary and mandibular casts in predetermined position
- ② To open and close.
- ③ Arrangement of teeth
- ④ To plan dental procedures.

54. WHAT ARE THE SHORT COMINGS OF A MEAN VALUE ARTICULATOR?

- (i) Non-adjustable.
- (ii) Inisal table and pin
- (iii) Mid-inisal pin
- (iv) Condylar shaft and slot
- (v) Vertical supporting arm.

55. WHAT ARE THE PARTS OF MEAN VALUE ARTICULATOR?

- (i) Upper and lower member
- (ii) Inisal table and pin
- (iii) Mid-inisal pin
- (iv) Condylar shaft and slot
- (v) Vertical supporting arm.

56. WHAT IS THE THEORY BEHIND DESIGN OF MEAN VALUE ARTICULATOR?

Based on Bonwill's theory when the distance between the condyles is equal to distance between condyles and midpoint and mandibular incisors. It forms an equilateral triangle.

57. WHAT ARE THE DIFFERENT THEORIES OF OCCLUSION?

- ① Bonwill's equilateral theory.
- ② Monson's spherical theory.
- ③ Halls conical theory.

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58. WHAT IS MEANT BY JAW RELATIONS?

Any spatial relationship of maxilla to mandible; any one of the infinite relationships of mandible to maxilla.

59. WHAT ARE THE DIFFERENT JAW RELATIONS?

- (i) Orientation jaw relations
- (ii) Vertical jaw relations
- (iii) Horizontal jaw relation.

60. WHAT IS THE IMPORTANCE OF JAW RELATIONS?

- ① Orientation jaw relations: It orients maxilla to opening and closing axis of mandible.
- ② Vertical jaw relation: Establishes height of lower 2/3 of face.
- ③ Horizontal jaw relation: To determine antero-posterior relation of maxilla.

61. WHAT IS PHYSIOLOGIC REST POSITION?

The natural position of the mandible when an individual is resting comfortably in an upright position and the associated muscles are in a state of minimal contractile activity.

62. WHAT IS THE SIGNIFICANCE OF PHYSIOLOGIC REST POSITION?

- It helps in recording vertical jaw relation
- It also helps in establishing free way space of 2-4 mm.

63. WHAT IS FREE WAY SPACE / INTER OCCLUSAL DISTANCE?

The distance between occluding surfaces of maxillary and mandibular teeth when mandible is in a specified position

64. WHAT ARE THE CONSEQUENCES OF INCORRECT VERTICAL RELATION OF OCCLUSION?

Increase V.D.

- a) Discomfort
- b) Trauma
- c) TMJ problem
- d) Bone resorption
- e) Clicking of teeth
- f) Facial distortion
- g) Difficulty in speech
- h) Swallowing

Decrease in V.D.

- a) Inefficiency
- b) Cheek biting
- c) TMJ problem
- d) Facial distortion

Maxillo-mandibular relationship independent of the tooth contact in which condyles articulate in anterior-superior position against the posterior slopes of articular eminence, in this position mandible is restricted to purely rotatory movements.

65. WHAT IS CENTRIC RELATION?

DMIP must coincide with centric relation in completely dentulous individuals.

- 1) Mandibular cast will be correctly oriented to opening axis of articulator if its mounted in C.R.
- 2) C.R. must be recorded in established VD which is normal for individual.

66. WHAT IS ECCENTRIC JAW RELATION?

Any relationship of mandible to maxilla other than centric relation.

67. WHAT IS THE SIGNIFICANCE OF ECCENTRIC JAW RELATION?

Used to adjust protrusion and lateral condylar guidances. Inclination of the articulator which will help in reproducing the mandibular movements of patients.

68. WHAT IS OCCLUSION?

The static relationship between incisal or masticating surfaces of maxillary or mandibular teeth or both.

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69. WHAT IS BALANCED OCCLUSION?

The bilateral simultaneous anterior and posterior occlusal contact of teeth in centric and eccentric positions.

70. WHAT IS CENTRIC OCCLUSION?

The occlusion of the opposing teeth when mandible is in centric relation, this may or may not coincide with maximal intercuspal position.

71. WHAT ARE THE FACTORS RESPONSIBLE FOR BALANCED OCCLUSION?

- 1) Condylar guidance
- 2) Incisal guidance
- 3) Orientation of occlusal plane
- 4) Compensatory curve
- 5) Axial inclination.

72. WHAT IS CONDYLAR GUIDANCE?

The mechanical form located in the posterior region of an articulator that controls movement of its mobile member.

73. WHAT IS BENNET MOVEMENT?

The working side condyle can just rotate on its axis or move outwards and laterally. This lateral movement is termed as Bennet movement.

74. WHAT IS INCISAL GUIDANCE?

The influence of contacting surfaces of mandibular and maxillary anterior teeth on mandibular movement.

75. WHAT IS COMPENSATORY CURVE?

The anteroposterior and mediolateral curve within the alignment of occluding surfaces and incisal edges of artificial teeth that is used to develop balanced occlusion.

76. WHAT IS MONSON'S CURVE / CURVE OF WILSON?

Mediolateral curve.

In this theory that occlusion should be spherical curvature of cusps as projected as frontal plane expressed in both arches the curve is mandibular arch being concave and the one in maxillary arch being convex.

77. HOW DO YOU ORIENT LEVEL OF OCCLUSAL PLANE?

arch being convex.

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DEPARTMENT OF PROSTHODONTICS

PRE-CLINICAL RECORD

NAME	: B. Ambarish Kamath
YEAR	: <u>II</u> BDS
REG. NO	: 19D0481
EXAMINATION CENTRE	:

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DEPARTMENT OF PROSTHODONTICS  
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J. P. NAGAR, BANGALORE - 560 078.



Certificate

*This is to Certify that*

*Mr./Ms. B. Ambarish Kamath*

*Reg. No. 19D0481*

*has satisfactorily carried out the practical exercise as  
Prescribed by the Rajiv Gandhi University of Health Sciences  
in the subject of Pre-Clinical Prosthodontics  
during the year 2020-2021*

Date :

*C. J.*  
Staff Incharge for Pre-clinical Prosthodontics

University Reg. No. : 19 D0481

Examination Centre :

Date of Practical Exam :

*Kelly*  
Internal Examiner

*[Signature]*  
External Examiner

*[Signature]*  
Dr. N. KATAVATH, MSc  
Professor and Head  
Department of Prosthodontics  
R.V. Dental College  
D.A.P.M.S.V. Dental College & Hospital  
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## INSTRUCTIONS TO THE STUDENTS

1. Students should enter the preclinical laboratory on time.
2. Students should wear clean and neatly ironed apon with name plates and should wear a head cap.
3. Students should observe silence in the department.
4. Students should have the relevant instruments for the specific practical exercise.
5. Students should keep the instruments clean in a tray.
6. Students should spread Mackintosh sheet on the table before starting work.
7. Students should avoid wastage of the materials and conserve the use of water.
8. Students should not put plaster, wax or other waste material in the sink.
9. Students should put off the Bunsen burner when not required.
10. Record book should be kept neat and in good condition.
11. This record book should be handed in for progress reports as and when required to the instructor.
12. **This record should be preserved till FINAL BDS and submitted during FINAL BDS CLINICAL EXAM**

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## ARMAMENTARIUM FOR PRECLINICAL EXERCISES

1. Mackintosh sheet
2. Rubber bowls
  - a) Flexible rubber bowl
  - b) Stiff rubber bowl
3. Straight Plaster spatula
4. Curved spatula (for mixing alginate)
5. Plastic spatula
6. Wax spatula
7. Wax knife
8. Lacron's carver
9. Stanley's knife
10. Plaster knife
11. Mean value articulator
12. Glass slab
13. Cement spatula / Broad bladed stainless steel spatula (for mixing ZnOE paste)
14. Half round file
15. Dental flasks with Clamps
16. Stainless Steel scale - 6 inch
17. Scissors - straight
18. Porcelain cup with lid
19. Soft Tooth brush
20. Impression tray, Stock Metal Alloys (Maxillary & Mandibular)  
Dental bus perforated No. 1 to 4  
Esserulous 4 perforated No. - 1 to 4
21. Camel's hair brush

## INTRODUCTION TO PROSTHODONTICS

### DEFINITION OF PROSTHETIC DENTISTRY:-

Prosthetic dentistry is that branch of dentistry pertaining to the restoration and maintenance of oral function, comfort, appearance and health of the patient by the restoration of natural teeth and / or the replacement of missing teeth and craniofacial tissues with artificial substitutes.

### AIMS OF PROSTHETIC DENTISTRY:-

The aim of Prosthetic Dentistry is restoration of missing or lost dentition and associated structures with a view to preserve what remains of masticatory apparatus, restore function and aesthetics.

### BRANCHES OF PROSTHETIC DENTISTRY-

1. REMOVABLE PROSTHODONTICS :- Complete dentures  
Partial dentures  
Complete overdentures  
Partial overdentures
2. FIXED PROSTHODONTICS :- Crowns  
Bridges  
Laminates
3. MAXILLOFACIAL PROSTHODONTICS :- Obturators  
Stents  
Splints  
Extraoral prostheses-  
Eyes, ear, nose, etc.
4. IMPLANT PROSTHODONTICS :- Removable Prosthesis  
Fixed prosthesis.

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#### REMOVABLE PROSTHODONTICS :-

It is the branch of Prosthodontics concerned with the replacement of teeth and contiguous structures for edentulous or partially edentulous patients by artificial substitutes that are removable from the mouth.

#### FIXED PROSTHODONTICS:-

It is that branch of Prosthodontics concerned with the replacement and / or restoration of teeth by artificial substitutes that are not readily removed from the mouth.

#### IMPLANT PROSTHODONTICS:-

It is that phase of Prosthodontics concerning the replacement of missing teeth and / or associated structures by restorations that are attached to dental implants

#### MAXILLOFACIAL PROSTHODONTICS:-

It is that branch of Prosthodontics concerned with the restoration and / or replacement of the stomatognathic and craniofacial structures with prosthesis that may or may not be removed on regular or elective basis.

## COMPLETE DENTURE



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EXERCISE NO.1

COMPLETE DENTURES

DEFINITION:-

A dental prosthesis which replaces the entire dentition and associated structures of the maxilla and mandible.

SURFACES OF COMPLETE DENTURES:-

1. Impression surface / Tissue surface :-

That surface of the denture which is in contact with the denture bearing, denture stabilizing and border seal areas present in the edentulous mouth.

2. Polished surface :-


The external surface of the denture that is in contact with the mucosa of cheek lips and tongue.

3. Occlusal surface :-

It is the occluding surface of the denture.

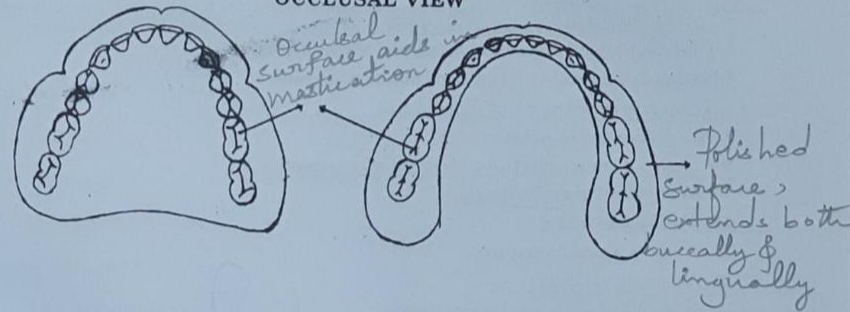
QUESTIONS: -

1. The surface of a complete denture that contacts the tissue is called as surface Impression Surface
2. A Prosthesis that replaces all the missing teeth and associated structure is called as Complete dentures

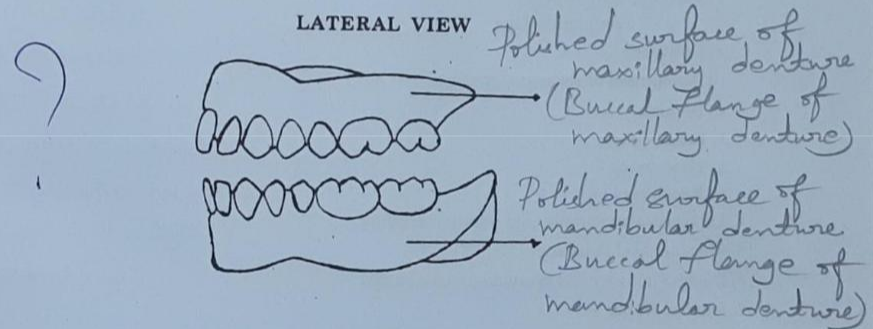
  
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# COMPLETE DENTURE

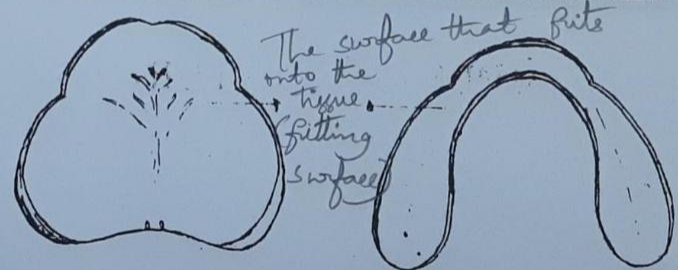
## OCCLUSAL VIEW



## LATERAL VIEW



## IMPRESSION SURFACE VIEW / TISSUE SURFACE VIEW



Label the Diagrams

*Prayasa*

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EXERCISE NO. 2

CLINICAL AND LABORATORY STEPS IN FABRICATION OF COMPLETE DENTURE

1. Examination, Diagnosis, Prognosis and Treatment Planning
2. Primary impression
3. Primary cast / Diagnostic Cast
4. Special/Custom tray
5. Final impression / Secondary impression / Master Impression
6. Final casts / Secondary impression / Master Impression
7. Temporary record base with occlusal rims
8. Jaw relation and selection of teeth
9. Transfer of jaw relation to the Mean Value articulator
10. Arrangement of artificial teeth
11. Waxing and carving
12. Try-in of waxed up dentures
13. Processing of dentures
  - a) Sealing of waxed up dentures to cast.
  - b) Flasking -base flasking  
-counter flasking
  - c) Dewatering
  - d) Application of separating media
  - e) Packing
  - f) Bench curing
  - g) Heat curing
  - h) Bench curing
14. Laboratory remounting and selective grinding
15. Finishing and Polishing
16. Denture delivery and instruction to the patient.
17. Patients Recall

UNDERLINE THE LABORATORY STEPS IN RED (Pencil)

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EXERCISE NO. 3 (A)

ANATOMICAL LANDMARKS

ANATOMICAL LANDMARKS OF PATIENT'S MAXILLARY EDENTULOUS ARCH AND THEIR CORRELATION WITH THE MAXILLARY EDENTULOUS CAST

1. LABIAL FRENUM
2. LABIAL VESTIBULE
3. BUCCAL FRENUM
4. BUCCAL VESTIBULE
5. DISTOBUCCAL AREA
6. MAXILLARY TUBEROSITY
7. HAMULAR NOTCH
8. FOVEA PALATINE
9. INCISIVE PAPPILLAE
10. RESIDUAL ALVEOLAR RIDGE
11. POSTERIOR PALATAL SEAL
12. MIDPALATINE RAPHAEE
13. PALATAL RUGAE

9

QUESTIONS - Exercise No. 3 (A) :-

1. Mention the primary stress bearing areas in maxilla ?

- Alveolar ridge
- Slopes of hard palate on either side of palatal raphe
- Hard palate

2. Mention the primary relief areas in maxilla ?

- ▶ Incisive papilla
- ▶ Mid-palatine raphe
- ▶ Fovea palatine
- ▶ Palatine torus (Sharp bony prominence)
- ▶ Rugae and cuspoid eminence

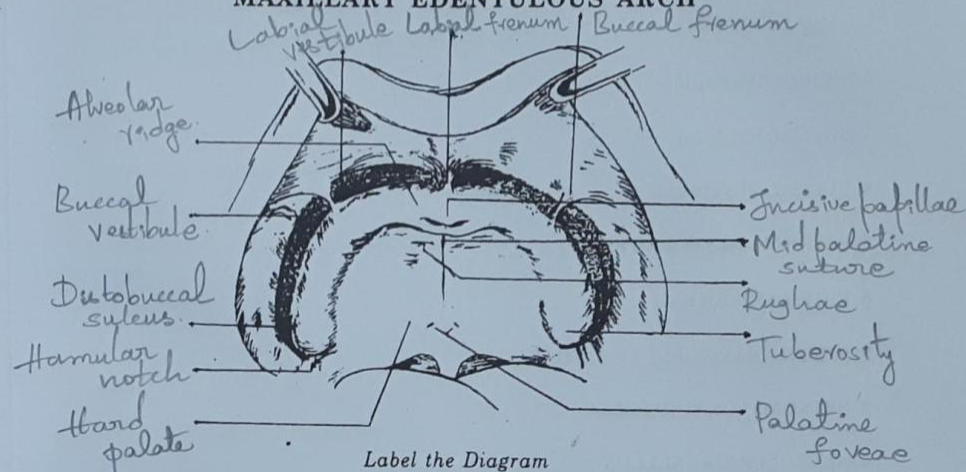
3. Mention the denture limiting areas in maxilla ?

- \* Labial frenum
- \* Labial vestibule
- \* Buccal frenum
- \* Buccal vestibule
- \* Hamular notch
- \* Posterior palatal seal area
- \* Fovea palatine

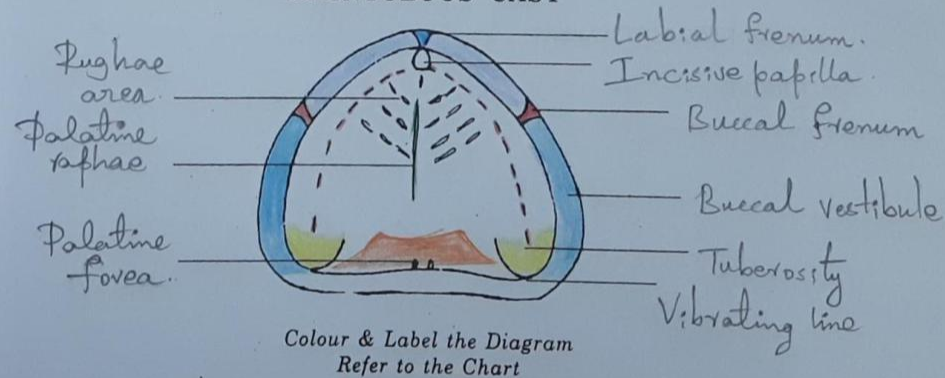
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INTRA-ORAL ANATOMICAL LANDMARKS OF THE MAXILLARY EDENTULOUS ARCH



SURFACE LANDMARKS OF THE MAXILLARY EDENTULOUS CAST



EXERCISE NO. 3 (B)  
ANATOMICAL LANDMARKS OF PATIENTS MANDIBULAR EDENTULOUS ARCH AND THE  
CORRELATION WITH THE MANDIBULAR EDENTULOUS CAST

1. LABIAL FRENUM
2. LABIAL VESTIBULE
3. BUCCAL FRENUM
4. BUCCAL VESTIBULE
5. RESIDUAL ALVEOLAR RIDGE
6. RETRO-MOLAR PAD
7. PTERYGOMANDIBULAR RAPHAE
8. RETROMYLOHYOID FOSSA
9. ALVEOLINGUAL SULCUS
10. LINGUAL FRENUM
11. BUCCAL SHELF AREA
12. PREMYLOHYOID EMINENCE
13. MASSETERIC NOTCH AREA
14. TONGUE

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QUESTIONS - Exercise No. 3 (B) :-

1. Mention the primary stress bearing areas in mandible ?

- \* Buccal shelf area.
- \* Retromolar pad.

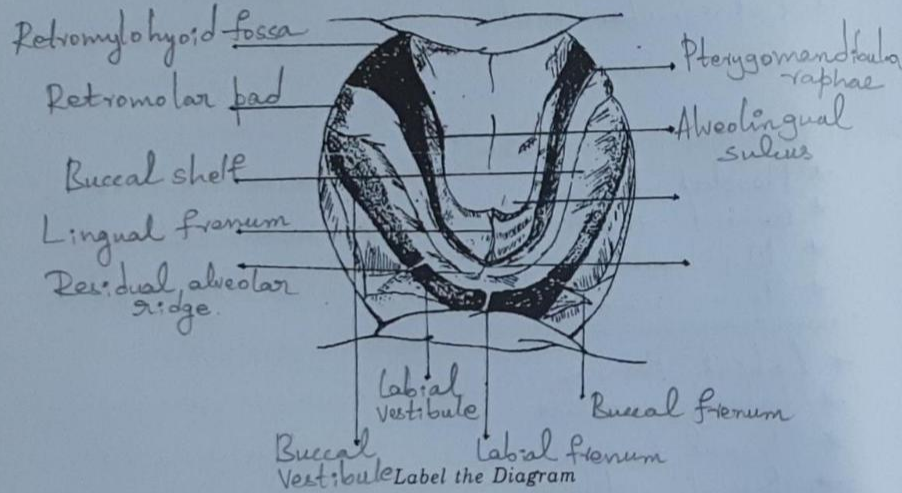
2. Mention the primary relief areas in mandible ?

- \* Mental foramen
- \* Gonial tubercle
- \* Mylohyoid ridge
- \* Torus mandibularis.

3. Mention the denture limiting areas in mandible ?

- \* Labial frenum
- \* Labial vestibule
- \* Buccal frenum
- \* Buccal vestibule
- \* Lingual frenum
- \* Alveolingual sulcus
- \* Retromolar pad
- \* Pterygomandibular raphe.

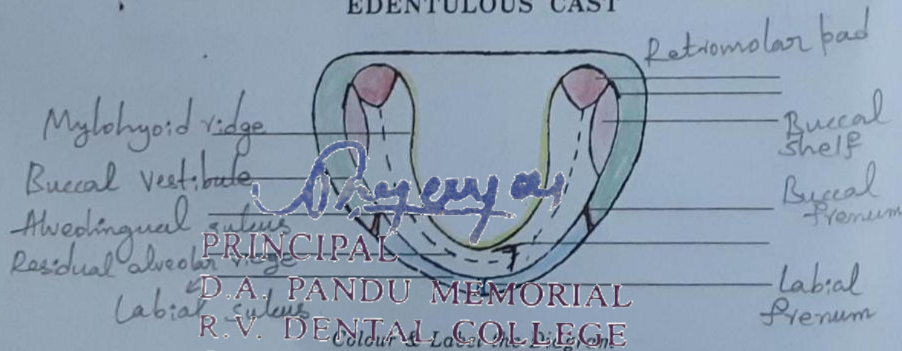
### INTRA-ORAL ANATOMICAL LANDMARKS OF THE MANDIBULAR EDENTULOUS ARCH



### EXERCISE 3 - C

Sl. No.	EXERCISE	GRADE	SIGNATURE
1.	Marking of anatomical landmarks on Maxillary and Mandibular cast		
2.	Marking of anatomical landmarks on Mandibular cast		

### SURFACE LANDMARKS OF THE MANDIBULAR EDENTULOUS CAST



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EXERCISE NO. 4  
PRIMARY IMPRESSION OF EDENTULOUS CAST

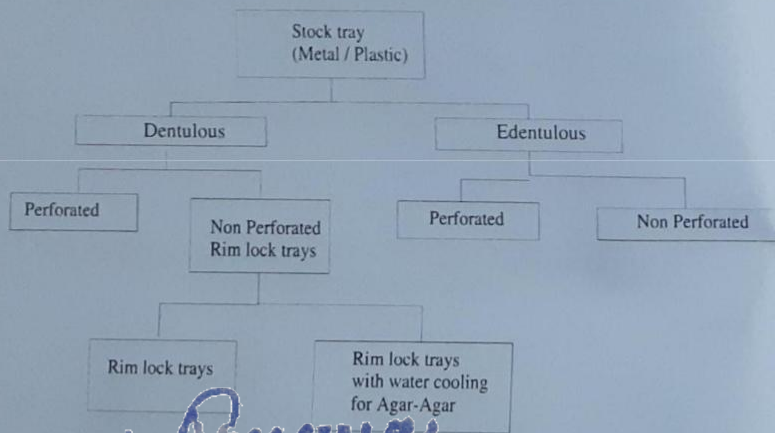
DEFINITION OF IMPRESSION :-

A complete denture impression is a negative registration of entire denture bearing, stabilizing and border seal areas present in the edentulous mouth which is recorded when the plastic material becomes relatively hard or set while it contact with tissues.

DEFINITION OF TRAY :-

A receptacle, usually made from metal that holds, directs and confines a impression material while impression is being made.

