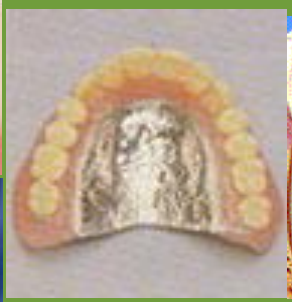
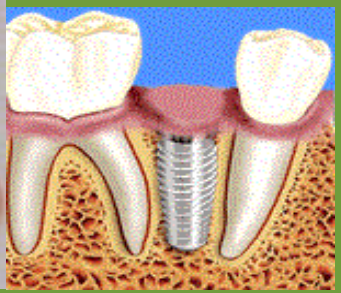
Dental Biomaterials
Applied Class Work

Prof. Dr. Azza Hashem
Dr. Heba Shalaby
Dr. Ghada Alkoronfoly


2016- 2017

Introduction applied

Aim of practical work:

At the end of each chapter students should be able to;

1- Identify the mode of material's presentation.
2- List the instruments used in manipulation.
3- Derive the ideal manipulation of materials.
4- Estimate the manipulative variables and correlate it to material's properties.
5- Select the proper uses of materials.

1- Mention :
a- Class number of shown cavity

b- Type of restoration Direct Or Indirect

c- Name of possible restoration

2- Mention :
a- Class number of shown cavity

b- Type of restoration Direct Or Indirect

c- Name of possible restoration

3- A- Identify cavity class

b- Type of restoration Direct Or Indirect

4- A- Identify cavity class

b- Type of restoration Direct Or Indirect?

c- Type of restoration esthetic or non-esthetic?

5- A- Mention name of restoration

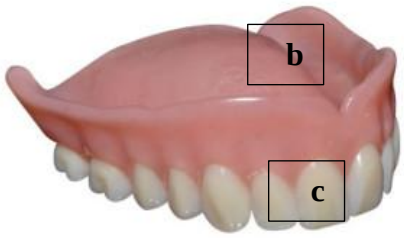
b- Type of restoration Direct Or Indirect?

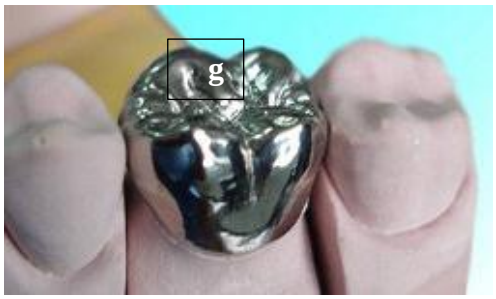
c- Type of restoration esthetic or non-esthetic?

6- A- Mention name of restoration

b- Type of restoration permanent Or temporary?

7- Identify the opposing appliances? Mention materials of construction.





Gypsum Model

I- Choose the correct answer: **(0.5 marks for each)**

1- **Using excess water to mix with $CaSO_4$. ½ H_2O to**:
   a- Increase strength of the model b-Increase model surface hardness
   c- Reproduce fine details and accuracy d-Gain a workable mix.

2- **All types of gypsum products undergo setting expansion due to:**
   a- Using of excess water in mixing b- Particle size and shape of powder
   c- Out word thrusting action of growing crystals
   d- Dissociation of $CaSO_4$. ½ H_2O and increase number of nuclei.

3- **Increasing the W/P ratio decreases the setting expansion of gypsum:**
   a- Decrease nuclei number and increase out word thrusting action of growing crystal.
   b- Increase nuclei number and increase out word thrusting action of growing crystal.
   c- Decrease nuclei number and decrease out word thrusting action of growing crystal.

4- **Hygroscopic expansion of gypsum products means expansion due to:**
   a- Immersion of gypsum under water before complete setting.
   b- Immersion of gypsum under water after complete setting.
   c- Mixing with excess water. d-None of the above.

5- **The amount of water that reacts chemically with 100 gm of improved stone powder is:**
   a-18.6 ml. **b**-22 ml. **c**-30 ml. **d**- 55 ml.

6- **Improved stone can be obtained by heating gypsum in:**
   a- Open air at 120^oC b- Boiling 30% solution of Ca Cl_2.
   c- An autoclave under steam pressure at 120-130^oC. d-None of the above.

7- **When hemihydrates is mixed with water:**
   a- The hemihydrates dissolve in water to form Ca^{++} and SO_4^{--}.
   b- Dihydrate is precipitated.
   c-The reaction is exothermic. **d**-All of the above.

8- **The chemical formula of the dental stone powder is:**
   a- $CaSO_4$. b-$CaSO_4$. $3H_2O$.
   c- $(CaSO_4)_2$. H_2O. d-$CaSO_4$. $2H_2O$.

9- **The dry strength of gypsum is:**
   a. The strength after one hour. b-The strength after 24 hours.
   c-The strength when the excess water is still left in the gypsum specimen.
   d- Two times as high as the wet strength.

10- **The following are factors affecting the setting time of gypsum products EXCEPT:**
   a. Fineness of the powder b- Chemical formula of the powder mixed
   c- Water/ Powder ratio d- Mixing time and rate

II- **Define :**

a. Initial setting time of gypsum products:

……
……

b. Final setting time of gypsum products:

……
……

c. The setting characteristics of gypsum products are:

1) …….
2) …….
3) ……
4) ……..

d. Setting expansion in gypsum occurs due to …….. and that can be increased by

1) …….
2) …….
3) …….

III-problem solving:

On mixing one of the gypsum products,

a- What is the amount of water essential to the chemical reaction?
b- What is the effect of the following:

1- Increase w/p:
   a- Thickness consistency……(Thick or thin)
   b- Setting time ……(fast or slow)
   c- Strength is……
2- Decrease w/p:
   a- Mix consistency……(Thick or thin)
   b- Setting time ……(fast or slow)
   c- Strength is……
3- Using hot water 60 ºc:
   a- Setting time…….(fast or slow)
   b- Strength is……
4- Using boiling water 100 ºc:
a- Setting time…….(fast or slow or no)
5- Adding K_2SO_4 to solution:
   a- Setting time…….(fast or slow or no), Why????

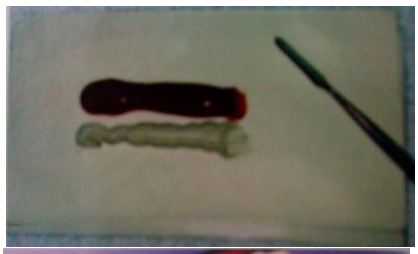
Home work

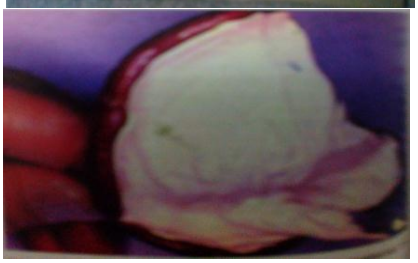
Mode of presentation:

List instruments and equipment used for manipulation:

Manipulative variables:

Inelastic impressions





I- Choose the correct answer:

1- Tray for ZnO/E impression is:

b- Readymade b-Specially made

2- Tray for ZnO/E impression is:

a- Perforated b-non-perforated

3- Inelastic Impression can be used with:

a-Dentulous patients. b- Edentulous.

c-partially edentulous.

4- ZnO/E impression supplied in form:

a- Two pastes.

b- powder and water liquid.

c- heavy and light**.**

5- ZnO/E impression was mixed by using:

a-glass slab and spatula.

b-Rubber bowel and spatula.

c-Oil resistant pad and stainless steel spatula.

6- The setting reaction of zinc oxide and eugenol impression material is accelerated by:

a- Increase in temperature.

b- Contact with saliva.

c- All of the above.

7- Tray for ZnO/E impression needs :

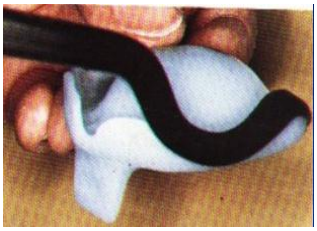
a- Special treaming. b- Border molding. c- Long tray.

8- Plaster impression has the following disadvantages:

a- Causes dehydration of the mouth b- Difficult in manipulation

c- Low flow d- All of the above

9- Material used for border molding is:



a- Impression compound .

b- ZnO/E impression .