TYPES OF STOCK TRAYS :-



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MATERIALS AND INSTRUMENTS :-

1. 1 1/2 cake of medium fusing impression compound
2. Vaseline
3. Large rubber bowl
4. Hot water (not more than 65°C)
5. Wax knife
6. Edentulous non perforated stock trays
  - a) Maxillary
  - b) Mandibular

PROCEDURE FOR MAXILLARY IMPRESSION :-

1. Select a maxillary edentulous stock metal tray which covers most of the anatomical portion of the cast by keeping the tray 2mm away from tissue surface of the cast.
2. Lightly grease the surfaces of the cast with Vaseline.
3. Coat the under surface of hard rubber bowl with Vaseline to prevent the softened compound from sticking to the bowl.
4. Break the impression compound into small pieces and place it in the bowl with warm water to soften it.
5. Knead the material and load it on the tray.
6. Place the loaded tray on the cast and press it until material extends into the sulcus of the cast. Press the extruded material at the sulcus to the cast.
7. Allow the material to harden.
8. Remove the impression from the cast.

PROCEDURE FOR MANDIBULAR IMPRESSION :-

Follow the similar procedure for the mandibular impression in mandibular stock metal tray.



QUESTIONS :-

1. What material have you used for making primary impression of edentulous die?

Impression compound.

2. What do you mean by fusion temperature of impression compound?

Indicates definite reduction in plasticity of materials during cooling. When impression compound is heated in a hot water bath. The material loses its hardness at 39°C. On further heating ~ 45°C the material softens to plastic mass.

3. What is the temperature of water used for manipulating impression compound during primary impression making?

65°C

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Sl. No.	EXERCISE	GRADE	SIGNATURE
1.	Impression of Edentulous Maxillary model	} B	<i>[Signature]</i>
2.	Impression of Edentulous Mandibular model		
3.	Impression of Edentulous Maxillary model	} B	<i>[Signature]</i>
4.	Impression of Edentulous Mandibular model		
5.	Thumb Impression with impression compound	} B	<i>[Signature]</i>
6.	Lining of thumb impression with ZOE		

## EXERCISE NO. 5

### CAST

#### DEFINITION OF CAST :-

The positive reproduction of the form and shape of the denture bearing, denture stabilizing and border tissues of the maxilla / mandible usually made in a gypsum product. A cast is made from an impression (negative replica) of these tissues.

#### TYPES OF CASTS :-

1. Diagnostic cast / Primary cast / Preliminary cast (Type II Gypsum)
2. Master Cast / Final Cast (Type III Gypsum)

#### PARTS OF A CAST :-

1. Impression surface
2. Base
3. Land area / Lodge.

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### PREPARATION OF PRIMARY CAST FROM PRIMARY IMPRESSION

#### MATERIALS AND INSTRUMENTS :-

1. Edentulous Primary impression of the Primary cast.
2. Dental Plaster (Type II)
3. Large Black Stiff Rubber Bowl
4. Wax knife
5. Plaster Spatula
6. Plaster Knife
7. Ceramic tile

#### PROCEDURE :-

##### STEP 1 : POURING OF THE IMPRESSION BY INVERSION METHOD

1. In a large black stiff rubber bowl, take measured quantity of water, add dental plaster by sprinkling it gradually till no free water is visible and water is completely saturated with dental plaster.
2. Spatulate the mix with a straight plaster spatula and vibrate the bowl to release air entrapped in it. Spatulate till you get a creamy mix.
3. Pour the dental plaster from one end of the impression. Tap the impression while pouring to avoid entrapment of air. Continue to add plaster till it fills the impression.
4. Pile the remaining plaster in the bowl onto the tile and invert the poured impression over the pile of plaster.
5. Mould plaster around the impression to cover the borders of impression.
6. Allow initial set to take place. Remove the excess material beyond the borders of the impression and allow the material to set completely.

## STEP II : RETRIEVAL OF THE CAST.

1. Take warm water (not more than 65°C) in a black stiff rubber bowl.
2. Immerse the poured impression in warm water for 5 minutes.
3. Allow the compound to soften and remove the softened material from the cast.
4. Check the cast for anatomical details or defects.
5. Retrieve the mandibular cast in same manner.

## STEP III : FINISHING OF THE CAST

1. Using a hematiline pencil, outline the depth of sulcus (labial and buccal) of the maxillary cast. The posterior end of the maxillary cast, should be marked, from the depth of hamular notch on one side through the fovea palatine, to the hamular notch on the other side.
2. Mark the depth of sulcus (labial, buccal and lingual) of the mandibular cast. The posterior end is marked beyond the retromolar pad including these pads on both the sides of the arch.
3. After marking the depth of the sulcus, the cast is trimmed using a plaster knife in such a way that the ledge of the cast is 3-4 mm high and 3-4 mm wide.
4. The base of the cast is 15 mm thick and such that the ridge crest is more or less horizontal anteriorly and posteriorly.
5. Using a plaster knife, the cast is trimmed and smoothed.

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## QUESTIONS:-

1. What is the purpose of the primary cast ?

- ▶ To measure the depth and extent of undercuts
- ▶ Determine the path of insertion
- ▶ Evaluate size and contour of arch

2. Primary Cast is poured in which material ?

Dental plaster (Type II).

3. What should be the dimension of the base of the cast ?

The base of the cast is 15 mm thick and such that the ridge crest is more (+) less horizontal anteriorly and posteriorly.

SL. No.	Work.	Grade	Signature
①	Preliminary impression of dentulous maxillary & mandibular model using Alginate	(B+1)	Anusale
②	Polishing of master cast with dental stone.	(B+)	Anusale 10/3/21

**EXERCISE NO. 5**

**PREPARATION OF EDENTULOUS CASTS**

SL. NO.	WORK	GRADE	SIGNATURE
1.	a. MAXILLARY	(B)	[Signature]
	b. MANDIBULAR		
2.	a. MAXILLARY		
	b. MANDIBULAR		

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**EXERCISE NO. 6**

**SPECIAL TRAY**

**DEFINITION OF SPECIAL TRAY OR CUSTOM TRAY :-**

Special Tray is a Customized tray made on a Primary cast, that holds, directs and confines an impression material, to make a Definitive / Final impression.

**MATERIALS USED FOR SPECIAL TRAY :-**

1. Base Plate (Shellac)
2. Base Plate Reinforced with
  - a) Compound
  - b) Wire
  - c) Self-cured acrylic resin
3. Acrylic Resin----
  - a) Self cured
  - b) light cured

## CLASSIFICATION OF SPECIAL TRAYS :-

### I BASED ON TYPE OF SPACER

- a) WITH SPACER      \_\_\_\_\_ FULL SPACER  
                                 \_\_\_\_\_ PARTIAL SPACER
- b) WITHOUT SPACER (CLOSE FITTING TRAY)

### II BASED ON MATERIALS USED :-

1. Base plate (Shellac)
2. Base plate reinforced with
  - a) WIRE
  - b) COMPOUND
  - c) SELF CURED RESIN
3. ACRYLIC RESIN      \_\_\_\_\_ CHEMICAL CURED  
                                 \_\_\_\_\_ LIGHT CURED

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## SPECIAL TRAY IN BASE PLATE :-

### PROCEDURE:

1. Mark the outline on the maxillary and mandibular primary cast for the special tray i.e., 2mm short of the sulcus.
2. Immerse the cast in water for 5min , to prevent the base plate from sticking to it.
3. Soften and press the base plate to intimately contact the cast. Commence the adaptation from the center of the palate. Press the base plate at the periphery into the labial and buccal sulci.
4. Cut excess of base plate at the periphery beyond the sulcus outline and roll it. In the posterior area the base plate is not rolled. It is filed to maintain a thin periphery in the posterior area.
5. After the adaptation of the base plate is completed, check the peripheries to confirm the outline and provide enough relief in the frenum area.
6. Use the excess base plate to make the handle prepare a handle 15mm high, 10mm wide and 5mm thick. Attach the handle to the special tray in the midline with slight labial tilt.
7. Remove the tray from the cast and check the border extensions and place it back on the cast
8. To reinforce the special tray orthodontic wire can be adapted over the crest of the ridge and then base plate is adapted over that.

## SPECIAL TRAY IN SELF CURED ACRYLIC RESIN:

1. Mark the midline of the cast coinciding with labial frenum.
2. Mark the outline on the maxillary and mandibular primary cast for the special tray i.e., 2mm short of the sulcus.
3. For partial spacer :  
Maxilla : Draw a T shape space to outline the ridge crest and mid palatal raphae.  
Mandible : Spacer should be outlined only over the crest of the ridge.
- For full spacer :  
Maxilla : Draw a full spacer outline 2mm short of the outline marked.  
Posterior palatal seal area should not be covered.

Mandible : Draw a full spacer outline 2mm short of the outline marked. Buccal shelf area should not be covered.

4. Soften the wax spacer in lukewarm water and adapt it on the cast within the outline marked. Place a sheet of thin foil over the wax spacer. The foil facilitates the removal of wax spacer and also prevents the wax spacer from melting due to the exothermic heat generated during the polymerization of the acrylic resin.
5. Apply separating media with the camel hair brush on the exposed portion of the cast to form a layer which will prevent the acrylic resin from adhering to the cast.
6. Take measured quantity of self cured resin monomer in the cup. The self cured / tray powder is added to the liquid till it saturates. It is mixed using a wax knife to get a homogeneous mix. The cup is covered with the saucer, to prevent evaporation of monomer.
7. The mix is allowed to lose its stickiness before it is removed from the container. When mix reaches dough stage remove the material, knead and adapt well on the cast to form a tray. Take care to limit the material within the outline marked to prevent trimming of tray later on. Cut away any excess material beyond the peripheral outline with a sharp carver or scissors.
8. Mold the excess material to prepare a handle of 12mm height 10mm width and 5mm thickness and attach it in the centre of the tray coinciding with the midline. No tilt is given to the handle for mandible. For maxilla handle should be kept at 45°.
9. In case where tin foil is not used over the wax spacer, wax will melt due to the heat generation during polymerization. To prevent this, apply pressure on initial set tray on the cast by holding it and immersing it in a bowl of cold water.
10. Once the material is set, the tray is removed and if trimming is required carry out with an acrylic trimmer, such that the tray borders are smooth and just short of the peripheral outline.
11. The tray is placed back on the cast.

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PREPARATION OF CUSTOM TRAY WITHOUT SPACER  
SHELLAC BASEPLATE

SL. NO.	WORK	GRADE	SIGNATURE
1.	a. MAXILLARY		
	b. MANDIBULAR		

**PREPARATION OF CUSTOM TRAY WITH PARTIAL SPACER IN  
CHEMICAL CURED ACRYLIC RESIN**

SL. NO.	WORK	GRADE	SIGNATURE
1.	a. MAXILLARY		
	b. MANDIBULAR		

**PREPARATION OF CUSTOM TRAY WITH FULL  
SPACER IN CHEMICAL CURED ACRYLIC RESIN**

SL. NO.	WORK	GRADE	SIGNATURE
1.	MANDIBULAR		

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EXERCISE NO. 7

PREPARATION OF FINAL CAST / MASTER CAST

DEFINITION OF FINAL CAST :-

An accurate replica of the residual ridge area and associated structures, reproduced from a final impression, upon which a dental prostheses will be fabricated.

CASTS ARE POURED IN DENTAL STONE BY TWO METHODS:-

- A) BOXING IN METHOD
- B) TWOSTAGE POURING METHOD

MATERIALS AND INSTRUMENTS :-

1. Final impression in special tray.
2. Stiff rubber bowl.
3. Straight Plaster spatula.
4. Plaster knife.
5. Beading wax.
6. Boxing wax.
7. Dental stone (Type III Gypsum)

## PROCEDURE :-

### A) BEADING & BOXING METHOD

1. The border of the impression are beaded with thin strips of beading wax which is placed 2mm beyond the sulcus extension. It is kept 4mm wide.
2. Boxing wax sheets are sealed to beading wax such that the entire impression is enclosed to form a box (Boxed-in).
3. Dental stone (type III Gypsum) is mixed in a stiff rubber bowl to form a creamy mix. It is poured from one end of the impression to gradually fill the impression to the height of the boxed wax. The assembly is vibrated to avoid air entrapment.
4. The dental stone is allowed to completely set.
5. In addition to the above mentioned procedure. In case of mandibular impression a tongue shaped form is placed along the lingual border to provide the tongue space.

### B) TWO STAGE POURING METHOD :-

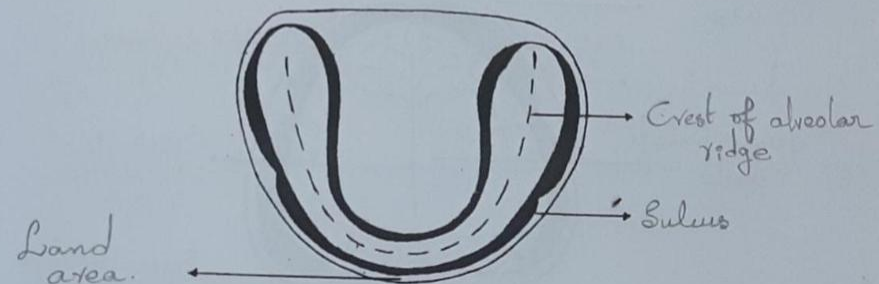
1. Dental stone is mixed in a stiff rubber bowl to form a creamy mix.
2. A small quantity is poured from one end of the impression to gradually cover the entire impression surface. The assembly is vibrated to prevent air entrapment.
3. Remaining stone is poured to cover the border of the impression. Few elevations are made over the stone for anchorage of the base. ALLOW STONE TO SET completely.
4. Prior to pouring the base, the dental stone is made wet with water to allow the dental stone to adhere to it while forming the base. Mix the dental plaster / dental stone and pile it on the tile. The impression with the set dental stone is inverted over the plaster.
5. Shape the soft plaster to the desired height and width to form the base.
6. Once the base is set, the impression is immersed in warm water to retrieve the cast.
7. Trim the cast to the desired height of the base and height and width of ledge.

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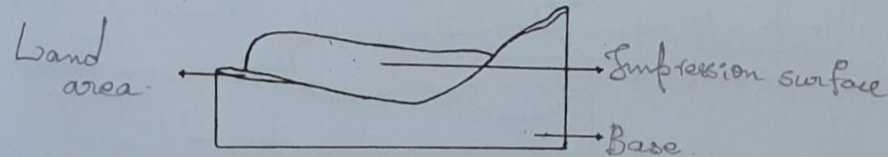
## FINAL CAST - MANDIBULAR

### OCCLUSAL VIEW



Label the Diagram

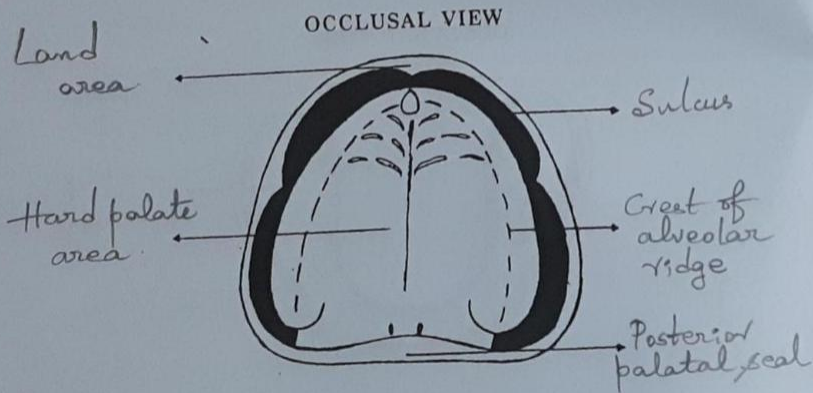
### LATERAL VIEW



Label the Diagram

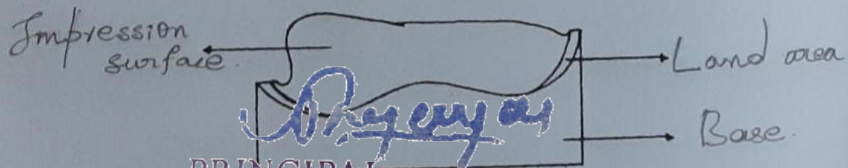


FINAL CAST - MAXILLARY



Label the Diagram

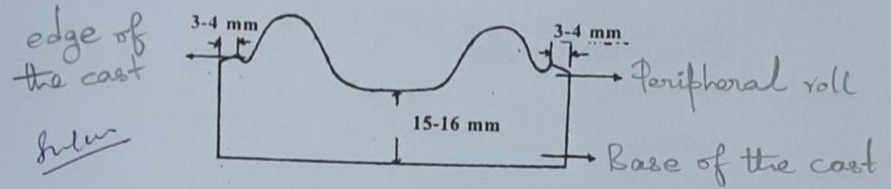
LATERAL VIEW



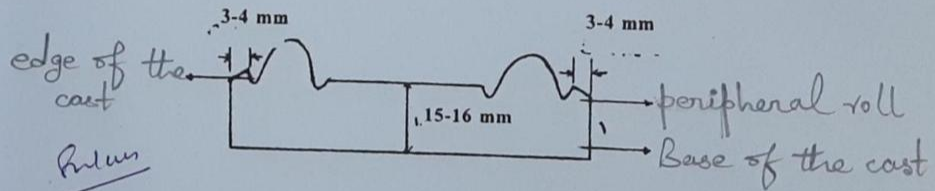
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PRIMARY CAST - MAXILLARY



PRIMARY CAST - MANDIBULAR



Label the Diagram

PREPARATION OF FINAL CAST :-

SL NO.	WORK DONE	GRADE	SIGNATURE
1.	PREPARATION OF FINAL CAST BY BEADING & BOXING METHOD MAXILLARY		
2.	MANDIBULAR		
1.	PREPARATION OF FINAL CAST BY TWO STAGE PRORING METHOD MAXILLARY		
2.	MANDIBULAR		

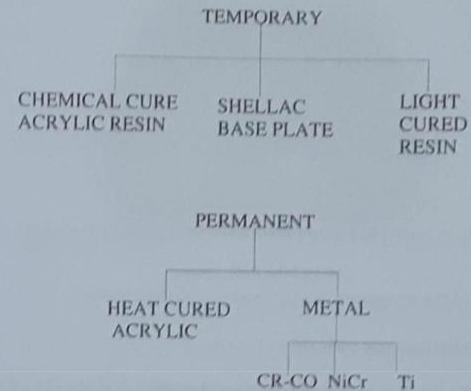
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EXERCISE NO. 8  
 FABRICATION OF RECORD BASES

DEFINITION :-

It is a temporary form, representing the base of a denture, that is used for making maxillomandibular (jaw) relation records for arranging teeth and taking try-in.

CLASSIFICATION:



## FABRICATION OF TEMPORARY DENTURE BASES:

### MATERIALS AND INSTRUMENTS :-

1. Master cast.
2. Shellac base plates.
3. Small scissors.
4. Wax knife.
5. Wax spatula.
6. Half round file.
7. Copying pencil.

### PROCEDURE :-

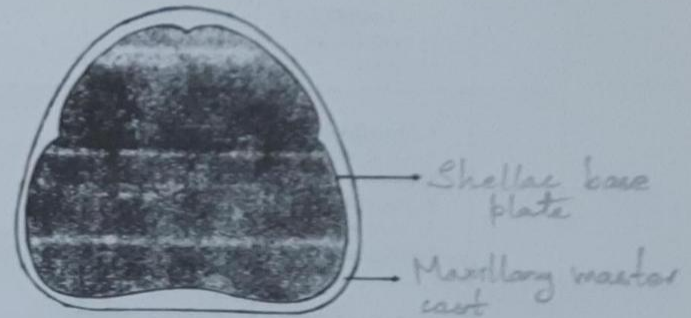
1. Soak the master casts in water, to prevent the shellac base plate from sticking to the casts.
2. Mark the extension of the temporary denture base on the master cast.
3. Soften and adapt the shellac base plate over the cast.
4. Cut the excess beyond the outline and roll the margin on the labial and buccal aspects.
5. File and flush the margins on the base plate on the posterior area of both maxillary mandibular record base.
6. Check the record bases properly for extension and adaptation.

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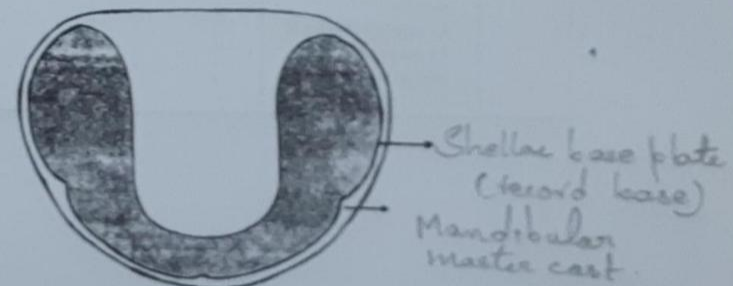
## TEMPORARY RECORD BASE

### MAXILLARY



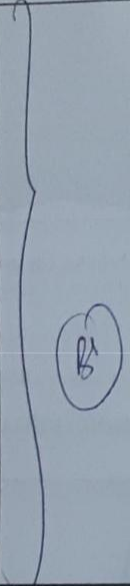
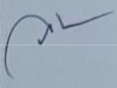
Label the Diagram

### MANDIBULAR



Label the Diagram

**PREPARATION OF RECORD BASE**

SL. NO.	WORK	GRADE	SIGNATURE
1.	a. MAXILLARY by using Shellac base plate b. MANDIBULAR by using Shellac base plate		
2.	a. MAXILLARY by using self cure acrylic b. MANDIBULAR by using self cure acrylic		
3.	a. MAXILLARY by using self cure acrylic b. MANDIBULAR by using self cure acrylic		
4.	a. MAXILLARY by using self cure acrylic b. MANDIBULAR by using self cure acrylic		

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EXERCISE NO. 9  
FABRICATION OF OCCUSAL RIMS

DEFINITION :-

Occusal rims are used as provisional substitutes for the planned complete dentures and are used to record jaw relation.

PURPOSE OF OCCUSAL RIMS:

They are used to establish :

- The level of occusal plane.
- The arch form.
- The maxillomandibular relation records  
(vertical and horizontal jaw relationship and estimated interocclusal distance)

MATERIAL AND INSTRUMENTS :

- Final casts with record bases.
- Modeling wax sheets.
- Wax knife.
- Straight plaster spatula.

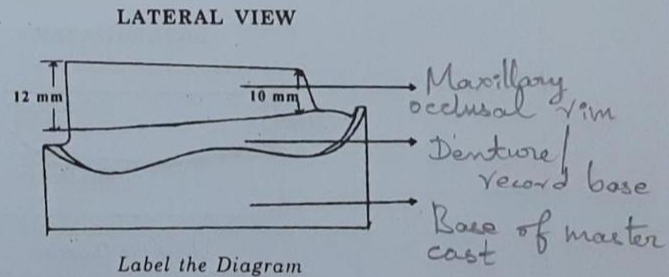
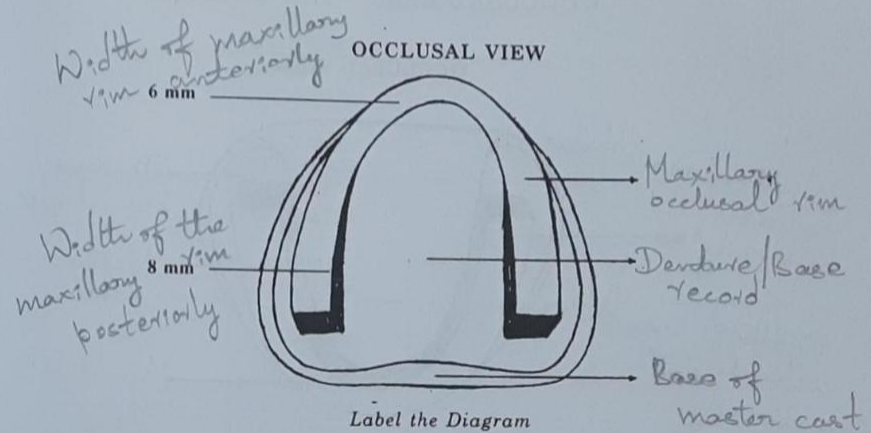
**PROCEDURE :-**

1. Use full length of the wax sheet for maxillary wax rims and 3/4th length of wax sheet for mandibular wax rims.
2. Soften the wax sheet from the edge and roll it gradually to form a soft roll.
3. Bend the soft roll of the wax in to a 'U' shaped form and place it over the ridge crest area of the record bases. Mould the wax onto the slopes of the ridge. Seal the wax all around the record bases with a wax knife.
4. Mark a vertical line at the base of both (maxillary and mandibular) casts at the midline and 2cms behind the buccal freni on both the sides. Measure and mark the height of the wax rim along these lines. Adjust the wax rims to get the specified height for normal teeth arrangement.
5. After the mandibular rim is prepared in the similar manner and its height adjusted to the specification, take care so that the height of the rim is not higher than anterior 2/3rd of retromolar pad.
6. The maxillary rim has a 2° - 5° labial tilt. The mandibular rim is straight anteriorly.
7. Polish the wax with soap and water to obtain a shine.