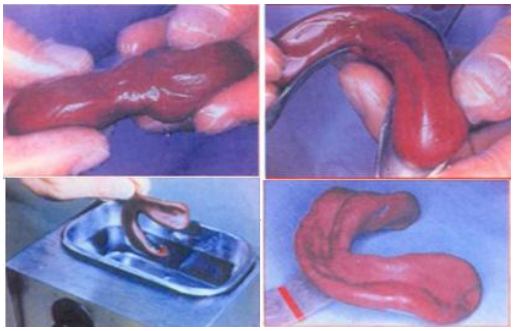
c- Pink wax.

d- Plaster of Paris.

10- Impression compound is :

a- Reversible impression.

b- Irreversible impression.



11- Zinc oxide-eugenol sets by a reaction known as:

a- Polymerizationreaction

b- Condensation reaction

c- Gellationreaction

d- Chelation reaction

12- Model obtained from ZnO/E impression is:

a- Study cast b- secondary cast (master cast)

II- Complete the following for mixing ZnO/E impression:

1- Increase in **temperature** ……(decrease or increase) the setting time.

2- Increase in the amount of **moisture** in the mix ……(decrease or increase) the setting time.

3- Altering the **normal ratio** of the base and accelerator paste (decrease base/accelerator)…. …… (decrease or increase) the setting time.

4- Chemical modifiers, e.g **accelerator** (Calcium and Mg-chloride) can. ……(decrease or increase) the setting time, while **Vegetable oil** can……(decrease or increase) the setting time.

5- The clinician can …… (Decrease or increase) the setting time by adding **Zinc acetate or few drops of water**.

6- Using a **cool glass slab** may …… (Decrease or increase) the setting time.

III- Problem solving:

From inelastic impression types select:

a- What is the Primary impression , type of tray used with this patient

b- What is the possible secondary impression , type of try

Hydrocolloid elastic impression

A- Alginate impression

I- Choose the correct answer: (0.5 marks for each)

4- **Tray is**:
c- Ready made b-Specially made c-none of them

5- Tray made from:
d- Metal b-plastic c-acrylic resin

6- Tray is:
b- Perforated b-non-perforated c-none of them

7- Alginate supplied in form:
a- Two pastes b-powder and water liquid.

8- Alginate was mixed by using:
a-glass slab and spatula b-Rubber bowel and spatula.

9- Thickness of alginate impression in tray:
a- 2-3mm b- 4-6mm c- 3-4mm

Why????? ----------

7-Alginate impression set :
a- chemically b- physical

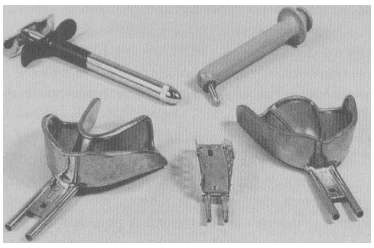
8- Increase powder/liquid ratio :
a- Increased setting time (prolonged).
b- Not affect setting time.
c- Decreased setting time(fast set).

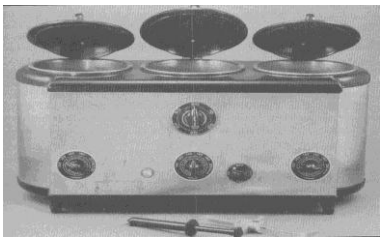
9- Vigorous, rapid mixing of alginate:
a- Increased setting time (prolonged).
b- Not affect setting time.
c- Decreased setting time (fast set)

10 The Obtained Gypsum model is :
a- immediately b- after 1hr c-after 24hr

11 For proper storage of alginate:
a- Wrapped by wet towel and inserted in plastic bag.
b- Immersed in rubber bowel containing water.
c- Air bench stored.

B- Agar-Agar hydrocolloid impression





Choose the correct answer or answers:

1- Tray is:

a- Ready- made b-Specially made c- Specially designed

2- Tray made from:

A-Metal b-Shellac base plate c- acrylic resin

3- Agar-Agar supplied in form:

e- Two pastes. b- Powder and water liquid.

c- Jar and two pasts. d- Jell in sealed container.

4- Agar-Agar was softened by:

a- Flame. b- Water bath.

C-Special softening equipment.