	ANTERIOR		POSTERIOR	
	HEIGHT	WIDTH	HEIGHT	WIDTH
MAXILLARY	22mm from the Sulcus	4-6mm	18mm from the Sulcus	6-8mm
MANDIBULAR	18mm from the Sulcus	4-6mm	2/3 <sup>rd</sup> of Retromolar pad	6-8mm

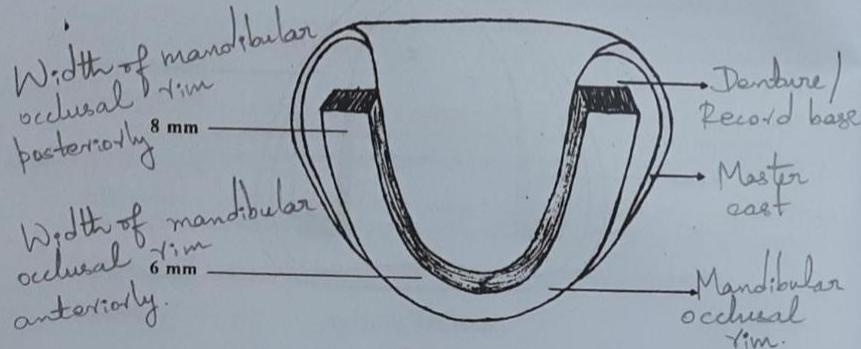
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**OCCLUSAL RIMS MAXILLARY**



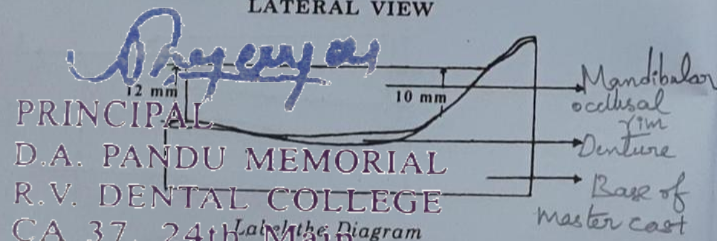
## OCCLUSAL RIMS - MANDIBULAR

OCCLUSAL VIEW



Label the Diagram

LATERAL VIEW



Label the Diagram

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## FABRICATION OF WAX OCCLUSAL RIMS:

SL NO	WORK DONE	GRADE	SIGNATURE
1	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
2	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
3	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
4	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
5	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
6	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
7	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
8	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
9	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		

FABRICATION OF WAX OCCLUSAL RIMS:

10	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
11	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
12	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
13	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
14	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		
15	MAXILLARY OCCLUSAL RIM		
	MANDIBULAR OCCLUSAL RIM		

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EXERCISE NO.10  
 ARTICULATORS

DEFINITION :-

An Articulator may be defined as a mechanical device that represents the temporo-mandibular joint and jaw members to which maxillary and mandibular casts may be attached to simulate jaw movements.

CLASSIFICATION:-

A. Based on theories of occlusion:

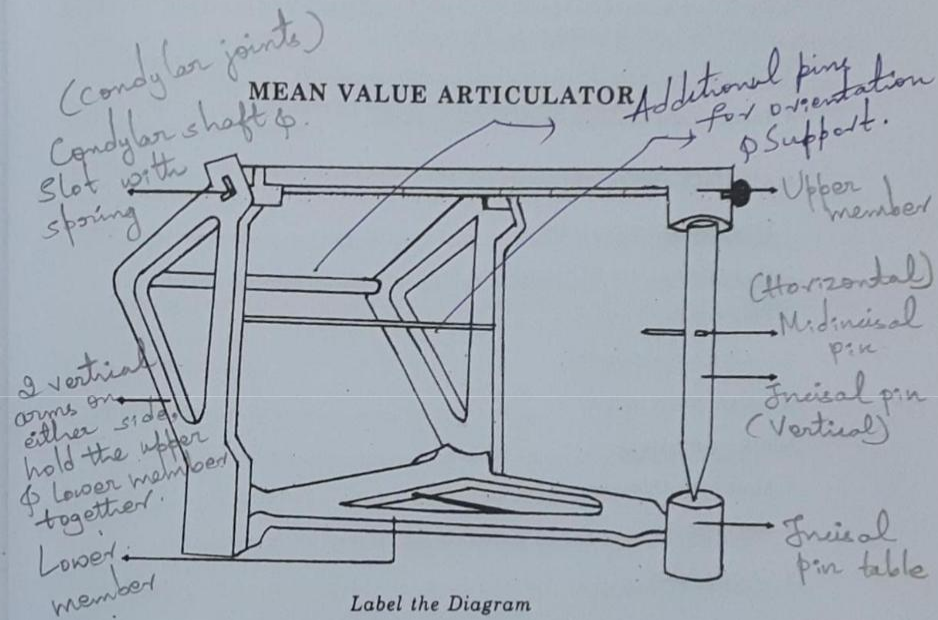
1. Bonwill Theory.
2. Conical Theory.
3. Spherical Theory.

B. Based on adjustability of articulators:

1. Non-adjustable
  - a. Simple hinge
  - b. Hinge with fixed condylar control
    - Mean value articulator  
by Gysi
2. Semi-adjustable
  - a. Arcon : Arcon articulators are those which contains the condylar path elements within its upper member and the condylar elements within the lower member.
    - Bergstorm derived the name ARCON from ARticulator and CONdyle.
    - examples : Hanau Arcon H2  
Whip mix.
  - b. Non Arcon : Non Arcon articulators contains condylar elements in its upper member.
    - examples : Hanau H2,  
Dentatus.
3. Fully-adjustable
  - examples : Denar  
TMJ

PARTS OF MEAN VALUE ARTICULATORS:

1. Upper member.
2. Lower member.
3. Vertical incisal pin.
4. Horizontal incisal pin.
5. Incisal table.
6. Condylar joints : a. Condylar guidance slots  
b. Condylar elements.
7. Condylar posts



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EXERCISE NO. 11


TRANSFER OF JAW RELATION TO THE ARTICULATOR

MAINTENANCE OF THE ARTICULATOR :

1. Clean and oil articulator.
2. Check the position of the vertical incisal pin. The upper end of the incisal pin should flush with the upper arm of the articulator.
3. The lower end of the incisal pin should touch the incisal table.
4. The horizontal incisal pin should be in its position.

MATERIALS AND INSTRUMENTS:-

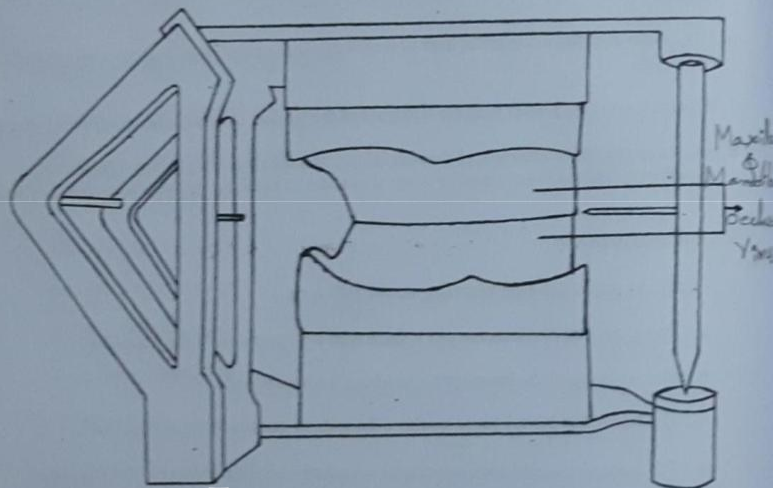
1. Final casts with occusal rims.
2. Dental plaster (Type II Gypsum)
3. Petroleum jelly Vaseline.
4. Carding or modeling wax.
5. Straight plaster spatula.
6. Black stiff rubber bowl.
7. Mean value Articulator
8. Half round file.
9. Copying Pencil.

  
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PROCEDURE :-

1. Prepare V- shaped notches in the base of the cast using a half round file to facilitate laboratory remounting procedures. The notches should be wide shallow and sharp.
2. Seal the occusal rims in a Class I relationship. Mark the midline, canine line and high lipline.
3. Seal the temporary bases to the cast to prevent the movement of the record base on the cast.
4. Lubricate the bases of both maxillary and mandibular casts with a thin layer of petroleum jelly.
5. Place lumps of soft carding wax or softened modeling wax at three points on the lower member and place the cast with sealed wax rims on the wax, support them such that they are centered when viewed from the top. When viewed from the side, the occusal plane of the occusal rims should be at the midplane of the articulator. The horizontal incisal pin should touch the midline marked on the occusal rims.
6. Mix plaster and place it over the base of maxillary cast to attach it to the upper member of the articulator.
7. Remove the excess plaster after the initial set of the plaster. Do the further contouring after final set.
8. Invert the articulator and remove the wax lumps. Mix the plaster and place it between the mandibular cast and lower member of the articulator in the same manner as that for the maxillary cast.
9. Clean the articulator.
10. Check the articulator after mounting for the following :
  - a. The upper end of the incisal pin is flush with the upper arm of the articulator.
  - b. The lower tip of the incisal pin is touching the incisal table.
  - c. The horizontal incisal pin is touching the midline marked on the occusal rim.
  - d. The occusal plane of the occusal rims coincides with the midplane of the articulator.
11. Separate the two occusal rims by breaking the seal. Transfer the midline onto the plaster attaching the cast to the articulator.
12. Inscribe your name and roll no. on plaster with copying pencil.

## TRANSFER OF JAW RELATION TO MEAN VALUE ARTICULATOR



*Principals Diagram*

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## EXERCISE NO. 12

### SELECTION OF TEETH FOR COMPLETE DENTURES

#### MATERIALS USED FOR ARTIFICIAL TEETH

1. Acrylic
2. Composite
3. Ceramic

#### CUSP ANGULATION OF POSTERIOR TEETH

1. Anatomical (Above  $30^\circ$ )
2. Semi anatomical ( $20^\circ$ )
3. Non anatomical ( $0^\circ$ )

#### SELECTION OF TEETH FOR PRECLINICAL SET UP :-

Anterior teeth : Mesio-distal width- To fit within the canine line.

Inciso-cervial length- To fit within the high lip line and occlusal surface of the rim.

Posterior teeth : Mesio-distal width- To fit between distal surface of canine to

. Anterior portion of maxillary tuberosity in maxillary arch.

. Retromolar pad in mandibular arch.

Bucco-lingual width- Within the Parson's triangle which is from canine at apex and retromolar pad at the base of triangle.

## ARRANGEMENT OF ARTIFICIAL TEETH

## MATERIAL AND INSTRUMENTS :

1. Teeth set
2. Bowl with cold water
3. Wax knife
4. Wax spatula
5. Lacrons carver
6. Modeling wax

## SEQUENCE OF ARRANGEMENT OF TEETH

- |                          |            |
|--------------------------|------------|
| 1. Maxillary anteriors   | Right side |
| 2. Maxillary anteriors   | Left side  |
| 3. Mandibular anteriors  | Right side |
| 4. Mandibular anteriors  | Left side  |
| 5. Maxillary posteriors  | Right side |
| 6. Maxillary posteriors  | Left side  |
| 7. Mandibular posteriors | Right side |
| 8. Mandibular posteriors | Left side  |

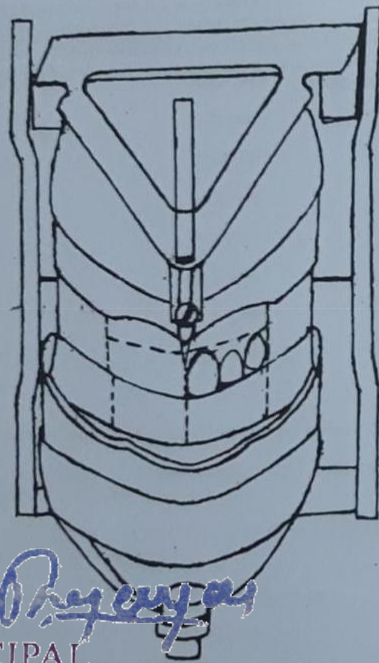
## PROCEDURE :-

1. Place the articulator with the mounted casts in cold water for 5 mins.
2. Remove the vertical incisal pin from the articulator and place it in a reverse position for clearer view while arranging the anterior teeth.
3. Remove half the height of the occusal rim and half of the labial aspect of each quadrant with a carver as you progress with teeth arrangement.
4. Soften the wax with a warm spatula to peel the wax in specific area.
5. Arrange the anterior teeth to follow the contour of occusal rim.
6. Position the central, lateral and canine keeping in mind their individual positions as shown in the chart.
7. Fix the position of each tooth by clipping it to the wax.
8. In the same manner arrange central, lateral and canine on the other side.
9. Check the individual position of the teeth in relation to the glass slab.
10. Reposition the incisal pin such that the upper end of incisal pin is flush with the upper arm of the articulator and tip is in contact with the lower arm.

11. Arrange the mandibular anteriors with the minimum of 2mm of vertical and 2mm of horizontal overlap following the arch form of the maxillary anteriors. Follow the position of the teeth according to the chart.
12. Arrange the maxillary posterior teeth following the positions as per the chart.
13. Arrange all the upper posteriors in a straight line with their central grooves following on the crest of mandibular ridge with the articulator in closed position.
14. Check the mesio-distal and bucco-lingual relation of the posterior teeth as per the chart.
15. In the same manner arrange the posterior teeth on the other side.
16. Arrange the mandibular 1st molar with its mesio-buccal groove coinciding with the mesio-buccal cusp of the maxillary 1st molar. Arrange the mandibular 2nd molar in relation to maxillary 2nd molar followed by the arrangement of 2nd premolar and lastly the 1st premolar. Occlusion of the maxillary posteriors is checked to see the maximum intercuspation from both buccal and lingual aspect.

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ANTERIOR VIEW OF THE MOUNTED OCCLUSAL RIMS ON  
MEAN VALUE ARTICULATOR

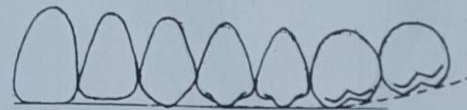


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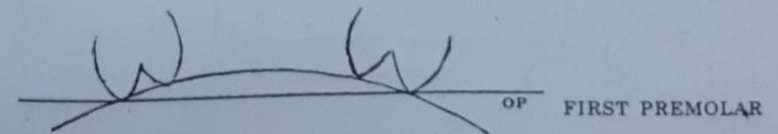
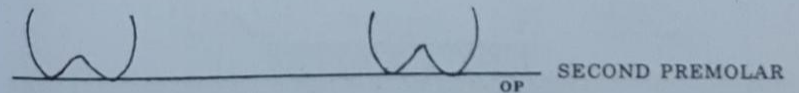
COMPENSATING CURVE

COMPENSATING CURVES when considered as a whole unit from two curves, an anteroposterior and a lateral curve.

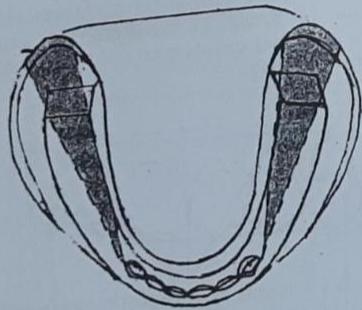
ANTERO POSTERIOR CURVE : Compensating curves are the artificial curves introduced into dentures in order to facilitate the production of balanced articulation; they are the artificial counterparts of the curves of Spee and Monson which are found in natural dentition.



LATERAL CURVES : In the natural dentition, there are two lateral curves, one involving the molar teeth (the curve of Monson), and the other involving the teeth anterior to the second premolars.



POUND'S TRIANGLE



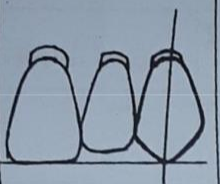
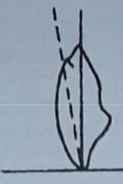

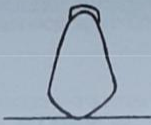
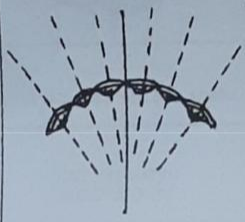
MAINTENANCE OF HEIGHT OF THE MANDIBULAR POSTERIOURS UPTO 2/3rd OF RETROMOLAR PAD




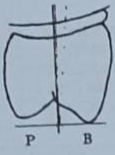

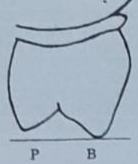
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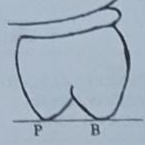
CHART OF NORMAL INDIVIDUAL POSITIONS OF TEETH :  
MAXILLARY ANETERIORS

	LABIO-LINGUAL INCLINATION	MESIO-DISTAL INCLINATION	RELATION TO OCCLUSAL PLANE	ROTATIONAL RELATIONSHIP
MAXILLARY CENTRAL 111	NO DEPRESSION AT THE NECK	PERPENDICULAR	ON THE OCCLUSAL PLANE TOUCH THE GLASS SLAB.	FOLLOW THE ARCH - FORM
MAXILLARY LATERAL 212	DEPRESSED AT THE NECK	DISTALLY TILTED	1mm ABOVE THE OCCLUSAL PLANE.	FOLLOW THE ARCH FORM.

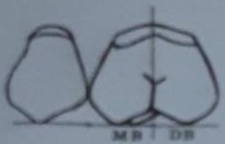



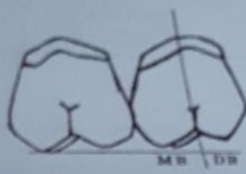

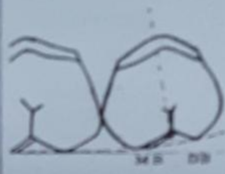

<p>MAXILLARY CANINES 2/2</p>	<p>PROMINENT NECK</p>	<p>STRAIGHT WITH NO TILT.</p>	<p>TIP OF CANINE CONTACTS THE OCCLUSAL PLANE</p>	<p>DISTAL HALF OF LABIAL FACE POINTING POSTERIORLY. ROTATED WITH MESIAL HALF IN LINE WITH THE LABIAL SURFACE OF LATERAL AND DISTAL HALF IN LINE WITH THE WAX RIM DISTALLY.</p>
				

MAXILLARY POSTERIORES

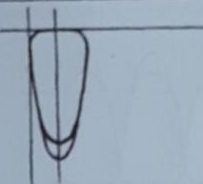


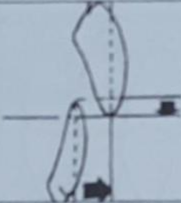

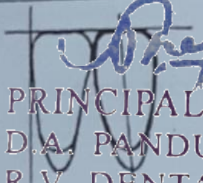

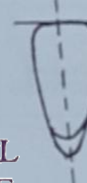
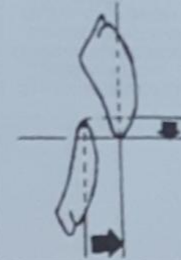

	<p>BUCCO-LINGUAL INCLINATION</p>	<p>MESIO-DISTAL INCLINATION</p>	<p>RELATION TO OCCLUSAL PLANE</p>
<p>MAXILLARY 1<sup>ST</sup> PREMOLAR 4/4</p>	<p>PALATALLY INCLINED</p>	<p>STRAIGHT</p>	<p>BUCCAL CUSP TOUCHES THE OCCLUSAL PLANE PALATAL CUSP 1 mm ABOVE THE OCCLUSAL PLANE</p>
			

<p>MAXILLARY 2<sup>ND</sup> PREMOLAR 4/5</p>	<p>PALATALLY INCLINED</p>	<p>STRAIGHT</p>	<p>BOTH THE CUSPS TOUCH THE OCCLUSAL PLANE</p>
			

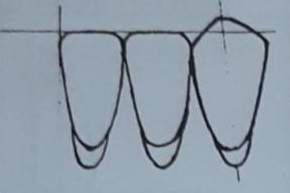


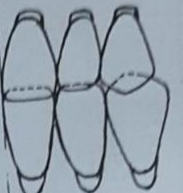

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<p>MAXILLARY 1<sup>ST</sup> MOLAR 6/6</p> 	<p>BUCCALLY INCLINED</p> 	<p>DISTALLY TILTED TO FOLLOW THE COMPENSATING CURVES</p> 	<p>BUCCALLY TILTED MESIOPALATAL CUSP TOUCH THE OCCLUSAL PLANE</p> 
<p>MAXILLARY 2<sup>ND</sup> MOLAR 7/7</p> 	<p>BUCCALLY INCLINED SLIGHTLY MORE THAN 1<sup>ST</sup> MOLAR</p> 	<p>DISTALLY TILTED TO FOLLOW THE COMPENSATING CURVES</p> 	<p>BUCCALLY TILTED - NO CUSP TOUCHES THE OCCLUSAL PLANE. - BUCCAL CUSPS ARE HIGHER THAN PALATAL CUSPS - DISTAL CUSPS ARE HIGHER THAN MESIAL CUSPS - MESIO-PALATAL CUSP IS THE LOWEST ON THE OCCLUSAL PLANE</p> 

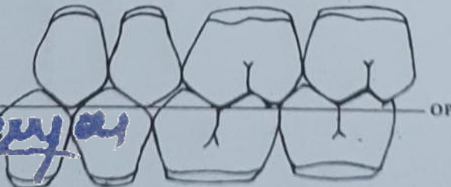
### MANDIBULAR ANTERIORS

	LABIO-LINGUAL INCLINATION	MESIO-DISTAL INCLINATION	RELATION WITH CORRESPONDING MAXILLARY TEETH	ROTATIONAL RELATIONSHIP
<p>MANDIBULAR CENTRAL 1/1</p> 	<p>DISTINCT LABIAL TILT</p> 	<p>PERPENDICULAR</p> 	<p>2mm OF HORIZONTAL AND VERTICAL OVERLAP.</p> 	<p>FOLLOWS THE CURVE OF ARCH</p> 
<p>MANDIBULAR LATERAL 2/2</p> 	<p>SLIGHT LABIAL TILT</p> 	<p>SLIGHTLY TO THE DISTAL AT NECK</p> 	<p>2mm OF HORIZONTAL AND VERTICAL OVERLAP</p> 	<p>FOLLOWS THE CURVE OF ARCH</p> 

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<p>MANDIBULAR CANINE 3 3</p>	<p>PROMINENT AT THE NECK</p>	<p>MESIAL TILT OF INCISAL TIP</p>	<p>2mm OF HORIZONTAL AND VERTICAL OVERLAP MANDIBULAR CANINE SHOULD BE HALF A CUSP MESIAL TO THE MAXILLARY CANINES</p>	<p>FOLLOWS THE ARCH FORM AND THE POSITION OF THE MAXILLARY ANTERIOR.</p>
				

MANDIBULAR POSTERIOURS

<p>MANDIBULAR POSTERIOURS 7654 4567</p>	<p>MESIOBUCCAL GROOVE OF MANDIBULAR 1<sup>ST</sup> MOLAR COINCIDING WITH MESIOBUCCAL CUSP OF MAXILLARY 1<sup>ST</sup> MOLAR. MANDIBULAR SECOND MOLAR, SECOND PREMOLAR AND FIRST PREMOLAR OCCLUDE HALF CUSP MESIAL TO ITS OPPOSING CORRESPONDING TEETH. THERE SHOULD BE MAXIMUM INTERCUSPATION FROM BOTH BUCCAL AND LINGUAL ASPECT.</p>
<p><i>Prayansh</i> PRINCIPAL</p>	

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EXERCISE NO. 14  
WAXING, CARVING AND POLISHING

DEFINITION:-

Waxing is the shaping of the denture base between the teeth and the borders to aid in retention, speech and aesthetics.

MATERIALS AND INSTRUMENTS :-

1. Modelling wax sheet
2. Wax spatula
3. Lacrons carver
4. Guaze piece
5. Soft tooth brush
6. Muslin cloth
7. Cotton
8. Soap

PROCEDURE :-

1. Place softened wax using a wax spatula around the artificial teeth and over the base plate to up the denture.
2. Contour the wax using a wax spatula and carve to form the matrix around each tooth to depict the gingival contour.
3. Contour the wax on the buccal flanges to form smooth concave surfaces.
4. Contour the wax on the lingual flanges to form smooth concave surfaces.
5. Smoothen the wax with a soft tooth brush, guaze and muslin cloth.
6. Polish with wet cotton and seals.