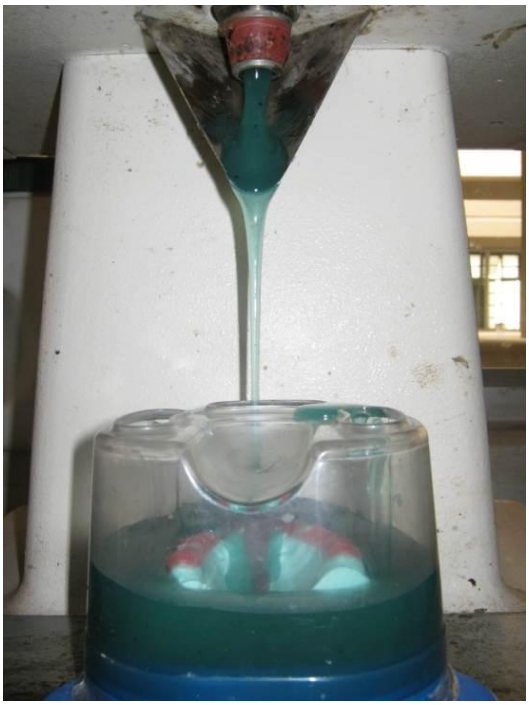
5- The most common use for Agar-Agar impression is:

a- Primary impression. b- Secondary impression.

c- Cast duplications.

6- Agar-Agar impression set by:

a- Gelation. b- Chelation. c- Polymerization reaction.



Agar-Agar duplication unit

II- Answer the following:

1- Why alginate impression should be removed in sharp snap movement from patient mouth?

2- Why it should poured immediately and immersed in 2% K_2SO_4 solution before pouring gypsum model?

Rubber base elastic impression materials

(A) For Rubber base (medium flow) impression

Choose the correct answer or answers: **(0.5 marks for each)**

10- **Tray is**:
d- Ready made b-Specially made c-none of them

11- Tray made from:
e- Metal b-Shellac base plate c-acrylic resin

12- Tray is:
c- Perforated b-non-perforated c-none of them

13- Rubber base supplied in form:
f- Two pastes. b-Powder and water liquid. c- Jar and two pasts

14- Rubber base was mixed by using:
a-glass slab and spatula b-Rubber bowel and spatula.

15- Thickness of all rubber base impression in tray (except poly ether):
a- 2-3mm b- 4-6mm c- 3-4mm

16- Try should be painted by adhesive liquid before rubber base impressions loading due to:
a -Hydrophilic nature of rubber base impression.
d- Hydrophobic nature of rubber base impression.
e- Low viscosity of rubber base impression.

8- Rubber base impression set by:
a- Gellation. b- Chelation. c- Polymerization reaction.

9- Surfactant applied above Silicone impression before gypsum pouring to:
a- Reduce the contact angle between gypsum products and hydrophobic impression.
b- Reduce the contact angle between gypsum products and hydrophobic impression.
c- Decrease surface air bubbles of model (rough model surface).

(B) For Rubber base (Heavy and light flow) impression:

1- Tray is:
a- Ready made b-Specially made c-none of them

2- Tray made from:
a-Metal b-Shellac base plate c-acrylic resin

3- Tray is:
a-Perforated b-non-perforated

4- Rubber base supplied in form:
a- Two pastes b- Powder and water liquid c-Jar and two pasts

5- Heavy or putty consistency impression consider:
a- Secondary impression. b- Primary impression.
c- Tray for light consistency impression.

6- Wash technique impression consider :
d- Primary impression b- Secondary impression

7- Gypsum model is :
a- Study cast b- Master cast c-Primary cast.

8- All rubber bases impression can be electroplated except polyether due to:
d- Its hydrophobicity. b- Its hydrophilicity c-Its high flow.

II- Problem solving:

For the opposing cases:

a- Select the possible primary impression materials, classify according to behavior after setting

b- Select the possible secondary impression materials and classify according to behavior after setting

c- Mention possible model material used in this case

Home work

Mode of presentation:

List instruments and equipment used for manipulation:

Manipulative variables:

Home work

Mode of presentation:

List instruments and equipment used for manipulation:

Manipulative variables:

Investment materials

I- Choose the correct answer: **(0.5 marks for each)**

1- The role of Silica in investment material is to:

a- Produce porosity in investment b. Mold expansion thermally

c- Increase the strength of the investment d. All of the above

2- Investment materials should be porous to:

a- Allow hygroscopic expansion b- Allow thermal expansion

c-Escaping of air from mold space d- b and c.

3- The purposes of heating the investment are to:

a- Increase the hygroscopic expansion of investment.

b- Expand the mold thermally.

c- Eliminate wax pattern from the mold. d- b and c

4- Investments used for casting gold alloys are:

a. Gypsum bonded investment. b. Silicate bonded investment.

c. Phosphate bonded investment mixed with special liquid.

d. None of the above

5- Artificial venting is essential in:

a- gypsum bonded investment b. Silicate bonded investment

c- Phosphate bonded investment d. All of the above

6- Too small casting may be due to:

a. Insufficient heating of the investment material.

b. Insufficient melting of the alloy.

c. Improper selection of the investment material d. a and c

7- The casting shrinkage of gold alloys is approximately:

a. 1.6 % b. 0.5 %. c. 2.3 %. d. 3 %.

8- The number of bubbles in an investment material can be reduced by:

a- Investing the pattern under water.

b- Mixing the investment under vacuum.

c- Using a higher water/powder ratio.

d- Using a lower water/powder ratio.

II- Enumerate steps of dental casting procedure: **(1 mark)**

1-

2-

3-

4-

5-

6-

7-

III- complete the following:

1- The refractory material is ----- which has high----------to compensate solidification shrinkage of metal.

2- Investment materials could be classified according to binder to:

a- ……..

b- …….

c- …….

3- The ……. and …….. Investment materials can expand hygroscopically.

4- Gypsum-bonded investment is limited to casting of ……., while phosphate-bonded investment can be used for casting of either ……. or ……. Depending on the type of the mixing liquid.

5- A metal ring is used with ……..investment in case of gold castings, while a ……..ring is used in case of base metal castings.

6- Expansions obtained with gypsum bonded investment are ……..,
…….and……

7- Investment that needs venting is……. and its binder is……. while the refractory material is……

Home work

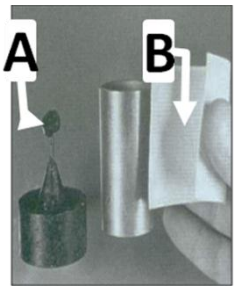
Mode of presentation:

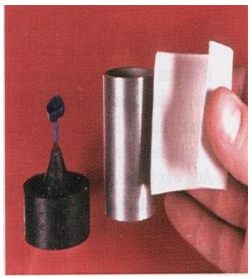
List instruments and equipment used for manipulation:

Manipulative variables:

Casting technology

1. Part A is---------and part B is---------
2. Delayed investing of part A will lead to
3. ---------- of the cast metal.
4. Wetting of part B will help in ----------of investment.
5. Base metal alloys don't corrode due to presence of ---------- element which found in percent ----------to ----------% and make ---------- layer





6- What is the use of such paper?

A) ----------

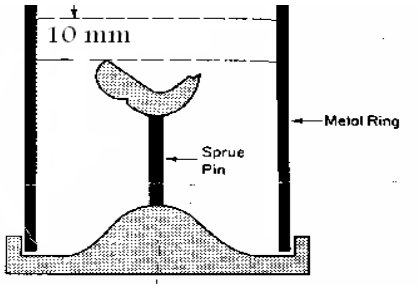
b) ----------

c) ----------

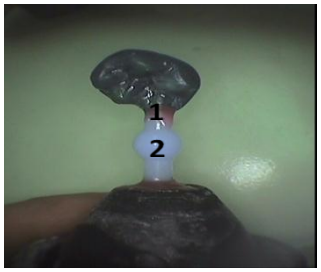
d) ----------

7-a- What is the expected casting defect?

B - What are the other causes for this defect?



8- A- Identify 1, 2



B- What is the rule of 2 ?

C- What is the suitable type of investment for casting base metal alloys and why?

d- Where does the point of attachment of the sprue to the wax pattern?

e- What is the diameter of the sprue? Why?

f- What is the direction of the sprue? Why?