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ARRANGEMENT OF TEETH IN CLASS I MOLAR

RELATION

Set No: 01

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM	(B1)	21/9/21
2	ARTICULATION Articulator Serial No: (1)	(B)	25/9/21
3	TEETH ARRANGEMENT  a. ANTERIORS  MAXILLARY  MANDIBULAR  b. POSTERIORs  MAXILLARY  MANDIBULAR	(B1)	23/9/21  9/10/21
4	FINISHING AND POLISHING	(B1)	9/10/21
5	DEMOUNTING		9/10/21

ARRANGEMENT OF TEETH IN CLASS I MOLAR

RELATION

Set No: 02

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM	B <sup>+</sup>	AL 25/3/21
2	ARTICULATION Articulator Serial No: (2)	B <sup>+</sup>	AL 19/2/21
3	TEETH ARRANGEMENT		
	a. ANTERIORS	B <sup>+</sup>	Jurade
	MAXILLARY	}	}
	MANDIBULAR		
	b. POSTERIORS	}	}
	MAXILLARY		
	MANDIBULAR		
4	FINISHING AND POLISHING	B <sup>+</sup>	AL
5	DEMOUNTING		Jurade

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ARRANGEMENT OF TEETH IN CLASS I MOLAR

RELATION

Set No: 03

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM	B <sup>+</sup>	AL 29/7/21
2	ARTICULATION Articulator Serial No: (3)	B <sup>+</sup>	Jurade 20/1/21
3	TEETH ARRANGEMENT		
	a. ANTERIORS	B <sup>+</sup>	Jurade
	MAXILLARY	}	}
	MANDIBULAR		
	b. POSTERIORS	}	}
	MAXILLARY		
	MANDIBULAR		
4	FINISHING AND POLISHING	B <sup>+</sup>	AL 25/10/21
5	DEMOUNTING		Jurade

ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

*Final Inlay*

Set No: 04

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM	B++	<i>[Signature]</i> 13/8/21
2	ARTICULATION Articulator Serial No:	B+	<i>[Signature]</i>
3	TEETH ARRANGEMENT		
	a. ANTERIORS		
	MAXILLARY		
	MANDIBULAR	B+	<i>[Signature]</i>
	b. POSTERIORES		
	MAXILLARY		
	MANDIBULAR		
4	PRINCIPAL FINISHING AND POLISHING		<i>[Signature]</i>
5	DEMOUNTING		

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ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 05

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM	B++	<i>[Signature]</i> 6/9/21
2	ARTICULATION Articulator Serial No: 2	B+	<i>[Signature]</i>
3	TEETH ARRANGEMENT		
	a. ANTERIORS		
	MAXILLARY	B+	<i>[Signature]</i> 14/9/201
	MANDIBULAR		
	b. POSTERIORES		
	MAXILLARY		
	MANDIBULAR	B+	<i>[Signature]</i>
4	FINISHING AND POLISHING		
5	DEMOUNTING		<i>[Signature]</i>

ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

*For processing* Ser No: 06

SL NO	WORK DONE	GRADE	SIGNATURE	
1	OCCLUSAL RIM	B <sub>1</sub>	<i>AL</i>	
2	ARTICULATION Articulator Serial No: 3	B <sub>1</sub>	<i>AL</i>	
3	TEETH ARRANGEMENT  a. ANTERIORS MAXILLARY MANDIBULAR  b. POSTERIORs MAXILLARY MANDIBULAR	}	<i>AL</i>	
4	FINISHING AND POLISHING			
5	DEMOUNTING			

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ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 07

SL NO	WORK DONE	GRADE	SIGNATURE	
1	OCCLUSAL RIM	B <sub>1</sub>	<i>AL</i>	
2	ARTICULATION Articulator Serial No: 1	B <sub>1</sub>	<i>Praveen</i>	
3	TEETH ARRANGEMENT  a. ANTERIORS MAXILLARY MANDIBULAR  b. POSTERIORs MAXILLARY MANDIBULAR	}	<i>AL</i>	
4	FINISHING AND POLISHING			
5	DEMOUNTING			

ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 08

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM	(B1)	CL
2	ARTICULATION Articulator Serial No: (2)	(B1)	Jurasti
3	TEETH ARRANGEMENT	}	
	a. ANTERIORS		
	MAXILLARY		
	MANDIBULAR		
	b. POSTERIOR		
	MAXILLARY		
	MANDIBULAR	(B1)	CL
4	FINISHING AND POLISHING		
5	DEMOUNTING		R. S. / 9/20

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ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 09

Final Exam

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM	(B1)	CL
2	ARTICULATION Articulator Serial No:	(B1)	Jurasti
3	TEETH ARRANGEMENT		
	a. ANTERIORS		
	MAXILLARY		
	MANDIBULAR		
	b. POSTERIOR		
	MAXILLARY		
	MANDIBULAR		
4	FINISHING AND POLISHING		
5	DEMOUNTING		

ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 10

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM		
2	ARTICULATION Articulator Serial No:		
3	TEETH ARRANGEMENT  a. ANTERIORS  MAXILLARY  MANDIBULAR  b. POSTERIORs  MAXILLARY  MANDIBULAR		
4	PRINCIPAL FINISHING AND POLISHING		
5	D.A. PANDU MEMORIAL DEMOUNTING R.V. DENTAL COLLEGE		

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ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 11

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM		
2	ARTICULATION Articulator Serial No:		
3	TEETH ARRANGEMENT  a. ANTERIORS  MAXILLARY  MANDIBULAR  b. POSTERIORs  MAXILLARY  MANDIBULAR		
4	FINISHING AND POLISHING		
5	DEMOUNTING		

ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 12

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM		
2	ARTICULATION <small>Articulator Serial No:</small>		
3	TEETH ARRANGEMENT  a. ANTERIORS  MAXILLARY  MANDIBULAR  b. POSTERIORIORS  MAXILLARY  MANDIBULAR		
4	FINISHING AND POLISHING		
5	DEMOUNTING		

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ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION


Set No: 13

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM		
2	ARTICULATION <small>Articulator Serial No:</small>		
3	TEETH ARRANGEMENT  a. ANTERIORS  MAXILLARY  MANDIBULAR  b. POSTERIORIORS  MAXILLARY  MANDIBULAR		
4	FINISHING AND POLISHING		
5	DEMOUNTING		

ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 14

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM		
2	ARTICULATION Articulator Serial No:		
3	TEETH ARRANGEMENT  a. ANTERIORS MAXILLARY  MANDIBULAR  b. POSTERIORIORS MAXILLARY  MANDIBULAR		
4	FINISHING AND POLISHING		
5	DEMOUNTING		

  
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ARRANGEMENT OF TEETH IN CLASS I MOLAR  
RELATION

Set No: 15

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM		
2	ARTICULATION Articulator Serial No:		
3	TEETH ARRANGEMENT  a. ANTERIORS MAXILLARY  MANDIBULAR  b. POSTERIORIORS MAXILLARY  MANDIBULAR		
4	FINISHING AND POLISHING		
5	DEMOUNTING		



ARRANGEMENT OF TEETH IN CLASS II MOLAR  
RELATION

CLASS II

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM		
2	ARTICULATION Articulator Serial No:		
3	TEETH ARRANGEMENT  a. ANTERIORS MAXILLARY MANDIBULAR  b. POSTERIOR MAXILLARY MANDIBULAR		
4	FINISHING AND POLISHING		
5	DEMOUNTING		

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ARRANGEMENT OF TEETH IN CLASS III MOLAR  
RELATION

CLASS III

SL NO	WORK DONE	GRADE	SIGNATURE
1	OCCLUSAL RIM		
2	ARTICULATION Articulator Serial No:		
3	TEETH ARRANGEMENT  a. ANTERIORS MAXILLARY MANDIBULAR  b. POSTERIOR MAXILLARY MANDIBULAR		
4	FINISHING AND POLISHING		
5	DEMOUNTING		

EXERCISE NO. 15

FLASKING OF WAXED DENTURE

DEFINITION OF FLASK :-

A metal case, usually made up of brass, used in the investing procedure for dental prosthesis.

DEFINITION OF FLASKING :-

It is the process of investing a waxed up denture in a dental flask.

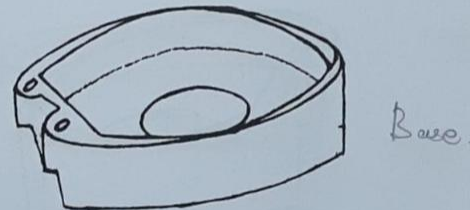
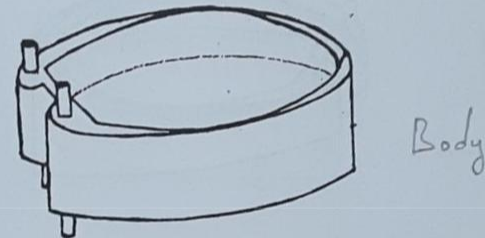
MATERIALS AND INSTRUMENTS :-

1. Large black stiff rubber bowl
2. Straight plaster spatula
3. Wax knife
4. Upper and lower dental flask and clamps
5. Cotton

PROCEDURE :-

1. Check the fit of three components of the dental flasks. The base, body and lid should fit snugly in each other with rim contact without being too tight.
2. Apply Vaseline on the inner surface and edge of flask.
3. Apply Vaseline to the base of flask.
4. Seal the waxed-up dentures to their respective cast to prevent ingress of plaster during flasking.
5. Pour mixed dental plaster in the base of the flask and place the cast with waxed up denture on it such that the ledge of the cast is at the level of the rim of the flask once it is in final position. Make sure that the heels of the mandibular cast is well supported with plaster.
6. After the initial set of the plaster remove the excess and produce a sloping surface. Smoothen the plaster surface with a straight plaster spatula and clean any remnants of plaster adhering to the teeth surface.
7. Apply Vaseline on the plaster and any exposed surface of stone.
8. Place the body of flask in position and check for clearance all around the walls of the flask body.
9. Pour a creamy mix of dental plaster into the flask. Tap it gently to prevent air entrapment.
10. Place the lid and position it under a bench press/ clamp and allow the dental plaster to set completely.
11. Clean the flask.

MAXILLARY FLASK

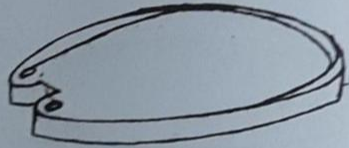


Label the Diagram

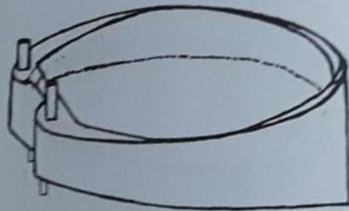
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MAXILLARY FLASK

Lid



Body



Base



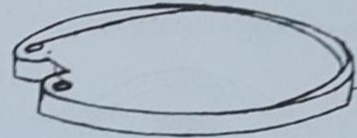
*Praveen*

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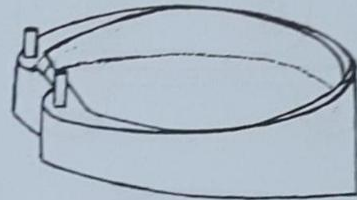
Label the Diagram

MANDIBULAR FLASK

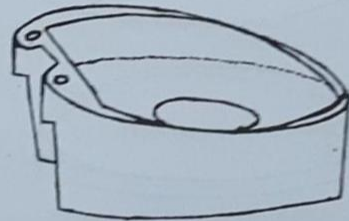
Lid



Body

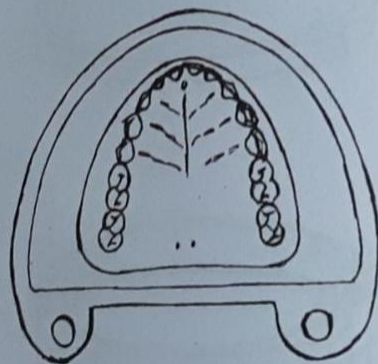


Base

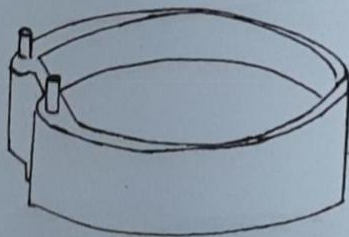


Label the Diagram

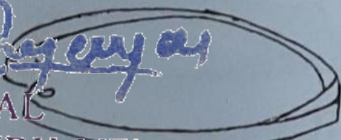
## BASE FLASKING



Base



Body



Lid

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## EXERCISE NO. 16

### DEWAXING OF THE DENTURE MOULDS

#### DEFINITION :-

Procedure of removal of softened wax and base plate to get a mould space for packing the acrylic resin.


#### MATERIALS AND INSTRUMENTS :-

1. Plaster knife
2. Wax knife
3. Lacrons carver
4. Napkin
5. Camel's hair brush
6. Separating medium (sodium alginate)

#### PROCEDURE :-

1. Allow the water to boil. Place the flask carrier and immerse them in boiling water for 5 mins only. If prolonged heating is carried out the molten wax may soak into the mould plaster and shellac may adhere to tooth surface.
2. Remove the hot flask from the water bath and place it on the table top. Place flask upside down i.e. flask base on the upper side.
3. Grip flask by its sides with a napkin. Ply between rims of the base and body with tip of plaster knife on any one side. Insert wax knife to slightly lift the base on another side and leave the tip of knife in position between base and body of flask.
4. Grip the entire base of flask with the napkin and with a very gentle wriggling action lift up the base vertically.

5. Lift the softened shellac base plate from the mould. Grip the body of flask with a napkin and tilt it to allow the molten wax to be drained.
6. Hold the flask under hot running water to flush the wax from the mould and the cast.
7. With the camel's hair brush apply sodium alginate as a separating medium.
8. Do not allow the separating medium to pool on the teeth. Allow the separating medium to dry to form an impervious layer on the plaster.

  
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## EXERCISE NO. 17

## PACKING OF HEAT CURED ACRYLIC RESIN IN THE DEWAXED PLASTER MOULD

## DEFINITION :-

The act of filling and compressing a denture base material into a mould in a flask.

## MATERIALS AND INSTRUMENTS :-

1. Separating medium (sodium alginate)
2. Heat cured acrylic resin - polymer  
- monomer
3. Camel's hair brush
4. Ceramic cup and saucer- for mixing heat cured acrylic resin.
5. Wax knife
6. Wax spatula
7. Lacrons carver
8. Small rubber bowl.
9. Cellophane sheets


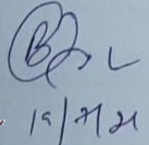
## PROCEDURE :-

1. Apply separating medium on the mould & the cast with camel hair brush & allow it to dry.
2. Wipe the cervical portion of the teeth with cotton dipped in monomer.
3. Pack one mould at a time.
4. Take the heat cured acrylic liquid (monomer) in the ceramic cup. Sprinkle the acrylic powder (polymer) into the liquid till it is saturated. Mix the powder and the liquid thoroughly with the rounded end of a clean wax knife. Cover the mix in the cup with a saucer.

Check the consistency of the mix for the following :-

- a. Wet sand stage
- b. Cob - web stage (Sticky)
- c. Dough stage (Stickiness lost)

5. Pack the mould with heat cured acrylic resin in the dough stage.
6. Place a moist cellophane sheet over the acrylic.
7. place the base of the flask over it. Close the flask and place it under a Bench Press.
8. Apply gradual pressure while tightening. As the clamp tightens over the flask, excess material flows out between the rims of flask. Avoid rapid closure of flask as it may result in fracture of the cast.
9. Release the Bench Press, remove the flasks and open them.
10. Peel off the cellophane sheet. Trim away the excess material, i.e. the Flash, beyond the denture borders using a lacrons carver or a wax knife.
11. Repeat the procedure of trial closure with a fresh moist cellophane sheet.
12. After the second trial closure, keep the cellophane sheet in position to prevent evaporation of monomer.
13. Apply a fresh layer of separating medium (sodium alginate) on the casts and surrounding plaster surface using a soft camel's hair brush. Remove the cellophane sheet.
14. Close the flask base and place the entire assembly in it's clamp with flask base resting on the base of the clamp.
15. Close the clamp as tight as possible and make sure that the two rims of the flask are in complete contact.
16. After the final closure of the flasks, keep them at room temperature for 30-60 mins. This is called as 'BENCH CURING'.

Work Done	Signature
 PRINCIPAL Heat cure, manipalati	 15/7/21

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## EXERCISE NO. 18

### CURING OF DENTURES

#### DEFINITION OF CURING CYCLE:-

Curing or polymerization cycle is the technical name for the heating process employed to control the initial propagation of polymerization in the denture mould.

The curing cycle selected should depend on the thickness of the resin.

Curing is done in an ACRYLIZER, where temperature can be adjusted for the various curing cycles.

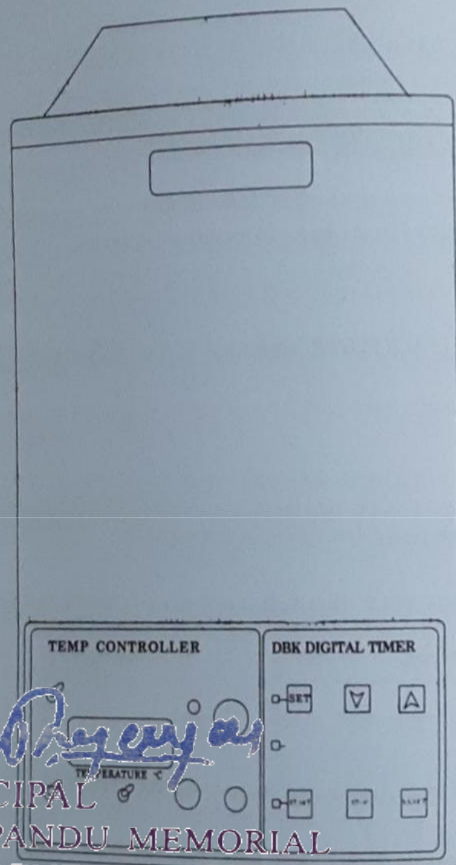
#### Curing Cycles :-

1. SHORT CURING CYCLE: Heat the flask in water at 65<sup>o</sup> C for 90 mins then boil the water for 1 hour for adequate polymerization in thinner portions.
2. LONG CURING CYCLE : Heat the flask in water at 60<sup>o</sup> C to 70<sup>o</sup> C for 9 hours.

#### PROCEDURE :-

1. Place the flask in an acrylizer to carry out the curing following the short curing cycle.
2. After curing remove the flasks from the acrylizer and 'Bench Cool' them for 30 mins, to prevent warpage of denture.

## ACRYLISER



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## EXERCISE NO. 19

### DEFLASKING

#### DEFINITION :-

Retrieval of the cured denture from the flask.

#### INSTRUMENTS :-

1. Plaster knife
2. Wax knife
3. Mallet or small hammer
4. Saw

#### PROCEDURE :-

1. Once the flasks have cooled to room temperature remove them from their respective clamps.
2. Tap the flasks on the outside using a hammer to release the plaster from the sides of the flasks. Remove the lid and eject the plaster block with the acrylised denture out of the flasks.
3. Break the plaster carefully to retrieve the denture alongwith the casts. You could use a saw for sectioning the plaster.
4. Clean the occlusal and polished surface off any investing plaster. Take care that the dentures do not separate from their respective casts.

EXERCISE NO. 20  
LABORATORY REMOUNT

Processing of the dentures may lead to occlusal discrepancy which requires to be corrected prior to denture insertion.

This is accomplished by carrying out LABORATORY REMOUNT procedure.

DEFINITION OF LABORATORY REMOUNT :-

To place a prosthesis back on the articulator to perfect the occlusal harmony by Selective Grinding.

MATERIALS AND INSTRUMENTS :-

1. Micromotor
2. Straight handpiece
3. Suitable abrasive points.
4. Articulating paper
5. Sticky wax

PROCEDURE :-

1. Reposition the maxillary and mandibular casts on the articulator mounting to see that the notches on the cast fit accurately on the elevations of the articulator mounting.
2. Fix them with the sticky wax.
3. Close the articulator to check for occlusal discrepancy and vertical pin position.

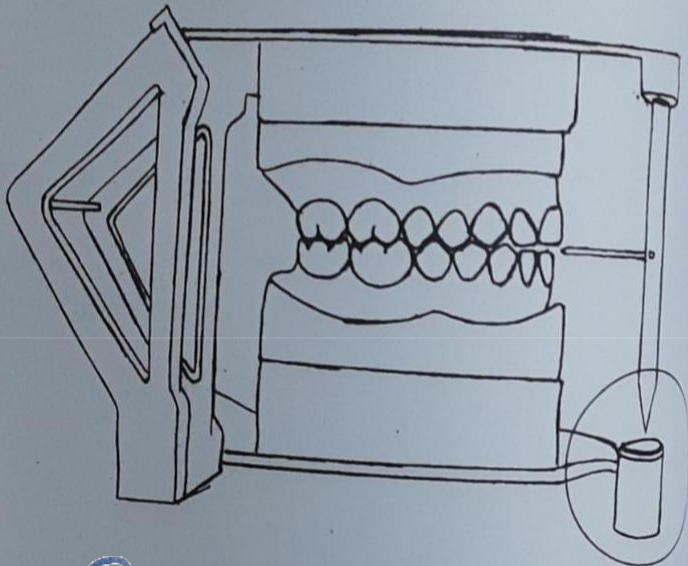
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4. If the vertical pin does not contact the incisal table, it shows that there is an increase in vertical relation which requires to be corrected by selective grinding.
5. Place the articulating paper over the mandibular teeth. Close the upper member of the articulator over it and tap on the articulating paper keeping the condylar elements in its anterior position, i.e. in the correct centric relation.
6. Open the articulator to check for the high points on the occlusal surfaces of the teeth.
7. Modify these high points by grinding with abrasive points. This process of correcting the occlusion is called 'SELECTIVE GRINDING'.
8. Repeat the procedure until the vertical incisal tip comes in contact with the incisal table.
9. Lightly polish the abraded cusps and surfaces.

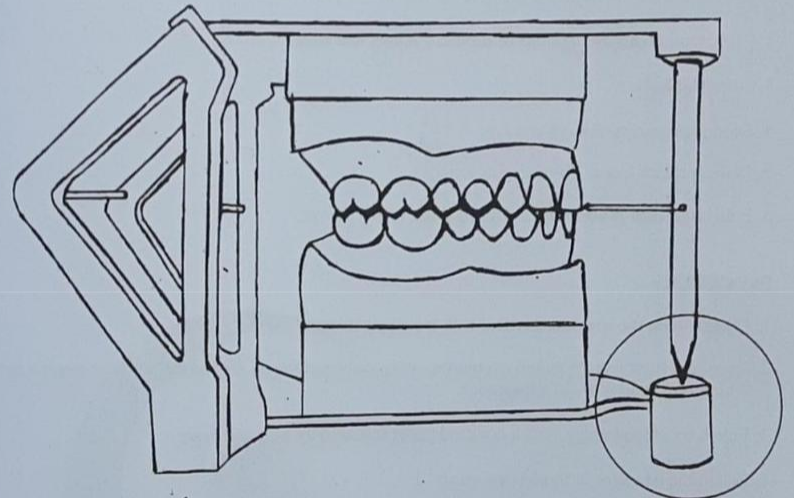


REMOUNTED CAST PRIOR  
TO SELECTIVE GRINDING



Pin not touching the  
incisal table

REMOUNTED CAST AFTER  
SELECTIVE GRINDING



Pin touching the  
incisal table after  
selective grinding

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EXERCISE NO. 21  
FINISHING AND POLISHING OF ACRYLIC COMPLETE DENTURES.

FINISHING :- To put a final coat or surface on the refinement of form prior to polishing or process of achieving the final perfection of the form of the polished surfaces of a denture.

POLISHING :- To make apt - 1 smooth and glossy, usually by friction to give lustre to;

Act or apt - 2 process of making a denture smooth and glossy.

INSTRUMENTS :-

1. Steel or Carbide Acrylic trimming metal burs
2. Carborundum abrasive points of different shapes and sizes.
3. Strip Mandrils
4. Sand paper strips- Rough and Fine
5. Polishing Felt Cone- Pumice with water
6. Polishing Mop Wheel (buff)- French chalk with Vaseline

PROCEDURE :-

1. Grossly trim the irregular borders with metallic trimmer.
2. Carry out finer reduction and contouring using carborundum points and alpine stone to get a surface which is ground glass in appearance.
3. Finish by smoothening with a dry sand paper followed by wet sand paper.
4. Polish the dentures in three steps using:

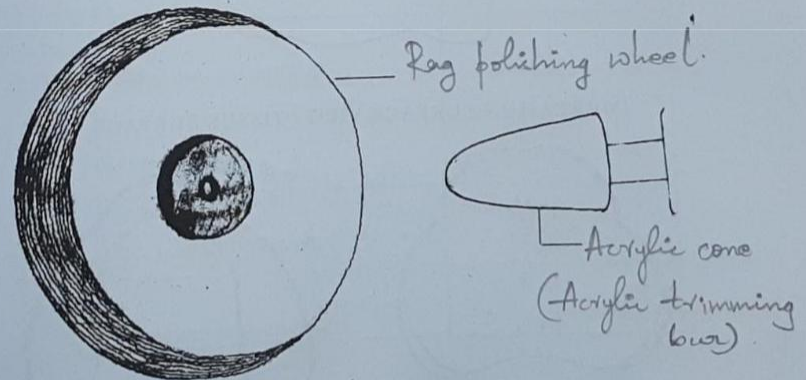
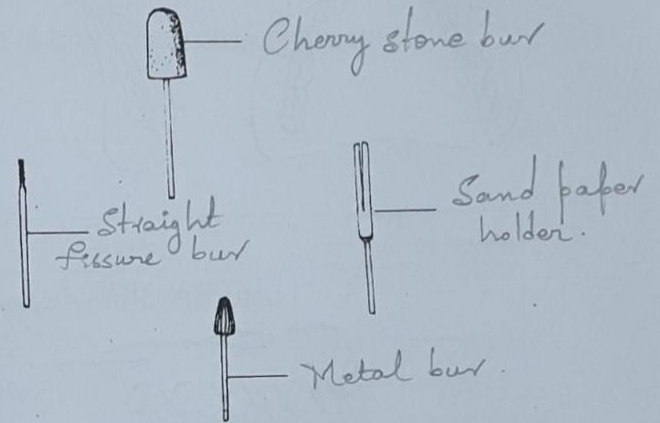
a. Felt cone

b. Mop wheel with French chalk and Vaseline or polishing cake

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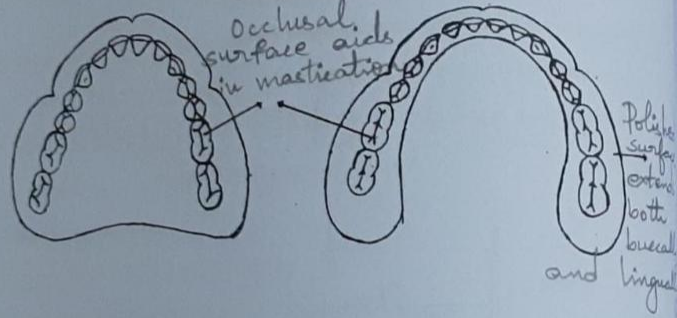
FINISHING AND POLISHING KIT



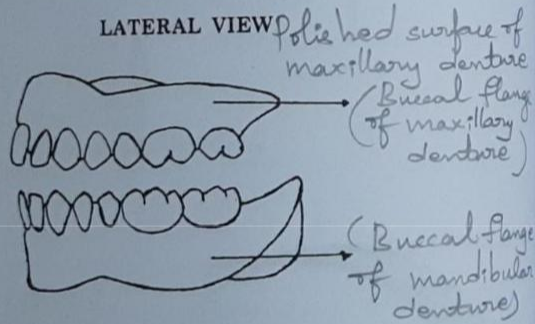
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## COMPLETE DENTURE

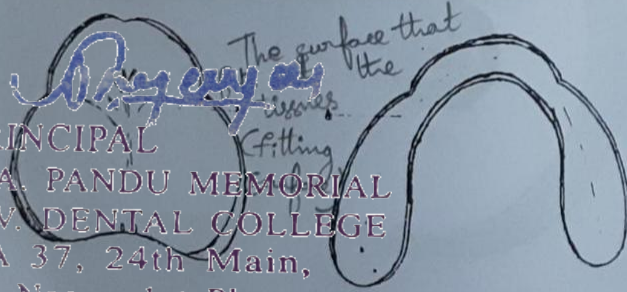
### OCCLUSAL VIEW



### LATERAL VIEW



### IMPRESSION SURFACE VIEW / TISSUE SURFACE VIEW



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## PROCESSING OF COMPLETE DENTURE

SL. NO.	WORK	GRADE	SIGNATURE
1.	FLASKING IN TWO POUR TECHNIQUE		
2.	DEWAXING	(B)	RL
3.	PACKING AND CURING	(B)	RL
4.	TRIMMING AND POLISHING		
5.	REMOUNTING		
6.	OCCLUSAL CORRECTION		
7.	FINISHING AND POLISHING	(B)	RL

EXERCISE NO. 22

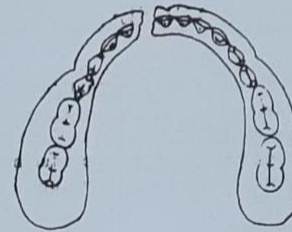
REPAIR OF ACRYLIC DENTURES

1. Align the broken pieces together. Observe that they fit accurately without any space between the broken parts.
2. Join the broken pieces with sticky wax or low fusing compound. Stabilize the broken pieces with a match stick across the fracture line using sticky wax or low fusing compound.
3. Apply vaseline to the impression surface to prevent plaster from sticking to the denture.
4. Pour dental plaster into the impression surface of the denture.
5. Allow the plaster to set to form a cast.
6. Remove the denture from the cast.
7. Using an acrylic trimmer prepare the broken surfaces, reducing 2mm on either side of the fracture line. Form a step for the addition of acrylic resin on either sides of the prepared portion. With a fissure bur prepare grooves in the broken portions for anchorage (this increases the area for contact with the self cure acrylic resin).
8. Apply separating medium on the cast & seat the broken pieces on the cast.
9. Sprinkle self cure acrylic powder in the space between the fracture portion of the denture and add this until the space is completely filled with the resin. Slightly overfill the space to allow bulk for polishing.

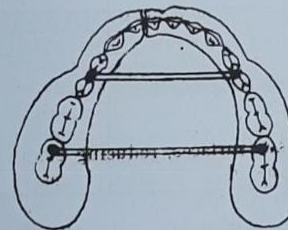
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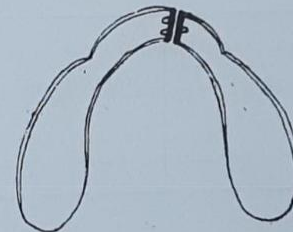
REPAIR OF DENTURE



FRACTURED MANDIBULAR DENTURE



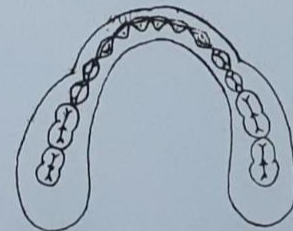
ALIGNMENT OF THE FRACTURED DENTURE



PREPARATION OF BEVELS AND SLOTS



STEP PREPARATION



REPAIRED DENTURE

## REPAIR OF ACRYLIC DENTURES

SL.NO	NATURE OF WORK DONE	GRADE	SIGNATURE
1.	MAXILLARY		
2.	MANDIBULAR		

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## EXERCISE NO. 23

### RELINING RESIN DENTURE BASES

Relining involves replacement of tissue surface of an existing denture, whereas rebasing involves replacement of the entire denture base. If the denture is to be relined, the impression material is removed from the denture. The tissue surface is cleaned to enhance bonding between the existing resin and the relining material.

Following this sequence, an appropriate resin is introduced and shaped using a COMPRESSION-MOULDING TECHNIQUE.

For relining, a **LOW POLYMERISATION TEMPERATURE** is desirable to minimise distortion of the remaining denture base. Hence a chemically activated resin is chosen. Materials used for relining dentures must comply with **SPECIFICATION NO 17**, which places limits on the rate of temperature rise and maximum acceptable temperature.

### DEFINITION:

The procedures used to resurface the tissue side of the denture with new base material, thus producing an accurate adaptation to the denture foundation area.

### INDICATIONS:-

1. Immediate dentures after 3-6 months where maximum residual ridge resorption would have occurred.
2. When the adaptation of the denture to the ridge is poor due to residual ridge resorption.
3. Economical reasons where the patient cannot afford a new denture.
4. Geriatric or chronically ill patients who cannot withstand physical and mental stress of construction of new dentures.

### CONTRA-INDICATIONS-

1. When the residual ridge is resorbed excessively.
2. Abused soft tissues due to ill fitting denture.
3. Temporomandibular joint problems.
4. Patient dissatisfied with the appearance of the existing denture.
5. Unsatisfactory jaw relationships in the denture.
6. Denture causing major speech problems.
7. Severe osseous undercuts.

### MATERIALS USED-

- Zinc oxide eugenol
- Resins - chemically activated
- Heat activated
- Micro-wave energy

### RELINING PROCEDURE:

#### 1. CLINICAL PROCEDURES-

- Static method- open mouth technique
  - Closed mouth technique
- Functional methods

Chair side technique

1. LABORATORY PROCEDURES-

- Articulator method
- Jig method
- Flask method

A. CLINICAL PROCEDURES-

a. STATIC METHOD-

OPEN MOUTH TECHNIQUE-  
PROCEDURE-

1. Maxillary and mandibular impressions are made independently without using the existing centric occlusion.
2. The dentures are used as special trays for making the secondary impression.
3. Borders & tissue surface of the denture is trimmed about 2mm leaving 4 tissue stops in canine & molar region.
4. Record borders & make final impression by using green stick compound & zinc oxide eugenol respectively.
5. After the maxillary and mandibular impressions are made a new centric relation record is accomplished. All these procedures are done in one appointment.

ADVANTAGES-

1. Selective trimming helps to make a selective pressure impression
2. Making a separate inter- ocusal record will allow the operator to concentrate on recording the jaw relation
3. It is possible to verify the centric relation record if necessary.

DISADVANTAGES-

1. It requires more clinical and laboratory time.

B. CLOSED MOUTH TECHNIQUE-

Maxillary and mandibular relining / rebasing can be done separately.

Various techniques are

1. Technique A
2. Technique B
3. Technique C
4. Technique D

TECHNIQUE A-

PROCEDURE-

1. It is a two step technique in which the centric relation is recorded using a inter-occlusal record and is used to guide the denture in position while making the relining impression.
2. Inter-occlusal record is recorded using wax or compound
3. 1.5- 2 mm deep groove is made in the wax to large undercuts.
4. The centric portion of the palate in the denture can be removed for visibility positioning the maxillary denture during impression making.
5. Zinc - oxide eugenol is the impression of the inter-occlusal record.
6. During impression making, patient is asked to close lightly into the newly - made inter-occlusal record.

ADVANTAGES-

1. Palatal opening in the wax better seating of the denture and alleviate the increase in vertical dimension

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2. Pre-made inter- Occlusal record helps to position the denture during impression making.

3. It also helps in orienting dentures in an articulator.

4. It is a two step procedure and it reduces the possibility of moving the maxillary denture forward during final impression making. Hence, it is more reliable.

DISADVANTAGES-

1. This procedure cannot be used to reline or rebase the dentures simultaneously.
2. Wax inter- Occlusal record is not very accurate.

TECHNIQUE B-

1. No new centric relation record is made here. Denture is prepared as explained above.

2. IMPRESSION WAX (IOWA WAX) is the material of choice for making impressions.

3. Impression is made in two steps. In the first step, all areas except the labial flange and the alveolar crest in between the canines are recorded. The labial flange and the alveolar crest between the canines are recorded in the second step.

ADVANTAGES-

-It will reduce the possibility of extreme forward movement of the maxillary denture.

DISADVANTAGES-

-Wax impression materials are difficult to work with and can distort easily. If the existing centric relation record is wrong then the impression becomes inaccurate.

TECHNIQUE C

-Centric relation is obtained as in technique B. the denture is prepared as in technique A.

- Also, labial flange and palatal flange are perforated to decrease the pressure inside the dentures during impression making.

-This technique is a combination of technique A and technique B.

TECHNIQUE D-

-Existing centric relation record is used here. Denture is prepared as described above. The borders are shortened and made flat.

-A large opening is made in the mid palatal region.

-Adhesive tape is attached over the buccal and labial surfaces of both dentures 2mm above the denture borders.

-Dental plaster or zinc oxide eugenol is suggested for recording most areas and plaster of Paris is used to record the palatal portion.

-After impression making, a deep groove is cut into labial and buccal surfaces of the dentures at the junction of the impression material and is filled with molten wax.

-The wax at the edge of the denture is used to record the sulcus.

- This technique shares the advantages of technique A. The disadvantage mainly being existing centric occlusion that may cause some pressure points and faulty impressions.

FUNCTIONAL METHOD-

1. It was suggested by WINKLER. Here, the patient need not be without dentures unlike previous techniques. (i.e dentures are not required for laboratory procedures).
2. Fluid resins (tissue conditioners) are used as impression material.

PROCEDURE-

1. The patient is advised to avoid nightwear of the dentures.

- Occlusal errors in the dentures are corrected to obtain centric occlusion that coincides with the centric relation.
- Flange over extensions/ under extensions and posterior palatal seal areas should be corrected.
- The tissue surface should be reduced to accommodate the tissue conditioning material.
- The tissue surface of the denture is dried and the material is placed.
- The denture is then inserted and the patient's mandible is guided to centric relation in order to stabilize the denture and the material is allowed to set. Once the material is set, the impression is removed and excess is trimmed.
- Unsupported areas in the dentures will show the over flow of the liner and poor recording of the borders. This indicates the need for localised border moulding with green stick compound
- After making the corrections, the dentures are inserted with the material and the patient is dismissed.
- After 3-5 days, dentures are examined for denuded (depressed) areas, which should be relined. The material should be renewed periodically (once a week) till the tissue healing is complete.
- Once the tissues are normal, impression made with zinc oxide eugenol or a light body elastomer over the tissue conditioner material and the cast is poured immediately
- During one of the previous visits an accurate orientation record of the maxillary denture should be recorded using a face bow.
- The tissue conditioner material undergoes some physical changes during its use which help the dentist to use it for different purposes. In its plastic and elastic stages it is used as a tissue conditioner, where as in its firm stage it is used as a reline impression material. Hence, for relining procedures it should be left in place for about 10-14 days to allow them to become firm and then reline procedure is carried out.

#### CHAIR SIDE PROCEDURE-

This method makes use of acrylic that could be added to the denture and allowed to set in the mouth to produce instant relining/ rebasing.

#### DISADVANTAGES-

- Material produces a chemical burn in oral mucosa.
- Material is porous and develops a bad odour.
- Poor colour stability.
- Material is not easily placed correctly.

#### LABORATORY PROCEDURE

Articulator method, jig and flask methods. It is common for both relining and rebasing except for differences.

Once the impression is recorded, it is poured immediately. Maxillary is mounted on a semi adjustable articulator with the help of a face bow tracing. A jig can be used for this purpose, but additional occlusal adjustments will be required.

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- Mandibular denture is mounted using an inter - Occlusal record. If occlusal discrepancy exists, selective grinding is done before the denture with the impression is separated from the casts.

The procedure is common for both relining and rebasing up to this stage. For relining, the required amount of tissue surface of the existing denture is trimmed away using an acrylic bur.

If rebasing is to be done, the denture base should be trimmed to just leave 2mm of acrylic around the existing teeth. After trimming, the dentures are placed in the articulator and waxed up without altering the vertical height.

#### JIG METHOD-

Here the impression is boxed and a cast is poured, a reline jig is used in this method. There are two types of jigs for this purpose:

- Hopper's duplicator
- Jectron jig

- These jigs function to maintain the occluso-mucosal relation. The cast along with the impression is mounted on the upper member of these instruments.
- Hooper's duplicator is an instrument that has two triangular parts connected by three pillars in each corner. Whereas, jectron jig uses only two pillars.
- A plaster index is made on the lower platform with the denture teeth penetrating the depth of about 2mm. when the plaster sets the indentations made by the denture teeth can be repeatedly positioned to maintain a fixed distance and relation between the cast and the Occlusal surfaces.
- When the key has set, the top and the bottom members are separated. Denture is removed from the cast.
- All of the impression material is removed from the denture and the denture is prepared(trimmed) according to the treatment selected ( relining / rebasing)
- If rebasing is selected, the entire denture base is removed from the teeth (if they are porcelain), and all but a small connecting bridge of acrylic is removed (if the teeth are plastic)
- The trimmed dentures are then set into the plaster key and the top of the instrument is replaced. The denture is waxed to the cast, processed and finished as usual. The cured denture should be repositioned on the jig to correct the occlusion prior to insertion.
- If relining is opted, auto-polymerising resin is used on the tissue surface of the denture and the upper member of the jig is closed. The denture is cured in a pressure container of warm water at 15psi for 30 minutes.

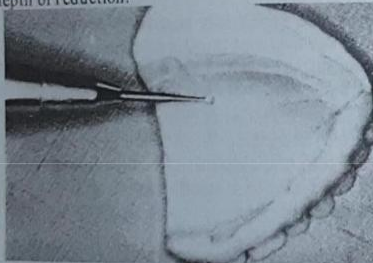
#### FLASK METHOD-

- The poured impression along with the denture is invested into the base of the flask.
- A silicone mould material is painted over the denture prior to investing the body. This is done to create a flexible mould. Flasking is completed as usual.
- Since silicone provides a flexible mold, the denture can be removed carefully after opening the flask.
- The denture base is trimmed as required (a portion of the tissue surface in relining and the entire denture base in rebasing) and placed back in the mould.
- The invested stone present in the base of the flask is the cast for the denture. if it is a maxillary denture then the posterior palatal seal should be marked using sharp instrument on the invested stone

1. Separating medium is painted over the mould space of the denture.
2. The resin is packed, cured, finished and polished as described in compression moulding technique.
3. The finished dentures are remounted to check for occlusal disharmony.

#### SUGGESTED PROCEDURE-WINKLER

1. The basal surface of the denture is marked with a number 6 round bur to indicate the depth of reduction.



2. The basal surface is reduced to allow room for the tissue conditioning material.



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1. A minimum thickness of tissue conditioner material is placed over the tissue surface of the denture. The denture is inserted in the mouth. The patient is instructed in the care of the resilient lining before being dismissed.
2. When the patient returns to the dentist after 3- 5 days, denture is examined for denuded areas.
3. Under extended borders should be corrected with impression compound before the next application of tissue conditioning material.



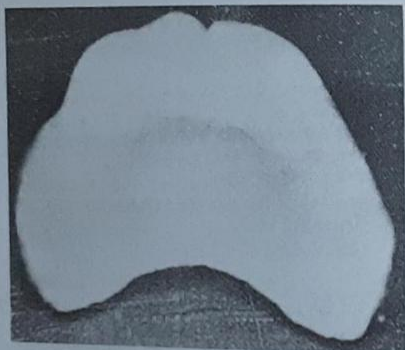
4. Zinc oxide eugenol wash impression made over tissue conditioning material after one week of use.



5. Impression made with tissue conditioning material for relining a maxillary denture.
6. LABORATORY PROCEDURE-  
 ✓ After the final impression is made, a cast must be poured immediately.



- ✓ Mount the maxillary cast on a semi-adjustable articulator using a face-bow transfer record. A jig could also be used. Even though this is easier than the use of an articulator, it is less accurate, especially when additional occlusal adjustment is required.
- ✓ Relate the mandibular denture to the maxillary denture, which is already mounted on the articulator, using an inter-Occlusal record.
- ✓ If an Occlusal discrepancy exists, it should be corrected before separating the impressions from the casts, by using a selective grinding procedure.
- ✓ The procedures of relining and rebasing are the same until this stage. During the laboratory phase of a rebasing procedure, the entire old denture base is replaced by a new material without changing the arrangement of the teeth. The presence of all the porcelain teeth greatly facilitates a rebasing procedure. If the resin teeth are present, relining is usually indicated, as it is difficult to rebase a denture with resin teeth.
- ✓ When the dentures are finished, plaster remount casts are made and the maxillary cast mounted on the articulator.



#### INSERTION PROCEDURES-

1. Use a pressure-indicating paste to locate the pressure areas. They are carefully relieved by grinding with mounted stones.
2. A new inter-Occlusal record is made with the lower denture in centric relation.
3. It is necessary to verify the mounting before adjusting the occlusion.
4. If necessary, the procedure, the occlusion can be perfected at the correct occlusal vertical dimension.
5. If a discrepancy is noted at the initial placement visit, check the occlusion once again.

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## EXERCISE NO. 24

### REBASING OF RESIN DENTURES

DEFINITION: The laboratory process of replacing the entire denture base material on an existing prosthesis.

#### INDICATIONS -

1. Immediate dentures after 3-6 months where maximum residual ridge resorption would have occurred.
2. When the adaptation of the denture to the ridge is poor due to residual ridge resorption.
3. Economical reasons where the patient cannot afford a new denture.
4. Geriatric or chronically ill patients who cannot withstand physical and mental stress of construction of new dentures.

#### CONTRA-INDICATIONS-

1. When the residual ridge is resorbed excessively.
2. Abused soft tissues due to ill fitting denture.
3. Temporomandibular joint problems.
4. Patient dis-satisfied with the appearance of the existing denture.
5. Unsatisfactory jaw relationships in the denture.
6. Denture causing major speech problems.
7. Severe osseous undercuts.

#### MATERIALS USED

- Zinc oxide eugenol
- Resins - chemically activated
- Heat activated
- Micro-wave energy

#### PROCEDURE-

1. The steps needed for rebasing are very similar to relining of dentures.
2. An accurate impression of the soft tissues is obtained using existing denture as a custom tray.
3. Subsequently, a stone cast is fabricated in the impression. The cast and denture are mounted in a device, the relining jig, designed to maintain the correct vertical and horizontal relationships between the stone cast and surfaces of prosthetic teeth.
4. The denture is removed and teeth are separated from existing denture base. The denture base is waxed to designed form.
5. The completed tooth arrangement is sealed to the cast, and the assembly is invested.
6. After elimination of the wax and removal of the base-plate, resin is introduced into mold cavity.
7. The material subsequently is processed; the denture is recovered. The denture is finished and polished.
8. Hence the prosthesis consists of a *new denture base in conjunction with teeth from the patient's previous denture.*

### SHORT TERM AND LONG TERM SOFT LINERS

The purpose of a soft liner is to absorb energy produced by the masticatory impact. Hence, a soft liner serves as a "shock absorber" between the occlusal surfaces of a denture and underlying oral tissues.

The most commonly used liners are **PLASTICISED ACRYLIC RESINS**. These resins may be heat activated or chemically activated.

Chemically activated usually employ poly (methyl methacrylate) as principal components. These polymers are supplied in powder form and are mixed with a plasticizer. The plasticizer is usually **DIBUTYL PHTHALATE**. the distribution of large plasticizer molecules minimizes entanglement of polymer chains and thereby permits individual chains to slip past one another. This slipping motion permits rapid changes in the shape of the soft liner and provides a cushioning effect for the underlining tissues. The liquids used in such applications do not contain acrylic monomers. Thus the resultant liners are considered **SHORT TERM SOFT LINERS** or **TISSUE CONDITIONERS**. Plasticizers are not bound within the resin mass and therefore may be leached out of soft liners. As this occurs, soft liners become progressively more rigid. The most successful materials for soft liners have been silicone rubbers.

#### MATERIALS USED AS SOFT LINERS:-

1. Plasticized acrylic resin
2. Vinyl resins
3. Silicone rubbers- most successful
  - Chemically activated
  - Heat activated
4. Other polymers-
  - Polyurethanes
  - Polyphosphazine

#### LONG TERM LINERS:-

Unlike chemically activated soft liners, heat activated materials generally are more durable and may be considered **LONG TERM LINERS**. Nonetheless, these materials degrade over time and should not be considered permanent.

The greatest difficulty with short and long term liners is that they cannot be cleaned easily. The most common fungal growth being that of *Candida albicans*.

*D. Pandu*


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Sl. No.	WORK DONE	GRADE	SIGNATURE
1.	Relining of Mandibular denture base		
2.	Repairing of maxillary denture base		

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## REMOVABLE PARTIAL DENTURE

  
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## REMOVABLE PARTIAL DENTURE

The branch of prosthodontics concerned with the replacement of teeth & contiguous structure for edentulous or partially edentulous portion by artificial substitutes that are removable from the mouth.

### DEFINITION :-

A removable partial denture is a prosthesis that replaces some teeth in a partially dentate arch, which can be removed from the mouth and replaced at will.

### TYPES OF REMOVABLE PARTIAL DENTURES :-

1. Acrylic partial denture
  - a. RIGID
  - b. FLEXIBLE
2. Cast partial denture

### PARTS OF AN ACRYLIC PARTIAL DENTURES :-

1. Artificial teeth
2. Denture base
3. Clasp

### COMPONENTS OF CAST PARTIAL DENTURE :-

1. Direct Retainer
2. Indirect Retainer
3. Auxillary Rests ( Canine, Incisal and occlusal)
4. Minor Connector
5. Major Connector
6. Denture Base
7. Artificial Teeth

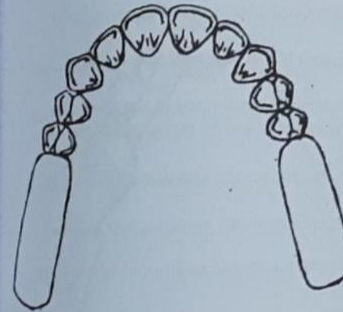
## KENEDDY'S CLASSIFICATION

- CLASS I - Bilateral edentulous areas located posterior to the remaining natural teeth.
- CLASS II - A unilateral edentulous area located posterior to the remaining natural teeth.
- CLASS III - A unilateral edentulous area with natural teeth remaining both anterior and posterior to the edentulous area.
- CLASS IV - A single, but bilateral (crossing the midline), edentulous area located anterior to the remaining natural teeth.

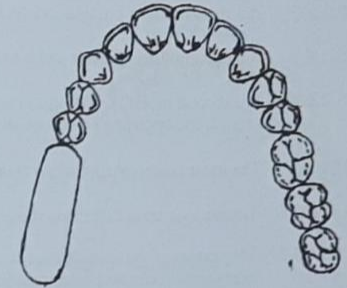
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## KENEDDY'S CLASSIFICATION



CLASS - I



CLASS - II



CLASS - III



CLASS - IV

## APPLGATE RULES GOVERNING THE KENNEDY'S CLASSIFICATION

Applegate provided 8 rules governing the application of Kennedy's method of classification :-

- RULE 1** :- Classification should follow rather than precede any extraction of teeth that might alter the original classification.
- RULE 2** :- If a third molar is missing and not to be replaced, it is not considered in the classification.
- RULE 3** :- If a third molar is present and is to be used as an abutment it is considered in the classification.
- RULE 4** :- If a second molar is missing and is not to be replaced, it is not considered in the classification. (e.g., if the opposing second molar is likewise missing and is not to be replaced for occlusion).
- RULE 5** :- The most posterior edentulous area ( or areas) always determines the classification.
- RULE 6** :- Edentulous areas other than those determining the classification are modification areas.
- RULE 7** :- The extent of the modification is not considered, only the number of additional edentulous areas should be taken into consideration.
- RULE 8** :- There can be no modification area in class IV arches.

(Other edentulous areas lying posterior to the single bilateral areas crossing the midline would instead determine the classification).

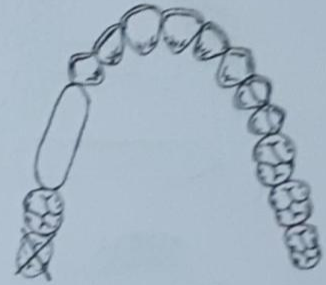
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## RULES GOVERNING THE KENNEDY'S CLASSIFICATION



RULE - 1



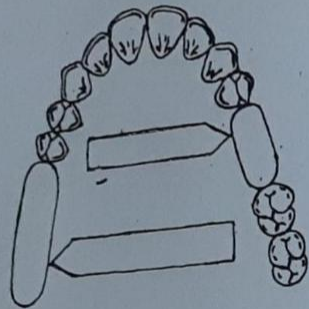
RULE - 2



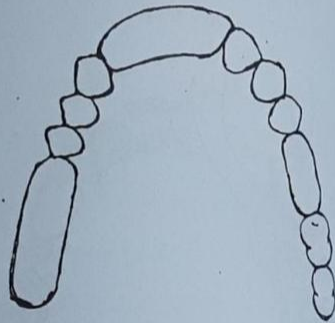
RULE - 3



RULE - 4



RULE - 5



RULE - 6



RULE - 8

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RULE - 8

CLASSIFY THE FOLLOWING CONDITION

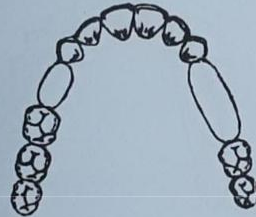
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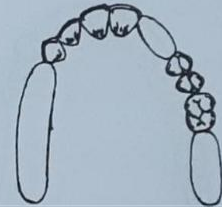
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(3)



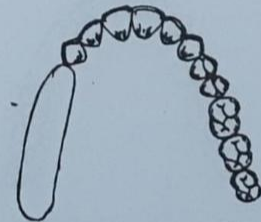
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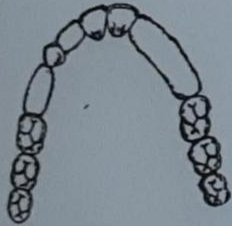


(6)



CLASSIFY THE FOLLOWING CONDITION

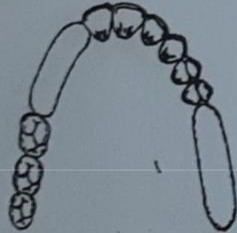
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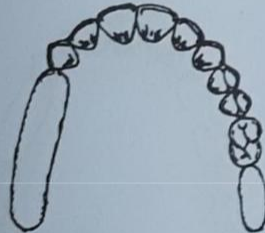
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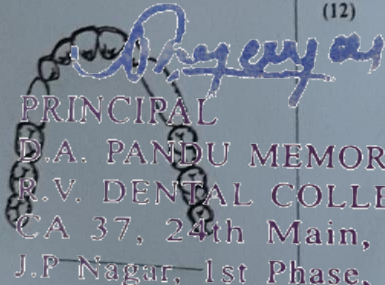
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COMPONENTS OF CAST PARTIAL DENTURE

**DIRECT RETAINER :-** A direct retainer is that component of a removable partial denture that engages an abutment tooth to resist displacement of the prosthesis away from basal seat tissues and to provide retention, stability and support.

**INDIRECT RETAINER :-** An indirect retainer is that component of a removable partial denture which prevents the movement of the distal extension base away from the tissue along the fulcrum line.

**REST AND REST SEAT :-** a component of a removable partial denture on a tooth surface that provides vertical support is called Rest.

**MAJOR CONNECTOR :-** A major connector is that component of a removable partial denture that connects the parts of the prosthesis located on one side of the arch with those on the opposite side.

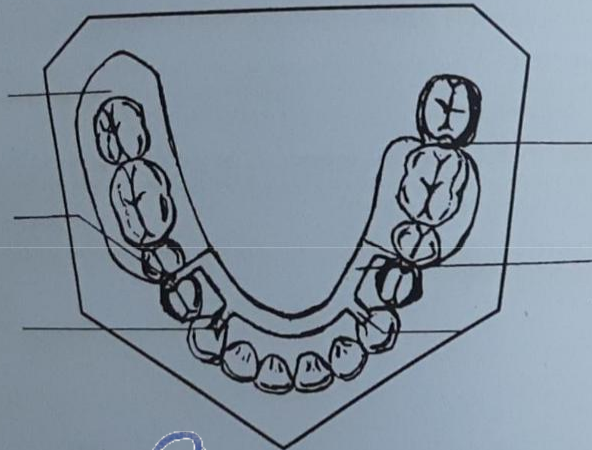
**MINOR CONNECTOR :-** A minor connector is that component of a removable partial denture that serve as the connecting link between the major connector or base of a removable partial denture and the other components, indirect retainer, occlusal rests, or cingulum rests etc.

**DENTURE BASE :-** Denture base is that component of a removable partial denture which supports the artificial teeth and consequently receives the functional forces from occlusion and transfers functional forces to supporting oral structures.

**ARTIFICIAL TEETH :-** Teeth that are replaced on partial denture which fulfill the function of mastication, aesthetics and phonetics.



## COMPONENTS OF REMOVABLE CAST PARTIAL DENTURE



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## CLINICAL AND LABORATORY STEPS OF ACRYLIC PARTIAL DENTURE

1. Examination, diagnosis, treatment plan & prognosis.
2. Mouth preparation - recontouring of teeth.
3. Making the impression and teeth / tooth selection.
4. Pouring the cast.
5. Marking the outline on the cast.
6. If required fabricating special tray for final impression.
7. Making the final impression
8. Pouring the final cast.
9. Temporary record base and wax rims
10. Jaw relations
11. Transferring the jaw relation to the articulator
12. Teeth arrangement & establishing occlusal relation
13. Try-in of waxed denture
14. Processing of acrylic denture base & finishing and polishing
15. Denture insertion - initial placement, adjustment of denture & instructions
16. Recall

UNDERLINE THE LABORATORY STEPS IN RED

### PROCEDURE :-

1. With a copying pencil draw the outline of the denture base and the position of the clasp on the teeth adjacent to the edentulous area (Abutment Teeth) on the cast.
2. Use a Stainless steel wires of 21 gauge thickness for preparation of the clasps. Adapt the clasps in position on the cast.
3. Adapt the base plate on the cast according to the outline drawn. Use a half round file to get the interdental contouring of the base plate.
4. Add modeling wax on the edentulous area and place the artificial teeth on it following the alignment of the adjacent teeth. In maximum intercuspation with opposing teeth seal their position and immerse the cast in cold water for 2mins. Later seal the baseplate to the cast to prevent the ingress of plaster while flasking.
5. Complete the Waxing and Carving procedure.
6. Prepare cast for Flasking
7. Trim the stone teeth to the level of the base plate
8. Trim the stone below the clasps with a bur to make space for the plaster to hold the position of the clasp while flasking

### 9. Flasking :-

Pour a creamy mix of plaster in the base of the flask and place the cast such that the ledge of the cast is in line with rim of flask. Cover all the stone teeth with plaster keeping the artificial teeth and the wax exposed both on lingual and buccal side.

Check that there are no undercuts.

Allow the plaster to set completely.

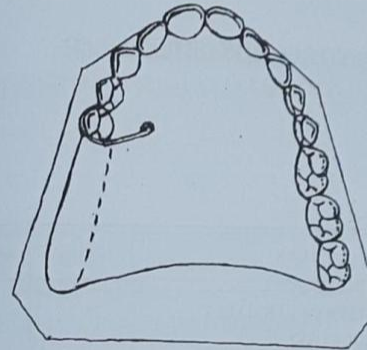
Apply Vaseline on all exposed portion of plaster and cast.

Place the counter and pour mixed plaster into it to fill it completely and place the lid. Place it under clamps until the plaster is set.

10. Carry out Dressing, Finishing, Curing, Deflasking, Finishing and Polishing procedures as followed to the complete denture prosthesis.

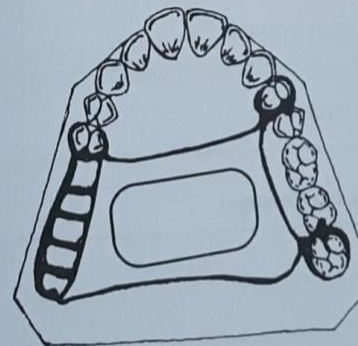
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### ACRYLIC PARTIAL DENTURE



Colour & Label the Diagram

### CAST PARTIAL DENTURE METAL FRAME WORK



Colour & Label the Diagram

CONSTRUCTION OF IDEAL RPD

SL. NO.	WORK	GRADE	SIGNATURE
1.	PREPARATION OF PARTIALLY EDENTULOUS CAST		
2.	FABRICATION OF TRIAL DENTURE BASE		
3.	PREPARATION OF OCCLUSION RIM		
4.	ARRANGEMENT OF TEETH		
5.	WAXING AND CARVING		
6.	FINISHING AND POLISHING		

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PROCESSING OF REMOVABLE PARTIAL DENTURE

SL. NO.	WORK	GRADE	SIGNATURE
1.	FLASKING IN REVERSE TECHNIQUE		
2.	DEWAXING		
3.	PACKING AND CURING		
4.	FINISHING AND POLISHING		

## FIXED PARTIAL DENTURES

Any dental prosthesis that is luted, screwed or mechanically attached or otherwise securely retained to natural teeth / tooth roots or dental implant abutments that furnish the primary support for the dental prosthesis.

### DEFINITION :-

A fixed partial denture is a restoration which replaces few of the natural teeth and which can not be readily removed by the patient or dentist, it is permanently cemented to the natural teeth or roots which furnish the primary support.

### TYPES OF FIXED PARTIAL DENTURES :-

1. CROWNS :- A crown is cemented extracoronal restoration that cover, or veneers, the outer surface of the clinical crown which reproduce the morphology and contours the damaged coronal portions of a tooth while performing it's function and also protecting the remaining tooth structure from further damage.
2. BRIDGES :- It may be defined as a partial prosthesis cemented to one or more teeth and replacing one or more but not all natural teeth.

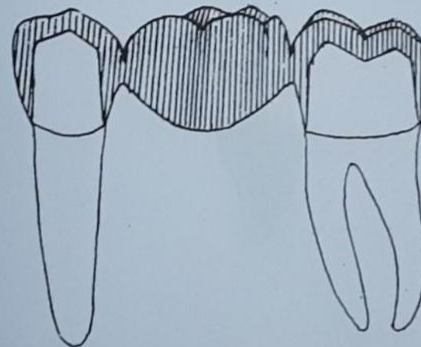
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## CROWN



## BRIDGE



## TYPES OF CROWN

### 1. ANTERIOR CROWNS

- a) Partial  
Metal  
Ceramic  
Composite  
Ceromer

- b) Complete  
Ceramic  
Composite  
Metal Ceramic  
Metal Composite  
Acrylic

### 2. POSTERIOR CROWNS

- a) Partial  
Metal  
Ceramics  
Composite  
Ceromer  
Metal Ceramic  
Metal Composite

- b) Complete  
Metal  
Ceramic  
Composite  
Ceromer  
Metal Ceramic  
Metal Composite  
Polymethyl Methacrylate

### 3. RADICULAR / DOWEL CROWNS

#### TYPES OF BRIDGES :-

- 1. Fixed - Fixed
- 2. Fixed Movable
- 3. Cantilever
- 4. Compound
- 5. Adhesive
- 6. Spring

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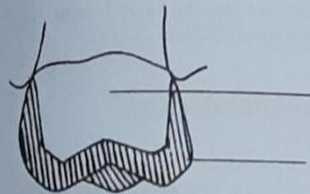
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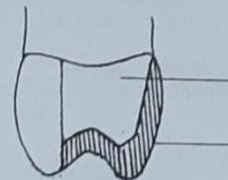
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## TYPES OF CROWN

### FULL CROWN



### PARTIAL CROWN



### RADICULAR CROWN



*Label the Diagram*

## COMPONENTS OF A FIXED PARTIAL DENTURE

1. **RETAINER :-**  
Any type of device used for stabilisation or retention of a prosthesis
2. **PONTIC :-**  
An artificial tooth on a CP Dental Prosthesis that replaces a missing natural tooth, restore its function, & usually fills the space previously occupied by the clinical crown.
3. **CONNECTOR :-**  
The portion of the fixed dental prosthesis that unites the retainer & pontic.

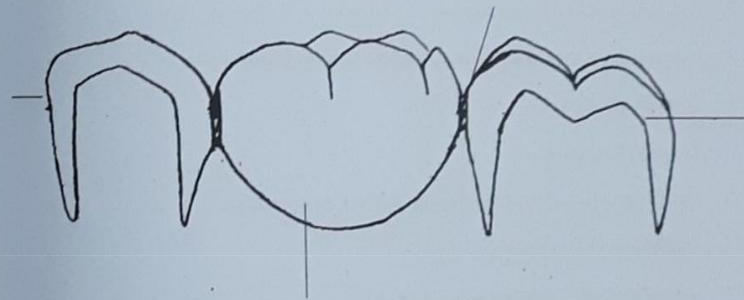
### ABUTMENT :-

The part of a structure that directly receives thrust or pressure, on average a tooth or a portion of tooth, that portion of a dental implant that serves to support or retain a prosthesis.

### PIER ABUTMENT :-

Pier abutment / intermediate abutment :- A natural tooth located between terminal abutments that serve to support a fixed or removable dental prosthesis.

## COMPONENTS OF FIXED PARTIAL DENTURE



*Colour & Label the Diagram*

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## STEPS IN FABRICATION OF FIXED PARTIAL DENTURE - SINGLE TOOTH CERAMOMETAL CROWN

1. Examination, Diagnosis, Evaluation and Treatment Planning
2. Impression for Diagnostic cast and Shade selection.
3. Diagnostic cast.
4. Intra occlusal record and face Bow.
5. Cast Transfer to the Articulator
6. Duplication of Diagnostic cast and Mock Preparation
7. Preparation of Provisional Restoration (if desired at this stage)
8. Impression for Provisional Restoration prior to tooth preparation.
9. Tooth Preparation
10. Gingival Retraction
11. Final Impression, Interocclusal record & Work Authorization
12. Preparation of Provisional Restoration
13. Cementation of Provisional Restoration
14. Preparation of Working Model
15. Application of Die spacer and fabrication of Wax pattern, Investing and Casting
16. Finishing of casting

UNDERLINE THE NAME OF THE COLLEGE

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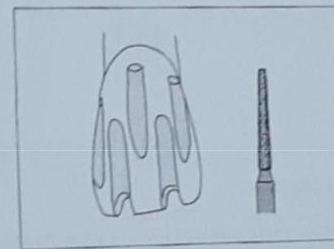
## Steps in the preparation of an all ceramic crown/ Porcelain jacket crown

### Armamentarium

1. Handpiece
2. Flat-end tapered diamond
3. Small wheel diamond
4. H158-012 radial fissure bur
5. RS-1 biangle chisel

### 1. Labial reduction

- Depth orientation grooves: Placed on labial and incisal surfaces with flat-end diamond bur
- Grooves are 1.2 to 1.4mm deep on the labial and 2.0mm deep on the incisal
- Three labial grooves are cut with the diamond held parallel to the gingival one-third of the labial surface

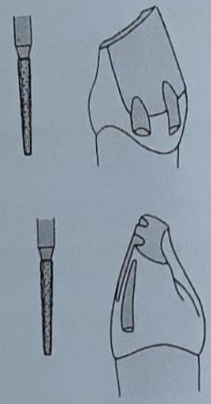


Depth orientation grooves; flat end diamond bur

- The labial surfaces of an all ceramic preparation are done in two planes to achieve adequate clearance for good esthetics without encroaching the pulp.

2. Incisal reduction

Incisal reduction is done with a flat end tapered diamond bur to a depth of 1.2 to 1.4mm



Incisal reduction; flat end diamond bur

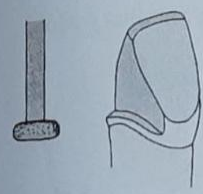
3. Axial and lingual reduction

- > The flat end tapered diamond bur will form the shoulder finish line while the axial reduction is done with sides of diamond.
- > Shoulder should be minimum of 1mm wide.

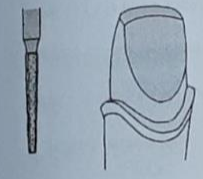
The lingual shoulder is atleast 1mm wide and should be a smooth continuation of labial and proximal radial shoulders

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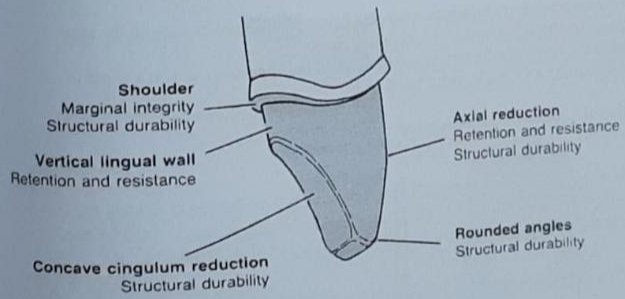
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Lingual reduction: small wheel diamond



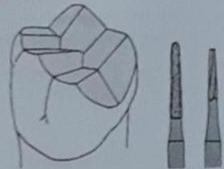
Lingual axial reduction: flat end diamond bur





## Steps in the Preparation of Full Metal Crown in Maxillary Molar

### 1. Occlusal Reduction



Round end tapered diamond and No. 171 bur

Use round end tapered bur to make depth orientation grooves on the triangular ridges and in the primary developmental grooves.

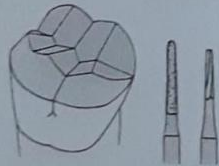
Minimum clearance on non-functional cusps (Maxillary facial and Mandibular lingual cusps);

1mm

Minimum clearance on Functional cusps (Maxillary lingual and Mandibular buccal cusps);

1.5mm

### 2. Functional cusp bevel



Round end tapered diamond and No. 171 bur

Place depth-orientation grooves for a functional cusp bevel. It should be made with the same round end tapered diamond bur used in the preceding steps.

It should parallel the inward facing inclines of the cusps of the opposing tooth, at a depth of 1.5mm, usually forming a 45° angle with a facial plane.

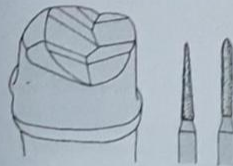
### 3. Buccal and lingual axial reduction

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 The facial axial reduction is done with a round end tapered diamond, producing a definite chamfer finish

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### 1. Proximal Axial reduction



Short Needle and Torpedo Diamond burs

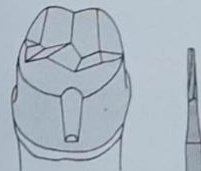
### 2. Chamfer and axial finishing



Torpedo diamond bur

Reduction performed parallel to long axis

### 3. Seating groove



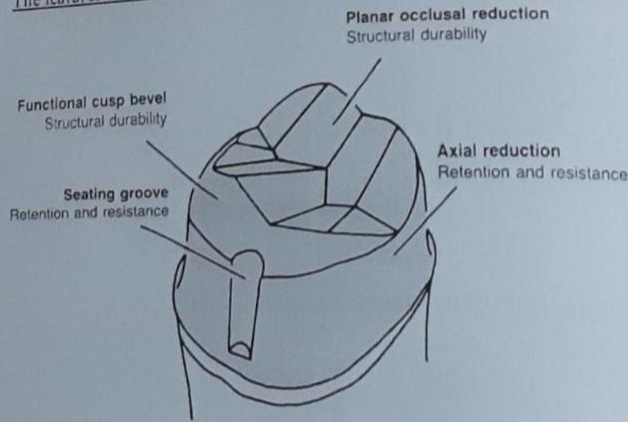
No. 171 L bur

A seating groove is placed on the axial surface. The groove should be cut to the full diameter of the bur, and it should extend gingivally to a point just 0.5mm above the chamfer. This groove mainly helps to guide the crown into place during cementation.

### 4. Finishing

Round of all sharp line angles to facilitate impression making, die pouring, waxing and casting.

The features of a full metal crown preparation and the function served by each.



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Sl. No.	EXERCISE	GRADE	SIGNATURE
1.	Preparation for full veneer crown on plaster model of molar tooth		
2.	Preparation for porcelain jacket crown on plaster model of central incisor tooth		
3.	Preparation for full veneer crown on molar typhodont tooth.		
4.	Preparation for porcelain jacket crown on Maxillary central incisor typhodont tooth		

## IMPRESSIONS IN FIXED PARTIAL DENTURE

Because it is neither possible nor desirable to make patterns for fixed prosthesis in the mouth, an impression, or negative likeness of the teeth and the surrounding structures is necessary to obtain a cast. This cast is then used to make a restoration in the laboratory. To obtain the cast, an elastic impression material is mixed and loaded in a tray that is inserted into the patient's mouth. When the material has set, it remains elastic, the impression is then poured and a positive likeness or definitive cast is obtained.

An acceptable impression must be an exact record of all aspects of the prepared tooth. The impression must be free of air bubbles, tears, thin spots and other imperfections that might produce inaccuracies.

### DEFINITION OF AN IMPRESSION:

A negative likeness or a copy in reverse of the surface of an object, an imprint of the teeth and adjacent structures for the use in dentistry

The various materials used are:

1. Reversible hydrocolloid.
2. Polyether
3. Polysulphide polymer
4. Condensation silicone
5. Addition silicone

### REVERSIBLE HYDROCOLLOID:

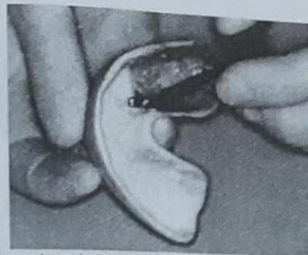
#### PROCEDURE:

1. Select the correct size of water cooled impression tray.
2. Place prefabricated stops across the posterior of the tray to prevent over seating and provide retention.
3. Displace the gingival tissues with the gingival retraction cord.
4. Fill the tray with heavy body material. Add wash material to the surface of the hydrocolloid tray material in the area of preparation and on adjacent tooth.
5. Carefully remove the cord from the sulcus and flood it with warm water.
6. Remove the impression tray from the tempering bath and seat the tray in the mouth. After seating, initiate and maintain the flow of room temperature water through the tray.
7. Hold the tray firmly in the patient's mouth while it sets.
8. Remove the tray with rapid motion, wash it and disinfect it.
9. Pour immediately.

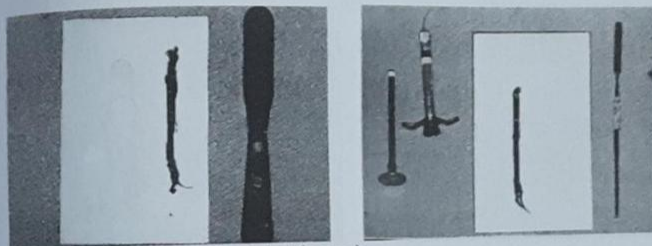
### HEAVY BODY AND LIGHT BODY COMBINATION:

1. Displace the gingival tissues with the cord and flood it with warm water.
2. Apply tray adhesive on to the tray.

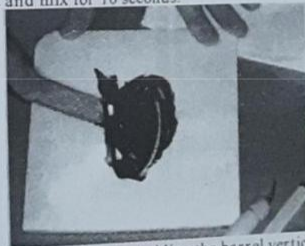
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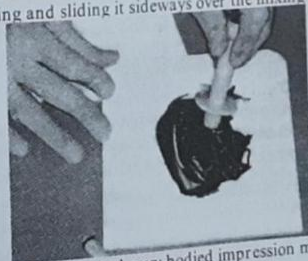
3. Isolate the abutment teeth and place gingival displacement cord in the sulcus.
4. On separate pads (one for the tray and one for syringe material), disperse equal amounts of base and accelerator



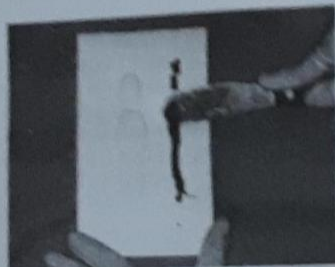
5. Blend the two pastes and mix for 10 seconds



6. Load the syringe, this can be done by holding the barrel vertically, pushing it through the mix, and then angling and sliding it sideways over the mixing pad.



7. Meanwhile, the assistant mixes the heavy bodied impression material.



8. Remove the displacement pad and gently dry the preparation with compressed air.  
 9. Place the tip of the syringe nozzle so that it touches the margin and inject the material. The tip should be inserted into the most distal embrasure first. When all the margins and axial surfaces have been covered the material is air blown into a thin layer



10. Seat the tray filled with heavy body. It must remain immobile while the material undergoes polymerisation (6-12 minutes)



#### SINGLE MIX TECHNIQUE:

As the name indicates only one mix is used from the syringe and fill the tray. Most materials and the tray are used as a caulking gun like device. The material is a slightly shorter working time.

#### AUTO MIX

Most manufacturers use impression materials in pre-packaged cartridges with a displacement pad. The material is applied with a caulking gun like device, in which mixing occurs as the material is dispensed. The high viscosity incorporated material can be directly applied to the impression tray. Advantage is the elimination of mixing and mixing of voids in the impression. Auto

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mix material is not available for polysulphides, because these materials are too sticky for proper mixing with existing cartridge tips.

#### POLYETHER AND POLYSULPHIDE IMPRESSION MATERIAL- CLOSED MOUTH IMPRESSION TECHNIQUE:

Also known as DUAL ARCH or TRIPLE TRAY TECHNIQUE.

It is popular for making impressions for single units. The impression is made at maximum intercuspation with a high viscosity polyether or polyvinyl siloxane impression material supported by a thin mesh in a frame. The impression includes the prepared tooth, adjacent teeth and opposing teeth and record their maximum intercuspation relationship (hence the name triple tray).

#### PROCEDURE:

1. Select and evaluate closed mouth tray.
2. Apply adhesive to the tray walls. Load both sides of the tray with a high viscosity elastomer.
3. Remove the cord and using a syringe apply the material onto critical areas.
4. Place the tray into position and have the patient close properly in maximum intercuspation.
5. Remove the polymerised impression helping the patient open the mouth by applying pressure to the set material or tray border on the non-prepared side.

## Preparation of Working cast and Die

Working cast is the cast that is mounted on an articulator.

The die is the model of the individual prepared tooth on which the margins of the wax pattern are finished.

Steps in the preparation

1. Dowel pins are positioned over the impression with bobby pins. Stabilize the dowel in the bobby pins, and the bobby pin itself against the straight pins with sticky wax.

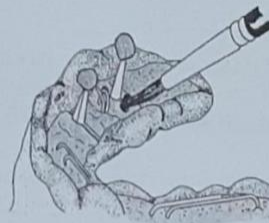


2. Pour die stone into the impression, filling the impression of the teeth and covering the knurled end of the dowel pin. Paper pins are added to non-removable parts of the unset first pour to provide retention for the second pour of stone.



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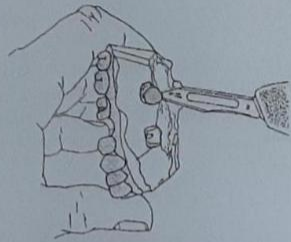
1. When the stone has set, remove the straight pins and bobby pins from the impression. Place a small ball of soft utility wax on the top of each dowel. The stone around the dowel pins is lubricated with a thin coat of petrolatum or commercially available separating medium to permit easy separation of the dies from the working cast later.



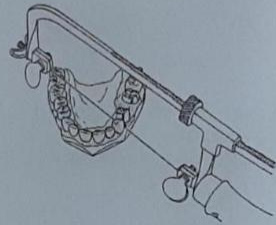
2. Place a wet paper towel into the open lingual space. This will enable a complete base for the cast to be poured. When the base is poured, leave peaks and curls of stone projecting from the top of it to provide retention for the mounting plaster later.



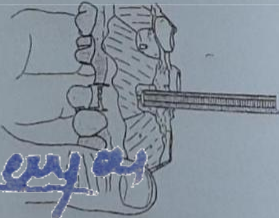
3. After the stone has set, remove the cast from the impression and trim the excess on a model trimmer. Use a sharp knife to uncover the spheres of utility wax and to remove them. Make certain that all wax is removed and that no stone chips are left around the apex of the dowel pin. Allow the stone to harden for 24 hrs.



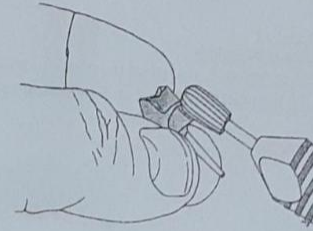
1. When the stone is hard and dry, use a saw frame with a thin blade to cut through the layer of die stone. There should be a cut on the mesial and distal side of each die, and the cuts should taper towards each other slightly from occlusal to gingival.



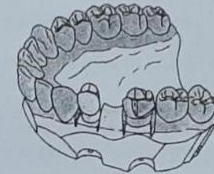
2. After the dies have been separated from the cast, the ends of the dowel pins are tapped to loosen the dies from the cast.



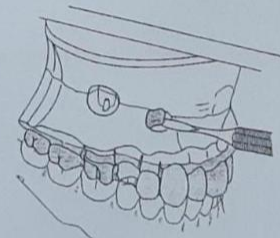
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1. Dies are reinserted into the cast to make certain that they will seat completely and will be stable.



2. Place utility wax back into the wells around the tips of dowels to protect them from plaster contamination. Soak the cast in water and mount it on the articulator using mounting stone. When the stone has set, remove the wax covering the tips of the dowels.



### FABRICATION OF WAX PATTERN

Two accepted ways of fabricating a wax pattern

1. The direct technique: in which the pattern is waxed on the prepared tooth in the mouth
2. The indirect technique: in which the pattern is waxed on a stone cast made from accurate impression of the prepared tooth

1. PKT(Thomas ) waxing instruments
2. Beavertail burnisher
3. Stable brush
4. No.2 pencil
5. Laboratory knife with no.25 blade
6. Cotton pliers
7. Bunsen burner
8. Inlay casting wax
9. Zinc stearate powder
10. Die lubricant

#### 1. COPING FABRICATION

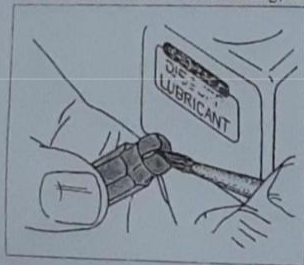
It's the first step in making a wax pattern

To prevent the wax from sticking to the die stone coat the die thoroughly with die lubricant and soak in for several minutes.

Flow wax over surface of the preparation using a no.7 hot spatula

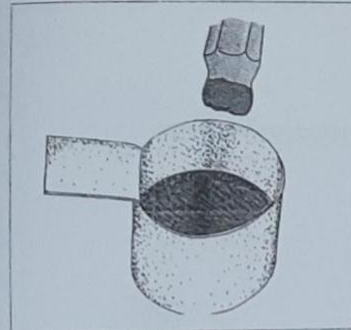
The coping can also be formed by dipping the die in molten wax

To ensure the finished restoration will have adequate proximal contact with the teeth adjacent to it wax pattern should be oversized mesiodistally. This will provide adequate bulk in contact areas to allow casting, finishing and polishing.



The die is lubricated before waxing.

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The coping can also be formed by dipping the die in molten wax.

#### 1. AXIAL CONTOURS

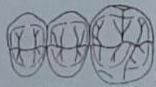
- Proximal contacts and facial and lingual axial contours of the wax pattern established at this time.
- Proximal contacts of posterior teeth are located in the occlusal third of the crowns except for the contact between the maxillary first and second molars which are located in the middle third.
- The contact should not encroach on the gingival embrasure
- Lingual embrasures are slightly larger than the facial embrasures.
- Facial contours of restoration should be in harmony with those of adjacent teeth.
- Height of contour of facial surface of posterior teeth usually occurs in the cervical third
- Facial contours of both maxillary and mandibular posterior teeth extend 0.5mm beyond the outline of the root at the CEJ.

Proximal contours on adjacent teeth are lightly scraped

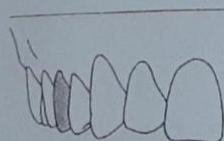


Occlusogingival dimension of proximal contours

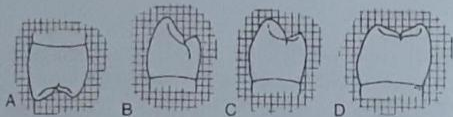




Faciolingual dimension of proximal contacts



Facial contours of restoration should be in harmony with those of adjacent teeth



Height of contour on the facial surface of all posterior teeth extends horizontally 0.5mm beyond plane of the root.

A, B height of contour extends 0.5mm on lingual surface of maxillary teeth and mandibular first premolars

C, D height of contour extends 0.75mm on mandibular second premolars and 1mm on mandibular molars

### 3. Occlusal Morphology

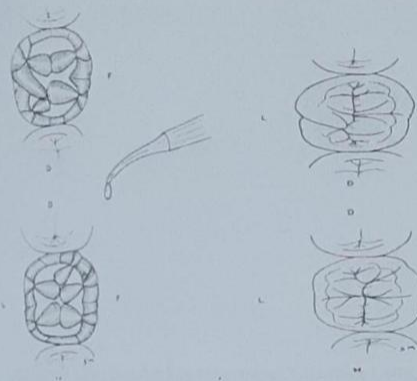
Waxing of occlusal surface is done after axial surface is completed.

Wax pattern fabrication - posterior teeth

Biomechanically designed tooth preparation maintains the original position of all cusp tips, facilitating the development of functional occlusion.

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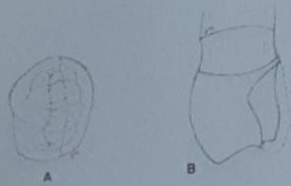
→ Wax cones are placed representing the cusp tips.  
Place functional cusp (stamp) tips first followed by non-functional cusps.

→ Close the articulator regularly to ensure that cusps pass between one another without interference.

→ Wax is added gradually to form buccal lingual mesial and distal cusp ridges.  
Evaluate centric and eccentric occlusion with each wax addition.

→ Check the occlusal contacts with zinc stearate and occlusal contact is adjusted.





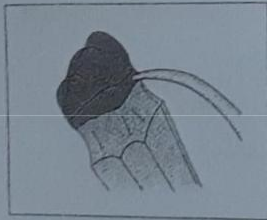
A

B



C

- A: wax is cut away for ceramic veneer after the contours and occlusion is finalized  
 B: proximal view of cut-back for a maxillary molar with a metal occlusal surface  
 C: proximal view of cut-back for a maxillary first molar with a ceramic occlusal surface  
 The marginal ridge is supported with metal



- Cut away the wax where ceramic veneers are planned and readapt the wax to finish lines.
- Burnish the marginal wax with a beaver-tail burnisher and smooth and polish all surfaces with a die bur.
- Wash the wax pattern in warm water.

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Wax pattern fabrication for anterior teeth:



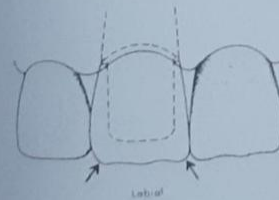
Labial



Incisal

Wax cones are determining the position of the incisal corners.

Functional and esthetic morphology is developed consistent with the desired anterior guidance

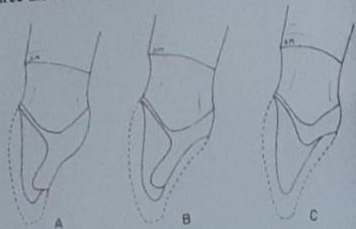


Labial



Incisal

Gingival and incisal embrasures, incisal edge position, occlusal relation, axial contours and esthetic form are definitively established in wax.  
Three distinct cut backs are employed for anterior teeth.



- A: proximal and occlusal contact for anterior metal crown  
B: proximal contact in metal and occlusal contact in porcelain  
C: proximal and occlusal contact in porcelain

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## INVESTMENT MATERIALS AND INVESTING PROCEDURE

### DEFINATION-

An investment can be described as a ceramic material which is suitable for forming a mold into which a metal or alloy is cast. The procedure for forming the mold is described as INVESTING.

### TYPES OF INVESTMENT MATERIALS

Three types of investment materials are available. They all contain silica as refractory constituent. Difference lies only in the binder.

1. GYPSUM BONDED INVESTMENT
2. PHOSPHATE BONDED INVESTMENT
3. SILICA BONDED INVESTMENT

### GYPSUM BONDED INVESTMENT

ADA. Specification no. 2 is casting investment for dental gold alloys.

They are used for casting gold alloys. They can withstand temperature up to 700 degree centigrade.

### COMPOSITION

1. BINDER- Gypsum (alpha- calcium sulphate hemihydrates)  
Accounts for 25%- 45%  
Function- imparts strength to the mold  
- compensates for expansion of the mold by setting expansion
2. REFRACTORY- Silica  
Available in four allotropic forms  
- quartz  
- Tridymite  
- Cristobalite  
- fused quartz  
Function - to regulate thermal expansion
3. MODIFIERS-  
Reducing agents - carbon and powdered copper are added to provide non- oxidizing atmosphere in the mold.  
Colouring agents are added.  
Modifying chemicals- regulate setting expansion and setting time, also prevents shrinkage of gypsum when heated above 300 degree centigrade.  
Eg. Boric acid and sodium chloride

### IDEAL REQUIREMENTS OF AN INVESTMENT MATERIAL-

1. Controllable expansion to compensate precisely for shrinkage of the cast alloy during cooling.
2. The ability to produce smooth castings with accurate surface reproduction and without nodules.
3. Chemical stability at high casting temperatures.
4. Adequate strength to resist casting forces.
5. Sufficient porosity to allow space for gas escape.
6. Easy recovery of the casting.

### PROPERTIES-

1. GYPSUM BONDED INVESTMENTS-

- They satisfy most of the requirements of ideal material, although they are not suitable for casting metal-ceramic alloys because the gypsum is unstable at high temperatures required and sulphide contamination of the alloy can occur. In addition with some materials obtaining adequate expansion may be difficult. This can be critical in casting complete crowns.

### 1. PHOSPHATE BONDED INVESTMENTS-

- They are more stable at high temperatures and thus are the materials of choice for casting metal-ceramic alloys, and their expansion can be conveniently and precisely controlled.

**SETTING TIME** - According to ADA. Specification no.2 for inlay casting investments, the setting time should not be less than 5 minutes and not more than 25 minutes. The modern inlay investments set initially in 9-18 minutes.

### SETTING EXPANSION-

The purpose of setting expansion is to aid in enlarging the mold to compensate partially for the casting shrinkage of the gold.

Setting expansion are of 3 types-

1. Normal setting expansion.
2. Hygroscopic setting expansion
3. Thermal expansion.

#### 1. NORMAL SETTING EXPANSION-

A mixture of silica and gypsum hemihydrates results in setting greater than that of the gypsum product when it is used alone. The silica particles probably interfere with the intermeshing and inter-locking of the crystals as they form. Thus, the thrust of the crystals is outward during growth and therefore more effective in the production of an expansion. ADA specification no.2 for type I investment permits a maximum setting expansion in air of 0.5%. Modern investments show setting expansion of 0.4%.

#### 2. HYGROSCOPIC SETTING EXPANSION-

When gypsum products are allowed to set in contact with water, the amount of expansion exhibited is much greater than normal setting expansion. The increased amount of expansion is because; water helps the outward growth of crystals. This additional expansion is known as hygroscopic setting expansion. The investment should be immersed in water before initial set is complete. ADA specification no.2 for type-II investments requires a minimal of 1.2% and maximum of 2.2% expansion.

#### 3. HYGROSCOPIC THERMAL INLAY CASTING INVESTMENT-

A new inlay casting investment that can be used as a hygroscopic or thermal type is a mixture of silica and gypsum which contains a blend of quartz and gypsum. In the hygroscopic casting technique, the investment is heated to 482 degrees centigrade (900 degree F) after setting in water. In the normal water immersion technique. When used in the thermal casting technique, the investment is not immersed in water but after setting in water, it is heated to 482 degrees centigrade (900 degree F) so that the appropriate expansion is achieved.

### INVESTMENT FOR CASTING HIGH MELTING ALLOYS

The alloys used for metal ceramic restorations and cobalt-chromium alloys for partial dentures are high melting alloys.

The investment used for this purpose are-

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- Phosphate bonded investment
- Ethyl silica bonded investment

### PHOSPHATE BONDED INVESTMENT

#### COMPOSITION

**BINDER**- magnesium oxide (basic) and a phosphate that is acid in nature  
**REFRACTORY**- silica in the form of cristobalite, quartz, or a mixture of the two in concentration of approximately 80%.

### ETHYL SILICA BONDED INVESTMENT

#### COMPOSITION

**REFRACTORY**- Silica  
**BINDER**- Silica derived from ethyl silicate or aqueous dispersion of colloidal silica or sodium silicate.

#### INVESTING PROCEDURE-

##### ARMAMENTARIUM-

- Vacuum mixer and bowl
- Vibrator
- Investment powder
- Water or colloidal silica
- Spatula
- Brush
- Surfactant
- graduated cylinder
- Crucible former
- Casting ring and liner

##### STEP BY STEP PROCEDURE-

In this technique, the pattern is first painted with surface tension reducer; the surface must be wet completely.

1. The mixing bowl can either be wiped completely dry or shaken dry. If shaken dry, remember that the residual water adds about 1ml to the mix. Add investment powder to the liquid in the mixing bowl and quickly incorporate it by hand. Residual material from the spatula is wiped onto the mechanical mixing blade, which helps maintain the correct water powder ratio, crucial for accurate control of expansion.
2. Attach the vacuum hose to the bowl, evacuate the bowl, and mechanically spatulate. The mixing should be carefully timed in accordance with the manufacturer's instructions and the type of mixing bowl used (high speed versus low speed). If phosphate bonded investments are used, additional vibration under vacuum helps minimize nodules.
3. Coat the entire pattern with investment, pushing the material ahead of the brush from a single point. Gently vibrate throughout the application of investment, being especially carefully to coat the internal surface and the margin of the pattern.
4. A finger positioned under the crucible former on the vibrator minimizes the risk of excessive vibration and possible breaking of the pattern from the sprue. After the pattern has been completely coated, the ring is immediately filled by vibrating the remaining investment out of the bowl.

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1. Place the lined casting ring over the pattern and with the aid of vibration; pour the investment down the side of the ring. Fill the ring slowly, starting from the bottom and moving upwards.
  2. When the investment reaches the level of the pattern, tilt the ring several times to cover and uncover the pattern, thereby minimizing the possible entrapment of air. Investing must be performed quickly within the working time of the investment. If the investment begins to set too soon, rinse it off quickly with cold water. The wax pattern can then be replaced on the die, and its margins can be reflowed again.
  3. After the ring is filled to the rim, allow the investment to set.
  4. If hygroscopic technique is used, place the ring in 37 degree centigrade (100degree F) water bath for 1 hour.
- VACUUM TECHNIQUE-**
1. First, hand spatulate the mix.
  2. With the crucible former and the pattern in place, attach the ring to the mixing bowl.
  3. Attach the vacuum hose and mix according to the manufacturer's recommendations.
  4. Invert the bowl and fill the ring under vibration.
  5. Remove the vacuum hose before shutting off the mixer.
  6. Remove the filled ring and crucible former from the bowl.
  7. Immediately clean the bowl and the mixing blade under running water.

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## CASTING PROCEDURES FOR DENTAL ALLOYS

The objective of casting process is to provide a metallic duplication of missing tooth structure, with as much accuracy as possible.

### STEPS IN CASTING

1. Tooth preparation- prepare tooth or teeth to receive a cast restoration
2. Impression – make the impression of the prepared tooth.
3. Die preparation
4. Wax pattern make wax pattern from type II inlay casting wax
5. Sprue former
6. Casting ring liner
7. Investing
8. Wax elimination and heating (burnout)
9. Casting- casting machines  
-Fuel used
10. Quenching
11. Recovery of casting
12. Sand blasting
13. Pickling
14. Polishing

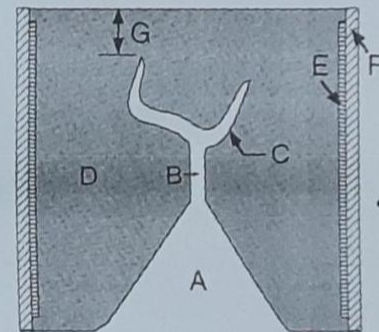


Fig. 12-15 Diagrammatic representation of a dental casting mold: A, crucible former; B, sprue; C, cavity formed by wax pattern after burnout; D, investment; E, liner; F, casting ring; G, recommended maximum investment thickness of approximately 6 mm between the end of the mold cavity and the end of the invested ring to provide pathways for sufficient gas escape during casting.

... position for vacuum pressure casti

### DESCRIPTION IN DETAIL

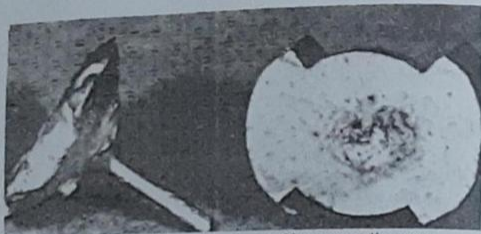
#### SPRUE FORMER

**DEFINITION OF A SPRUE-** A sprue is the channel IN REFRACTORY INVESTMENT mold through which molten metal flows.

After the wax pattern has been made, either directly on a prepared tooth or on a die replica of the tooth, a sprue former is attached to it, and it is surrounded with investment.

#### SELECTION OF SPRUE FORMER IS BASED ON FIVE PRINCIPLES

1. The sprue diameter is approximately the same size as the thickest area of the wax pattern. If the sprue diameter is too small then, this area will solidify before the casting itself and localised shrinkage porosity may develop. Reservoir sprues are used to help overcome this problem.



Localised shrinkage caused by using sprue of improper diameter

2. The sprue former should be attached to the portion of the pattern with the largest cross section area. It is best for the molten metal to flow from thick section to surrounding thin portions and not reverse. This design minimises the risk for turbulence.
3. Adjust the length of the sprue to 3/8" to 1/2" so that the wax pattern will be approximately 1/4" from the top of the ring.
4. Wax sprue formers are more common than plastic.
5. Patterns may be sprued directly or indirectly. For direct spruing, sprue forms a direct connection between pattern area and crucible former area. With use of indirect sprue, a connector or reservoir bar is placed between wax pattern and the crucible former.



Fig. 12-12 Left, Primary sprue oriented directly toward the wax pattern. Note the spherical reservoir on the vertical sprue. Right, Indirect sprue design showing a horizontal reservoir runner bar that is positioned near the heel center of the invested ring.

Other considerations are

**SPRUE FORMER POSITION:** Clinicians prefer proximal surface, others pre proximal surface or just below the proximal surface.

**SPRUE FORMER DIRECTION:** 5 degrees to the proximal surface is satisfactory.

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**SPRUE FORMER LENGTH**-it should be adjusted such that the top of the wax pattern is within 6mm of the open end of the ring for gypsum bonded investment and 3-4 mm for phosphate bonded investment.

#### CASTING RING LINERS.

A ring liner is placed on the inner side of the casting ring.

- TYPES** -
1. Fibrous ceramic aluminous silicate.
  2. Cellulose paper
  3. Ceramic - cellulose combination

Asbestos has been discontinued as its fibres when inhaled are carcinogenic.

#### FUNCTIONS-

1. Allows for mold expansion.
2. When the ring is transferred from the furnace to the casting machines, it reduces loss of heat as it is a thermal insulator.
3. Permits easy separation of the investment from the ring after the casting is over.

#### INVESTING

Apply wetting agent on the wax pattern. Seat the casting ring into the crucible former taking care that there is uniform space around the wax pattern. The pattern should be located near the centre of the ring.

Mix the investment as per the recommended water - powder ratio and vibrate. Take some investment on the brush and apply it on the wax pattern pushing it forwards from an edge to the deeper parts of the pattern to avoid air bubbles. The ring is resealed on the crucible former and placed on vibrator and gradually filled with the remaining investment mix. Allow it to set for one hour.

#### WAX ELIMINATION AND HEATING (BURN-OUT)

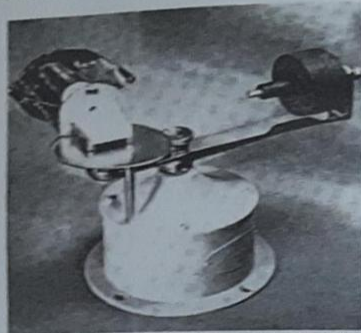
The purpose of burnout is the elimination of wax from the mould cavity and achieving thermal expansion. Separate the crucible former from the ring. If metallic sprue former is used, it should be removed before burnout. Plastic sprue formers require double burnout.

Burnout is started when the mould is wet. Store it in humidator if burnout is to be delayed. Heating should be gradual. Rapid heating causes formation of steam which causes the walls of the mould cavity to flake. In extreme cases an explosion can occur. Fast or too rapid heating causes cracks in the investment due to uneven expansion.

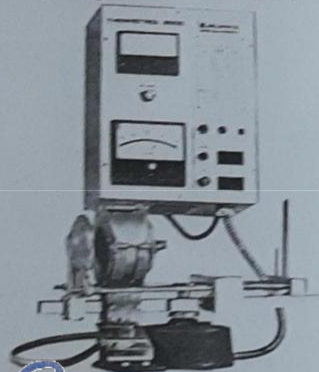
For burnout, the ring is heated gradually to 400 degrees in 20 minutes and then maintained for 30 minutes. In the next 30 minutes, raise the temperature to 700 degrees and maintain it for 30 minute.

## CASTING MACHINES 1. CENTRIFUGAL FORCE TYPE-

- It is spring driven or motor driven.
- Alloy is fused by electric resistance or induction furnace or on a refractory tray by blow torch.

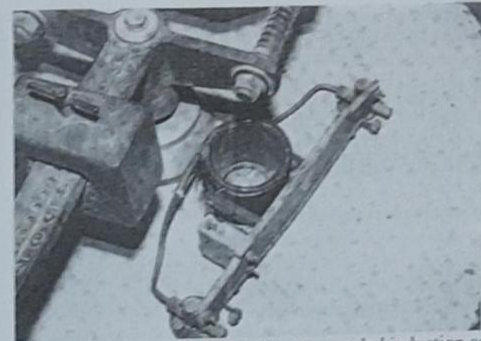


Centrifugal casting machine, spring wound

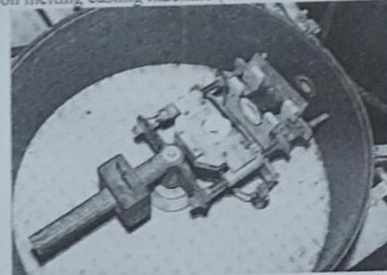


Spring wound casting machine with electrical resistance melting furnace

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Induction melting casting machine (water - cooled induction coil)



Induction melting casting machine (vertical crucible positioned within the induction coil)

## 2. AIR PRESSURE TYPE-

- Either compressed air or gases like carbon dioxide or nitrogen can be used to force the molten metal into the mould. This type of machine is satisfactory for making small castings.

## FUELS USED

- Blow torch
- Electrical resistance or induction

**BLOW TORCH**-used in combination  
natural gas or artificial gas and air or  
oxygen and acetylene gas (high fusion alloys)

## ZONES OF A FLAME-

1. **MIXING ZONE**-air and gas are mixed here. No heat is present. It is dark in colour.
2. **COMBUSTION ZONE**- this surrounds the inner zone. Green in colour. It is a zone of partial combustion and is oxidizing in nature.
3. **REDUCING ZONE**-blue in colour and is just beyond the green zone. It is the hottest part of the flame. This zone is used for fusion of casting alloy.
4. **OXIDIZING ZONE**-outer most zone in which final combustion occurs. This zone is not used for fusion.

### QUENCHING-

It is done by immersing in a container of water. This leaves the casting metal in an annealed state and also helps to fragment the investment.

### PICKLING-

The surface oxide from the casting is removed by pickling in 50% hydrochloric acid. HCl is heated but not boiled with the casting in it.

### CAUSES OF DEFECTIVE CASTINGS

Classified under 4 headings-

1. *Distortion*

2. *Surface roughness and irregularities*

3. *Porosity - A. Solidification defects-*

- Localised shrinkage porosity
- micro porosity

*B. Trapped gases-*

- pin-hole porosity
- Gas inclusions
- Subsurface porosity

*C. Residual air*

4. *Incomplete or missing details*

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### Finishing of the Cast Restoration

Steps involved:

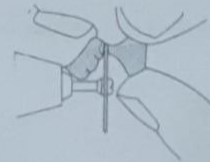
1. The internal margin is inspected to confirm that the casting accurately reproduces the prepared tooth and is intimately adapted to the prepared surfaces of the margin.



2. The casting is checked for the instability and rocking, adjustments are made using small stones and carbide burs.



3. The sprue is removed from the casting using a separating disc.



4. The area of sprue attachment is reshaped.
5. The proximal contacts are adjusted.







## HEAT POLYMERIZED ACRYLIC CROWN ARMAMENTARIUM

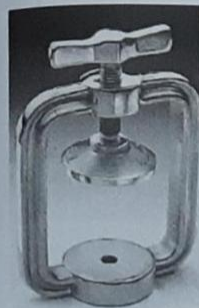
- Diagnostic cast
- Utility wax
- No.7 spatula
- Rubber bowl
- Spatula
- plaster
- Laboratory knife no.25 blade
- Large camel hair brush
- Dappen dish
- Separating media
- Monomer polymer
- Medicine dropper
- Straight handpiece
- Acrylic burs
- Abrasive discs and moore mandrel

1. After tooth preparation an initial impression is used for construction of acrylic tooth
2. Trim the cast with the mesial and distal ends at right angles to the line of the teeth. The cast is cured in areas of intercrevicular tooth preparation to expose the margins.
3. Mock tooth preparation is performed on a second set of diagnostic cast.
4. The desired occlusion and contact areas in wax on the mounted casts is formulated
5. The waxed up tooth is invested in a separable flask.



6. The wax is eliminated with a sharp stone surface is cooled and coated with tin foil substitute.
7. Acrylic polymer and monomer is mixed in the ratio of 3:1 by volume
8. Packing of the flask is done by the flask is closed in an appropriate press with a sheet of cellophane or trial pack separating film.
9. The flask is separated and washed with water.
10. The flask is closed and held tightly together with a surgical clamp or press.

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11. The resin is polymerized by subjecting it to a polymerization cycle of 74 c for 8 hours or 74 c for 2hours then increasing the temperature of the water bath to 100 C and processing for 1 hour

Sl. No.	EXERCISE	GRADE	SIGNATURE
1.	Making an impression for fabrication of full veneer crown on molar typhodont tooth		
2.	Preparation for working Cast & Die		
3.	Fabrication of wax pattern		
4.	Investing, casting & finishing of cast restoration.		
5.	Investing, Dewaxing, finishing of heat polymerized acrylic crown on prepared maxillary central incisor typhodont tooth.		

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## COMPLETE DENTURE PROSTHODONTICS

### 1. DEFINE PROSTHODONTICS.

Prosthodontics is the dental speciality pertaining to the diagnosis, treatment planning, rehabilitation and maintenance of the oral function, comfort & appearance and health of patients with clinical conditions associated with missing or deficient teeth and/or maxillofacial

### 2. WHAT IS A PROSTHESIS?

Substitutes using biocompatible substance. An artificial replacement of part of human anatomy restoring form, function and esthetics.

### 3. WHAT IS A DENTURE PROSTHESIS?

The replacement of natural teeth in the arch and their associated parts by artificial substitutes.

### 4. WHAT ARE THE OBJECTIVES OF PROSTHETIC DENTISTRY?

Restoration of missing or lost dentitions and associated structures with a view to preserve what remains in masticatory apparatus, restore function and esthetics.

### 5. MENTION THE BRANCHES OF PROSTHODONTICS.

- ① Removable prosthodontics.
- ② Fixed prosthodontics
- ③ Maxillofacial prosthodontics
- ④ Implant prosthodontics.

### 6. WHAT IS AN IMMEDIATE DENTURE PROSTHESIS?

Any fixed or removable denture prosthesis fabricated for placement immediately following the removal of natural teeth/tooth.

### 7. WHAT ARE THE ANATOMICAL LANDMARKS OF SIGNIFICANCE IN THE EDENTULOUS MAXILLARY FOUNDATIONS, THEIR APPLICATION AND SIGNIFICANCE?

Residual alveolar ridge → Secondary stress bearing area → Porous  
Palatine rugae → 2<sup>o</sup> stress bearing area → Support denture  
Inisive papilla → stress relieving area → Exit point for nasopalatine vessels

Frenum → limiting area → Accomodated by groove in denture  
 Vestibule → Limiting area → Houses flanges of denture base.  
 Mid-palatal raphae → Stress relieving area → Relief compensates for movement of denture base

8. WHAT ARE THE ANATOMICAL LANDMARKS OF SIGNIFICANCE IN THE EDENTULOUS MANDIBULAR FOUNDATION, THEIR APPLICATION AND SIGNIFICANCE?

Stress bearing Area	Relief Area	Limiting areas
1) Buccal shelf area	1) Mylohyoid ridge	1) Labial frenum
2) Residual alveolar ridge	2) Mental foramen	2) Labial vestibule
	3) Genial tubercle	3) Buccal frenum
	4) Torus mandibularis	4) Buccal vestibule
		5) Retromolar pad
		6) Alveolingual sulcus
		7) Lingual frenum

9. WHAT IS A DENTAL IMPRESSION?

A negative likeness or copy in reverse of the surface of an object, an imprint of the teeth and adjacent structures for uses in dentures.

10. WHAT IS A COMPLETE DENTURE PROSTHESIS?

A removable dental prosthesis that replaces the entire dentition and associated structures of maxilla and mandible.

11. WHAT ARE THE IMPRESSION MATERIALS USED FOR MAKING THE PRELIMINARY IMPRESSION?

- \* Stock tray
  - \* The following impression materials can be used.
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- Impression compound
  - S.D. ANE PANDU MEMORIAL
  - Polyvinyl silico-phosphate

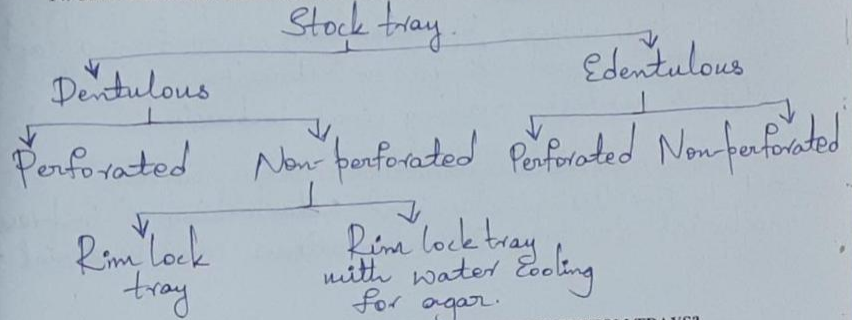
12. WHY IS THE IMPRESSION COMPOUND A BETTER MATERIAL FOR MAKING A PRELIMINARY IMPRESSION?

- Easy to manipulate
- Material can be correlated
- Impression can be correlated
- Easy to load and box.

13. WHAT IS AN IMPRESSION TRAY?

A receptacle or device used to carry the impression material to the mouth. Confine the material in apposition to the surface to be recorded and control the impression material where it sets to form the impression.

14. GIVE THE CLASSIFICATION OF IMPRESSION TRAYS.



15. WHAT ARE THE MATERIALS USED IN PREPARATION OF CUSTOM TRAYS?

- 1) Autopolymerising resins
- 2) Light polymerated resins
- 3) Thermoplastic resins.

16. WHAT ARE THE METHODS OF PREPARING THE CAST? WHICH METHOD IS BETTER & WHY?

Beading and Boxing.  
 - Allows to control thickness of material  
 - Minimum wastage of material

17. WHAT ARE THE FUNCTIONS OF AN IMPRESSION TRAY?

Functions

- Carry impression material
- Confine impression material
- Control impression material while making an impression.

### 18. WHY THERMOSTATICALLY CONTROLLED WATERBATH IS USED FOR SOFTENING

#### IMPRESSION COMPOUND?

Compound is placed in hot water (60°C) and is kneaded to achieve uniform consistency, without wrinkle and folds. Excessive heating leads to leakage of plasticiser from impression compound. One heating will lead to mass which cannot be kneaded properly.

#### 19. WHAT IS A CUSTOM TRAY?

An individualised impression tray made from a cast recovered from preliminary impression. It is used in making final impression.

#### 20. WHAT IS THE PURPOSE OF PERFORATIONS IN THE IMPRESSION TRAY?

It is for the mechanical interlocking of impression material to tray. It also allows excess material to flow.

#### 21. WHAT ARE THE METHODS OF PREPARATION OF ACRYLIC TRAY?

- Sprinkle on method
- Dough method.
- Vacuum adapted/pressure form method.

#### 22. WHAT ARE THE OBJECTIVES OF A FINAL IMPRESSION?

- Retention
- Stability
- Support
- Esthetics
- Preserving of remaining material

#### 23. CLASSIFY IMPRESSION TECHNIQUES

- 1) Border moulding tray
  - 2) One border moulding tray.
  - 3) Borderless modelling compound tray.
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- \* Depend on the technique of impression making
- 1) Mucoelastic technique.
  - 2) Mucocompressive technique.
  - 3) Selective pressure technique.

#### 24. WHAT IS MEANT BY BORDER MOULDING?

The shaping of impression material along the border-areas of the impression tray by functional or removal manipulation of soft tissue adjacent to borders to duplicate the contour and size of vestibule.

#### 25. WHAT ARE THE MATERIALS USED FOR BORDER MOULDING?

- ① Green stick compound
- ② Putty or heavy body elastomeric impression material.

#### 26. MENTION THE MATERIALS USED FOR OBTAINING FINAL IMPRESSION.

- 1) Medium/Regular body elastomeric impression material
- 2) ZnOE impression paste.

#### 27. DEFINE RETENTION?

The quality inherent in dental prosthesis acting to resist the forces of dislodgement along the path of placement.

#### 28. DEFINE STABILITY?

The quality of complete or removable partial dentures to be firm, steady or constant, to resist dislodgement by functional horizontal or rotational stresses.

#### 29. WHERE DO YOU LOCATE THE POSTERIOR BORDER OF MAXILLARY COMPLETE DENTURE?

- Posterior palatal seal area
- Posterior vibrating line.

#### 30. WHERE DO YOU LOCATE THE POSTERIOR BORDER OF MANDIBULAR COMPLETE DENTURE?

Denture should cover retromolar pad and mandibular complete denture under should extend posteriorly to contact retromylohyoid curtain.

31. WHAT DO YOU MEAN BY POSTERIOR PALATAL SEAL AREA?

The soft tissue are limited posteriorly by distal demarcation of movable and immovable tissue of soft palate and anteriorly by junction of hard and soft palate on which pressure within physiological limits can be placed, this seal can be applied by a removable complete denture to avoid in its retention.

32. WHAT IS VIBRATING LINE?

Vibrating line is an imaginary line across the posterior part of the palate making the division between the movable and immovable tissues of the soft palate. This can be identified when the movable tissues are functioning.

33. WHAT ANATOMICAL LANDMARKS INFLUENCES DISTOBUCCAL AREA OF MAXILLARY DENTURE?

An imaginary line across posterior part of the soft palate marking the divisions between immovable and non-movable tissues; this line can be identified when movable tissues are functioning.

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34. WHAT ANATOMICAL LANDMARKS INFLUENCES DISTOBUCCAL AREA OF MANDIBULAR DENTURE?

Masseter muscle process, Anterior border of coronoid process, Ramus of mandible.

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35. WHAT ANATOMICAL LANDMARKS INFLUENCES DISTOLINGUAL BORDER OF MANDIBULAR DENTURE?

Pteryomylahoid curtain containing Superior constrictor muscle and medial pterygoid muscle whose fibers are arranged in vertical dimension. Whenever pterygoid contracts it pushes pteryomylahoid anteriorly. Hence distobuccal border of mandible buccal border of maxilla and mandible, distolingual border of mandible are influenced.

36. WHAT IS A RECORD BASE?

An interim structure / denture base used to support the record rim material for recording maxillomandibular records.

37. WHAT ARE THE MATERIALS USED FOR CONSTRUCTION OF RECORD BASE COMPARE AND CONTRAST THE MOST COMMONLY USED ONES.

Temporary bases.	Permanent bases.
- Autopolymerising acrylic resin	- Heat cure acrylic resin
- Light curing resin	- Fluid resin
- Thermoplastic resin	- Metal bases.
- Shellac base plate	

38. WHAT ARE THE MATERIALS USED FOR PERMANENT DENTURE BASE?

- 1) Heat curing acrylic resins.
- 2) Fluid resins
- 3) Metal bases → Ni-Cr  
→ Co-Cr.

39. WHICH MUSCLES INSERT IN THE MAXILLARY & MANDIBULAR BUCCAL FRENUM?

Maxillary buccal frenum → Orbicularis, buccinator  
Mandibular buccal frenum.

40. WHAT ARE THE DISADVANTAGES OF USING HEAT CURED ACRYLIC AS TEMPORARY DENTURE BASE?

- Due to tedious procedure
- Time consuming
- We will end up with breaking/spoiling the cast.

41. WHAT IS AN OCCLUSION RIM? WHAT ARE THE FUNCTIONS OF AN OCCLUSION RIM?

occluding surface fabricated on interim or final denture base for purpose of making maxillo-mandibular relations: records and arranging teeth.

42. WHAT ARE THE MATERIALS USED FOR THE PREPARATION OF OCCLUSION RIM?

- 1) Modelling wax
- 2) Base plate wax.
- 3) Roorly impression compound.

43. NAME THE VARIOUS MANDIBULAR MOVEMENTS.

- 1) Basic movements - Rotations, translations
- 2) Excursive movement - Opening & Closing, protrusion
- 3) Border materials and retraction, lateral excursion
- 4) Functional movements - Chewing, Speech, swallowing

44. WHAT IS THE IMPORTANCE OF MANDIBULAR MOVEMENTS?

- 1) Recording jaw relations
- 2) Designing, selection and adjustment of articulator
- 3) Developing tooth form for dental restorations
- 4) Understanding basic principles of occlusion
- 5) Preserving periodontal health.

45. WHAT IS A FACE BOW?

An instrument used to record the spatial relationship of the maxillary arch to some anatomic reference point and then transfer this relationship to an articulator. It orients the dental casts to the same relationship to the articulator, customarily the anatomic reference point is the horizontal axis and one another selected anterior reference point.

46. WHAT ARE THE DIFFERENT TYPES OF FACE BOW?

- 1) Arbitrary face bow
- 2) Kinematic face bow.

47. GIVE DIFFERENCES BETWEEN ARBITRARY AND KINEMATIC FACE BOWS.

- Arbitrary hinge axis is recorded arbitrarily, bite fork is attached to the maxilla
- Kinematic is used to record accurate hinge axis and bite fork is attached to mandible.

48. WHAT ARE PARTS OF A FACE BOW?

- (i) U - Shaped frame
- (ii) Condylar rods
- (iii) Bite fork.
- (iv) Locking device
- (v) Orbital pointer pin.

49. WHAT ARE THE USES OF A FACE BOW?

To record the orientation jaw relation.

50. WHAT IS AN ARTICULATOR?

A mechanical instrument that represents temporomandibular joints and jaws to which maxillary and mandibular casts are attached to simulate some or all mandibular movements.

51. GIVE SIMPLE CLASSIFICATION OF ARTICULATORS.

- \* Based on adjustability
  - (i) fully adjustable
  - (ii) Semi adjustable
  - (iii) Non-adjustable.
- Based on position of condylar elements
  - (i) Arcon.
  - (ii) Non-Arcon.

52. NAME THE PARTS OF AN ANATOMIC ARTICULATOR.

- Condylar guidance
- Condylar elements
- Inisal guide table
- Inisal guide pin
- Inisal guidance
- Orbital indicator
- Mounting plates
- Upper & Lower member
- Gender locks

53. WHAT ARE THE FUNCTIONS OF AN ARTICULATOR?

- 1) To hold the maxillary and mandibular casts in predetermined position
- 2) To open and close.
- 3) Arrangement of teeth
- 4) To plan dental procedures.

54. WHAT ARE THE SHORT COMINGS OF A MEAN VALUE ARTICULATOR?

- (i) Non-adjustable.
- (ii) Inisal table and pin
- (iii) Mid-inisal pin
- (iv) Condylar shaft and slot
- (v) Vertical supporting arm.

55. WHAT ARE THE PARTS OF MEAN VALUE ARTICULATOR?

- (i) Upper and lower member
- (ii) Inisal table and pin
- (iii) Mid-inisal pin
- (iv) Condylar shaft and slot
- (v) Vertical supporting arm.

56. WHAT IS THE THEORY BEHIND DESIGN OF MEAN VALUE ARTICULATOR?

Based on Bonwill's theory when the distance between the condyles is equal to distance between condyles and midpoint and mandibular incisors. It forms an equilateral triangle.

57. WHAT ARE THE DIFFERENT THEORIES OF OCCLUSION?

- 1) Bonwill's equilateral theory.
- 2) Monson's spherical theory.
- 3) Halls conical theory.

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58. WHAT IS MEANT BY JAW RELATIONS?

Any spatial relationship of maxilla to mandible; any one of the infinite relationships of mandible to maxilla.

59. WHAT ARE THE DIFFERENT JAW RELATIONS?

- (i) Orientation jaw relations
- (ii) Vertical jaw relations
- (iii) Horizontal jaw relation.

60. WHAT IS THE IMPORTANCE OF JAW RELATIONS?

- 1) Orientation jaw relations: It orients maxilla to opening and closing axis of mandible.
- 2) Vertical jaw relation: Establishes height of lower 2/3 of face.
- 3) Horizontal jaw relation: To determine antero-posterior relation of maxilla.

61. WHAT IS PHYSIOLOGIC REST POSITION?

The natural position of the mandible when an individual is resting comfortably in an upright position and the associated muscles are in a state of minimal contractile activity.

62. WHAT IS THE SIGNIFICANCE OF PHYSIOLOGIC REST POSITION?

- It helps in recording vertical jaw relation
- It also helps in establishing free way space of 2-4 mm.

63. WHAT IS FREE WAY SPACE / INTER OCCLUSAL DISTANCE?

The distance between occluding surfaces of maxillary and mandibular teeth when mandible is in a specified position

64. WHAT ARE THE CONSEQUENCES OF INCORRECT VERTICAL RELATION OF OCCLUSION?

Increase V.D.

- a) Discomfort
- b) Trauma
- c) TMJ problem
- d) Bone resorption
- e) Clicking of teeth
- f) Facial distortion
- g) Difficulty in speech
- h) Swallowing

Decrease in V.D.

- a) Inefficiency
- b) Cheek biting
- c) TMJ problem
- d) Facial distortion

Maxillo-mandibular relationship independent of the tooth contact in which condyles articulate in anterior-superior position against the posterior slopes of articular eminence, in this position mandible is restricted to purely rotatory movements.

65. WHAT IS CENTRIC RELATION?

DMIP must coincide with centric relation in completely dentulous individuals.

- 1) Mandibular cast will be correctly oriented to opening axis of articulator if it is mounted in C.R.
- 2) C.R. must be recorded in established VD which is normal for individual.

66. WHAT IS ECCENTRIC JAW RELATION?

Any relationship of mandible to maxilla other than centric relation.

67. WHAT IS THE SIGNIFICANCE OF ECCENTRIC JAW RELATION?

Used to adjust protrusion and lateral condylar guidances. Inclination of the articulator which will help in reproducing the mandibular movements of patients.

68. WHAT IS OCCLUSION?

The static relationship between incisal or masticating surfaces of maxillary or mandibular teeth or both.

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69. WHAT IS BALANCED OCCLUSION?

The bilateral simultaneous anterior and posterior occlusal contact of teeth in centric and eccentric positions.

70. WHAT IS CENTRIC OCCLUSION?

The occlusion of the opposing teeth when mandible is in centric relation, this may or may not coincide with maximal intercuspal position.

71. WHAT ARE THE FACTORS RESPONSIBLE FOR BALANCED OCCLUSION?

- 1) Condylar guidance
- 2) Incisal guidance
- 3) Orientation of occlusal plane
- 4) Compensatory curve
- 5) Axial inclination

72. WHAT IS CONDYLAR GUIDANCE?

The mechanical form located in the posterior region of an articulator that controls movement of its mobile member.

73. WHAT IS BENNET MOVEMENT?

The working side condyle can just rotate on its axis or move outwards and laterally. This lateral movement is termed as Bennett movement.

74. WHAT IS INCISAL GUIDANCE?

The influence of contacting surfaces of mandibular and maxillary anterior teeth on mandibular movement.

75. WHAT IS COMPENSATORY CURVE?

The anteroposterior and mediolateral curve within the alignment of occluding surfaces and incisal edges of artificial teeth that is used to develop balanced occlusion.

76. WHAT IS MONSON'S CURVE / CURVE OF WILSON?

Mediolateral curve.

In this theory that occlusion should be spherical curvature of cusps as projected as frontal plane expressed in both arches the curve is mandibular arch being concave and the one in maxillary arch being convex.

77. HOW DO YOU ORIENT LEVEL OF OCCLUSAL PLANE?

arch being convex.