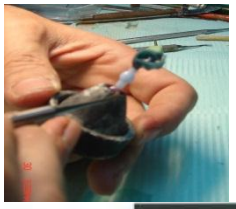
g- Base metal alloys shouldn't be pickled .. Why?

h- Using too long sprue will lead to ----------of investment

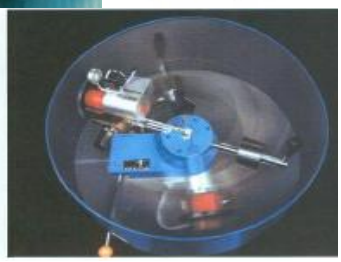
i- Using too short sprue will lead to incomplete casting due to ----------

i- Shrinkage porosity of cast metal could occur due to--------.

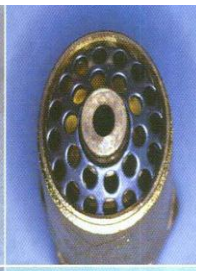
9- Why wax pattern should be coated by wetting agent before casting?



10- Which type of alloys can be casted by this centrifugal casting machine? Justifying your answer. Mention the name of casting defect.



11- Gas air torch (maximum heating temperature is 900 ^{o}c) why it is used with gold alloy only???



Home work

Mode of presentation:

List instruments and equipment used for manipulation:

Manipulative variables:

Non-metallic denture base

1- **What are the main uses of acrylic resin?**

……
……
……
……
……
……

2- The monomer should be kept in tightly sealed dark bottle to avoid:

a. Rapid polymerization reaction when mixed with the polymer.

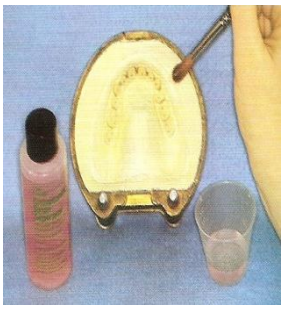
b. Self-polymerization of the liquid on storage.

c. Discoloration d. All of the above

3- What will happen if P/L ratio is increased?

……
……
……

4-Functions of separating medium are…….,……
…….,……
……..,……
……



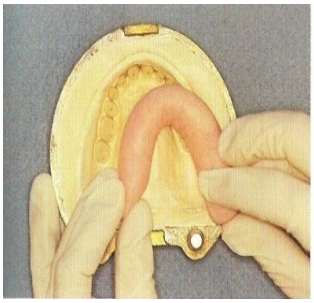
5-For packing step:

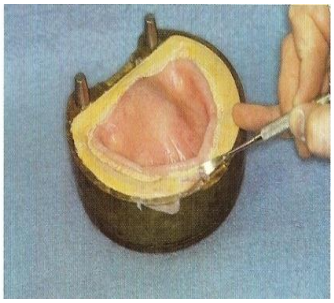
a- Conditions are

1- …….. ……

2- ……..

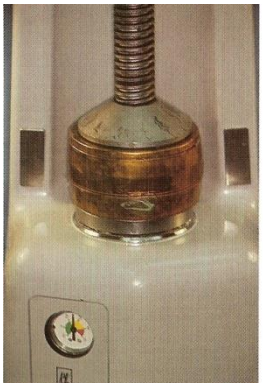
3- ……..





b- Early and delayed packing lead to……
……

6- **Opposing Figure:**



a- The material is going to be packed in this flask is _____ .

b- packing is done when the material is in the ____ stage.

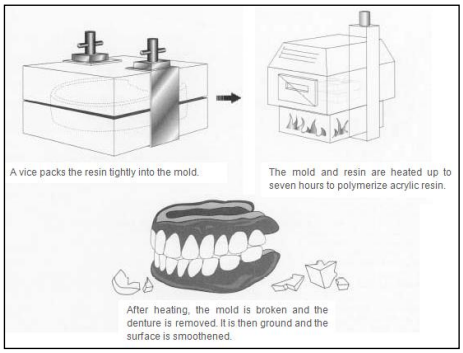
c- Too early packing lead to _____ and _____.

7- Denture should be kept in water why???

……
……
……
……

8- After polymerization of acrylic resin, rapid cooling should be avoided in order to:

A. Minimize porosity
B. Minimize discoloration
C. Minimize hardness.
D. None of the above.



9- Polymerization shrinkage porosity (Surface porosity) is due to:

a. Over packing b. Packing at dough stage.
c. Use of excessive monomer d. Under-curing.

a- Mention the possible causes of this problem

……
……
……..

b- How you can repair????

Home work

Mode of presentation:

List instruments and equipment used for manipulation:

Manipulative variables: