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PHARMACEUTICS-II

Syllabus: -

1. Prescription
2. Incompatibilities in Prescriptions
3. Posology
4. Solid dosage forms-Powders
5. Mono-phasic liquid dosage forms
6. Biphasic liquid dosage form- Suspensions
7. Biphasic liquid dosage form- Emulsions
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9. Pastes
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11. Poultice
12. Suppositories & Pessaries
13. Dental and cosmetic preparations
14. Sterile Dosage forms-
    I) Parenteral dosage forms
    II) Sterility testing
15. Ophthalmic Preparations

6. **Signature or transcription:** It gives direction to the patients regarding
   a) The method of administration or application
   b) The quality or number of doses to be taken
   c) The time of administration or application.
   d) The vehicle of administration.

7. **Renewal instruction:** It indicates on every prescription order, whether it may be renewed and how many times.

8. **Signature, address, and registration number of the Prescriber:** A prescription is never complete without the signature of the prescriber. In case the prescription is through a phone message pharmacist must be obtain the signature later on.

Example: prescription

SHARMA NURSING HOME Ph: 552248

5,Model Town, Delhi

Date: 28-3-13

Name: Mr. Nand Lal **Age: 45 yrs** **Sex: Male**

Address: 48, Azad Nagar, Delhi.

Rx (Superscription)

(Inscription)		
	Sodium bicarbonate	3 g
	Compound tincture of cardamom	2 ml
	Simple Syrup	6 ml
	Water q.s	90 ml

Fiat mistura(subscription)

Sig Cochleare magnum ter in die post cibos sumenda.(Signatura)

Sd/-
Dr Aswani Sharma
M.B.B.S., M.D.
Regd. No. 14328

Refill:_____

LATIN TERM	ENGLISH MEANING	LATIN TERM	ENGLISH MEANING
Omni	Every	Sumendus	To be taken
Collutorium	A Mouth Wash	Nocte	At Night
Ante Cibos	Before Meals	Tabella	A Tablet
Mitte	Send	Mistura	A Mixture
Post Cibos	After Meals	Octe	Eight
S.O.S	When Required		
Omni Hora	Every hour		
Pulvis	Powder		
Cohleare Magnum	One table spoon ful		
Q.S	As much as is sufficient		
Bis in die	Twice a day		
Ter in die	Three time a day		
Nebula	A Spray		

CHAPTER. 1
PRESCRIPTION

Q.1 Define prescription. Give an example of an ideal prescription and label its parts.

A prescription is a written order by a physician, dentist, veterinarian or any RMP (registered medical practioner) to a pharmacist to compound and dispense the specific medicine for the patient.

The order contains directions for the pharmacist to prepare a specific type and quantity of preparation for the patient, it also include the directions for the patient regarding the mode of administration of drugs.

Explain the different parts of the ideal prescription:

1. Date
2. Name, age, sex and address of the patient
3. Superscription
4. Inscription
5. Subscription
6. Signature.
7. Renewal instruction
8. Signature, address, and registration number of the Prescriber

1. Date: It helps a pharmacist to find out the date of prescribing and date of presentation for filling the prescription.

2. Name, age, sex, and address of the patient:

a. Name is mentioned to avoid the possibility of errors of giving the medicament to the wrong person.

b. Age and sex are mentioned for pharmacist to check the medication and its dose.

c. Address is recorded to held for any reference in later stage in contact the patient to deliver the medication personally.

3. Superscription: It is represented by a symbol Rx an abbreviation for recipe, meaning is you take. This symbol as considered as a prayer to Jupiter (God of healing). Sign of Jupiter employed as request for healing.

4. Inscription: It is the body of the prescription it contains

a) The name of the ingredient

b) The quantity of each ingredient.

The inscription has divided into following parts.

A. Base: It is the active medicament which produces the required therapeutic effect. Ex: in sulphur ointment, sulphur acts as base.

B. Adjuvant: It enhances the action of the medicament or to make the product more palatable. Ex: In turpentine liniment, Camphor acts as adjuvant.

C. Correctives: It is the substance which corrects any defects that may occur in the preparation. Ex: In castor oil emulsion, gum acacia acts as correctives.

D. Vehicle: Vehicle is a medium in which the medicaments are dissolved or suspended. The inscription may be written in the following order. Solid ingredients must be written first, then liquids and finally vehicle.

5. Subscription: It gives direction to the dispenser or pharmacist regarding

a) The dosage form: Ex: mixture, emulsion, powder, ointment

b) Instructions relating to its preparation

c) Quantity to be sent and manner of sending

CHAPTER - 2
INCOMPATIBILITIES

Q.1 Define incompatibility & classify with examples.

Definition: It may be defined as when several ingredients are mixed together, they may interact with each other so that an undesirable product is formed which alter or affect the appearance effectiveness & safety of the preparation.

Classification: -

1. Physical incompatibility: When two or more substances are combined together, a physical change takes place and an unacceptable product is formed.

a. Insolubility: It is due the substances are insoluble in vehicle.
Method to overcome: Suitable vehicle may be taken or by adding of suspending agent.

b. Immiscibility: This is due to immiscible nature of two liquids.
Ex: Oil in water, Chloroform in water
Method to overcome: By adding suitable emulsifying agent.

c. Precipitation: Resins are in soluble in water & forms precipitate which is indiffusible.
Method of overcome: This may be corrected by the adding of a suspending agent such as tragacanth which helps to suspend the precipitation.

d. Lequification: This is due to the formation of a liquid when two solids such as phenol, thymol, menthol, camphor etc. are mixed together. It causes instability in the preparation & in the presence of moisture various micro organisms can attack fast.
Method of overcome: To overcome this powders such as light kaolin or $MgCo_3$ which can absorbed moisture are mixed to maintain the free flowing property of the preparation.

Chemical Incompatibility: Chemical incompatibility may be a result of chemical interactions between the ingredients of a prescription and harmful or dangerous products may formed. It is divided into two groups.

A. Tolerated incompatibility: The chemical interaction can be minimised by changing the order of mixing or mixing the solutions in dilute forms but no alteration is made in the formulation.
Ex: Strychnine HCL with Aromatic spirit of ammonia.
Rx

Strychnine HCl Solution
Aromatic spirit of Ammonia
Water

Type: Chemical Incompatibility
Alkaloid salts with alkaline substances
Incompatibility:
Strychnine HCl is alkaloidal salt. Aromatic sprit of ammonia is alkaline substances strychnine HCl is reacts with Aromatic spirit of ammonia & produces free alkaloid which is insoluble in water.

Label: Shake will before use.

B. Adjusted incompatibility: This type of incompatibility is prevented by the addition or substitution of ingredients which does not affect the therapeutic action.
Ex: Sodium salicylate & lemon syrup by mixing these two salicylic acid is ppt out it is in-diffusible. It is corrected by compound tragacanth powder.
Rx

Sodium salicylate
Lemon syrup
Water

Type: Chemical incompatibility-soluble salicylates with acid

Incompatibility: Lemon syrup contains citric acid. It decomposed sodium salicylates into salicylic acid it is indiffusible.
How to Overcome: Lemon syrup prescribed as flavouring & sweetening agent. Hence it can be replaced by simple syrup & tincture lemon. (95% syrup 6% tincture lemon).

Other examples for Chemical Incompatibility:

1. Quinine sulphate, sodium salicylate with water:
Rx : Quinine HCl
Sodium salicylate
Water (Q.S)
Incompatibility: Quinine HCl is an alkaloidal salt. It reacts with sodium salicylate & quinine salicylate is precipitated out. It is an indiffusible.
How to Overcome: This type of incompatibility can be prevented by adding suspending agent like compound tragacanth powder. (2 g /100 ml) to the indiffusible substance. It is triturated in the mortor & added liquid ingredients & then soluble ingredients then dispensed.
Label: Shake will before use
2. Quinine sulphate, KI, H_2SO_4 & water. Iodides & bromides reacts with quinine SO_4, H_2SO_4 & H_2O (Herapathite):
Rx: Quinine sulphate
Dil H_2So_4
Pot Iodide
Water (Q.S)
Incompatibility: It is a chemical incompatibility, dilute H_2So_4 is used to dissolve quinine sulphate when freshly prepared it is clear. But after 3 days the reaction takes place as follows. Dil H_2So_4 reacts with potassium iodide & liberate hydro iodic acid. This is partly oxidized by dil H_2So_4 & free iodide is liberated.
Hydro-iodic acid, iodide & quinine So_4 combined together & from a compound known as "**Herapathite**" it is deposits as olive green scale. It is un-desirable.
How to Overcome: About 3 days use, they may be used dispensed together. More than 3 days Kl is dispensed in one bottle ingredients are dispensed in another bottle separately. These ingredients are mixed together when-ever required.
3. Sodium salicylates with quinine sulphate, H_2So_4 7 H_2O:
Rx: Sodium salicylate
Quinine sulphate
Dil H_2So_4
Water
Type: Chemical incompatibility of soluble salicylate with acid.
Incompatibility: Dil H_2So_4 is prescribed to dissolve quinine sulphate. But dil H_2So_4 decomposed sodium salicylic acid, which is indiffusible.
Overcome: Suspending agents like compound tragacanth powder (2g/100ml) is added
Label: shake well before use.

4. Sodium salicylate with caffeine citrate:

Rx: Sodium salicyalate -1.0g
Caffeine citrate -0.5g
Water up to -30ml

Type: Chemical incompatibility – **Soluble salicylates with acid**
Incompatibility: Caffeine citrate is a mixture of equal weights of caffeine & citric acid. Caffeine is week base & caffeine citrate is acidic in nature. The citric acid present in caffeine liberates salicylic acid which gets precipitated, which is indiffusible.
Overcome: Caffeine citrate is substituted by caffeine half its quantity. It reduces acidic reaction though caffeine is insoluble compound. Hence the mixture is clean.

6. Sodium salicylate with ferric salt with water:

Rx: Sodium salicylate
$FeCl_3$
Water

Type: This is chemical incompatibility- **salicylate with ferric salts.**
In this soluble salicylates reacts with ferric salts. Sodium salicylate reacts with ferric chloride and produces ferric salicylate which is precipitated out. It is indiffusible.
How to overcome: It is dispensed by using a suspending agent like compound tragacanth 2%.
Label: "Shake well before use"

7. Sodium salicylate $NaHCO_3$ & Water:

Rx: Sodium salicylate
$NaHCO_3$
Sodium meta bisulphate
Peppermint water

Type: Chemical incompatibility – **soluble salicylates with alkali.**
Incompatibly: The solution become dark in colour due to alkali catalyzed conversion of salicylate to quinoid form.
Overcome: So anti-oxidant-sodium meta bisulphate is added to prevent darkening of preparation.

8. Incompatibility of causing evolution of Co_2:
Ex: Sodium bicarbonate with borax

Rx: Sodium bicarbonate
Borax Glycerine
Water

Type: Incompatibility of causing evaluation of Co_2
Incompatibility:
When borax is dissolved in water oxidation reaction takes place & produces boric acid Boric acid reacts with glycerine & form mono-basic glycerine boric acid. This reacts with $NaHCo_3$ liberating Co_2 from the $NaHCo_3$.
Overcome: All the ingredients should be mixed with water in an open vessel until the effervescence stops. If the reaction is slow hot water is added to fasten the reaction.

Therapeutic Incompatibility:

When certain drugs are administered to the patient for a particular therapy but it produce effects other than that for which it is administered. Here the nature & intensity of action may be different from what it is expected.

Causes: Adverse reaction, Allergic reaction, Drug dependence (drug addiction),Drug tolerance, Drug resistance, Idiosyncrasy

Types of incompatibility:

1. Synergism: It refers to the effects of combined drugs in which the one drug tends to increase the pharmacological action of other drug or prolong the duration of action of another drug.

Ex: Phenobarbitone, sodium with Na salicylate

Rx: Phenobarbitone sodium
Sodium salicylate
Peppermint water

In this prescription phenobarbitone sodium & sodium salicylate minimum per dose. But combined action of these two ingredients is greater than the sum of their individual action with minimum dose, the maximum efficacy is obtained.

2. Antagonism: When two drugs possessing opposite actions, are prescribed in the same prescription is known as antagonism. So any one of the drug is omitted.

Ex:Phenobarbitone sodium with Ephedrine HCl.

Rx: Phenobarbitone sodium
Ephedrine HCl
Syrup Chloroform water
Water (U.S)

In this prescription, ephedrine Hcl is prescribed to prevent bronchial spasm in asthma. It also has the stimulant action as the cerebrum & respiratory centre. Pheno-barbitone sodium combined with ephedrine Hcl to overcome. Their stimulation it is an antagonistic combination.

3. Contraindication: The use of certain drugs which may be contra indicated in a Particular disease or a Particular patient who is allergic to it.

Ex: Barbiturates & Morphine in Asthma.

Questions:

1. Define Incompatibility. What are the different types/classification of incompatibilities?
2. Describe in detail about physical Incompatibility with example.
3. Describe in detail about Chemical Incompatibility with example.
4. Write a note on "Herapthe reaction" for Quinine.

CHAPTER - 3
POSOLOGY

Q 1. Define posology. Mention formula for calculation of children doses.

Def: Posology is a branch of medicine which deals with doses or quantity of drugs which can be administered to produce the required pharmacological actions.

Ex:

1. Paracetamol:

Maximum daily dose upto 4grams.
Route of administration – orally in divided doses.
Use – Anti-pyretic

2. Ampicillin:

Maximum daily dose -1 to 6grams
Route of administration -Oral daily in divided doses.
Use: Broad spectrum antibiotic

3. BCG Vaccine:

Single Dose -0.1ml
Route of administration -Prophylactic by intra muscular
Category -Active immunizing agent

Formulae to calculate children dose:

Response of drugs may vary from one patient to another patient. The dose for children can be calculated from the adult dose by using age, Body weight and surface area. Infants require lesser dose than the adult.

I. Depending on age:

a) Young's formula:

$$\text{Child's dose} = \frac{\text{Age in years}}{\text{Age in years} + 12} \times \text{adult dose}$$

This formula is suitable to calculate the dose for a child below 12 years.

b) Dilling's formula:

$$\text{Child dose} = \frac{\text{Age in years}}{20} \times \text{adult dose}$$

This formula is suitable to calculate the dose for a child between 12 to 20 years.

c) Fried's formula:

$$\text{Child dose} = \frac{\text{Age in months}}{150} \times \text{adult dose}$$

This formula is suitable to calculate the dose for infants.

II. Depending of body weight:

Clark's formula

$$\text{Childs's dose} = \frac{\text{Weight in pounds}}{150} \times \text{adult dose}$$

III. Based on surface area:

$$\text{Child dose} = \frac{\text{Body surface area of child}}{\text{Body surface area of an adult}} \times \text{Adult dose}$$

Questions:

1. Define posology.

2. Mention formula for calculation of children doses.

CHAPTER. 4
POWDER

Q 1. Define powder. What are the advantages and disadvantages of powder?

Def: - Powder is solid dosage form containing homogeneous mixtures of drugs and chemicals in a dry, fine state of sub-division and meant for internal and external use.

Advantages:
1. Powders show a greater stability than liquid dosage form. Ex: Aspirin and penicillin.
2. Easy of administration.
3. Rapid therapeutic effect.
4. They are easier to carry than liquids.
5. Incompatibility is less in case of powder than liquids.
6. Physician has free choice of drug combination.
7. The dose variation depending on the condition of the patient is possible.

Disadvantages:
1. Volatile drugs are not suitable for dispensing in powder from.
2. Hygroscopic drugs cannot be dispensing in the powder from.
3. Powder may easily deteriorate on exposure to atmosphere because of large surface area.
4. Powder show physical instability. Ex: colour change.
5. Time consuming to prepare.
6. Drugs which have bitter taste cannot be dispensed in powder form.

Classification of powder:

1. Bulk powder for internal use: Powders are dispensed in bulk for which accuracy of dosage is not important. Bulk powder contains several dosages of powders, they are supplied in a wide mouth container. The non potent substances which are supplied in bulk are antacid and laxative.

Ex: Compound Rhubarb powder B.P.C

Rx: Rhubarb, in powder
Light magnesium carbonate
Heavy magnesium carbonate
Ginger in powder

2. **Bulk powder for external use:** Bulk powder meant for external use is non potent substances. These powders are supplied in cardboard, glass or plastic containers, which are often designed for specific method of application.

1) Dusting powders: Dusting powders are mixtures of two or more medicaments, in a dry fine state of subdivision meant for external use.

Ex-Compound dusting powder of Zno and H_3Bo_3

Rx: Zno
Boric acid
Starch
Purified talc sterilized

Properties:
1. Homogenous
2. No local irritation
3. Flow easily
4. Spread uniformly
5. Cling to the skin

6. Good covering capability
7. Good adsorptive and absorptive capacity
8. Capable to protect the skin against irritation by friction, moisture or chemical irritants.

Method of preparation: Finely powder all the ingredients and mix them in an ascending order of weight, pass the powder through sieve No.250 in order to remove gritty particles. The dusting powder must be homogeneous and in a very fine state of subdivision to enhance effective and minimize local irritation.

Dusting powders are divided into two types.

Medicated dusting powder	Surgical dusting powder
They should not to be applied to open wounds and broken skin.	These are applied to body cavities and wounds and on burns
Sterility is rarely essential	They contain Anti-Bacterial agent.

Containers: The dusting powders are dispensed in sifter-top containers or pressure aerosols. The pressure aerosol containers are costlier than other containers but can protect the medicaments from contamination and other atmospheric conditions and help in the easy application of the preparation.

Uses: It is used as antiseptic, Anti-pruritic, Protective, Adsorbent and lubricating.

2. Insufflations: These are finely divided dusting powders meant for introduction into the body cavities such a Ear, Nose, Tooth sockets, Throat, Vagina etc. It is applied by insufflators consists of bulb chamber and delivery nozzle. Powder is placed in chamber and when bulb is compressed the air current carries the fine particles through the nozzle to cavities it produce local as well as systemic effects.

Disadvantages:

1. Not uniform dosage
2. Particles stick to each other and wall of the insufflators

3. Snuffs: For local action, these are to be inhaled through the nose. They are packed in a metal box or enclosed in a double wrapper lined with a waxy paper.

Ex: anti-septic powders.

4. Dentifrices: Dentifrices are used to clean the teeth they should have cleaning action by the detergent property. They should not damage tooth structure.

They contain following ingredients:

a. Mild abrasive and polishing agents: Ex -$CaCo_3$, prepared chalk
b. Detergents: Ex - sodium lauryl sulphate
c. Anti-septic: Ex - Phenol.
d. Preservatives: Ex -sodium benzoate
e. Flavouring agents: Ex- menthol, peppermint oil
f. Sweetening agent: Ex-saccharine.

3. Simple and compound powder for internal use:

a) **Simple powder:** A simple powder contains only one ingredient.
b) **Compound powder**: A compound powders contain two or more than two ingredient.

4. Powder Enclosed In cachets: Cachets or rice flour capsules are dosage containers formed by sealing together two concave discs of wafer sheet. The sizes varied from 3/4 to 1/8 inch in diameter. The medicament is filled in one concave disc. The other disc is placed over the medicament filled disc. The two discs were tightly sealed by moistening the margins and

pressing together firmly. Cachets are allowed to float on water so that they became soft, elastic and slippery. They could be swallowed with a cup of water. It should be protected from light.

Advantages:

1. Easy to prepare no complicated machinery is required.
2. Drugs are quickly dispensed in cachets.
3. Large doses of drugs can be dispensed.
4. They disintegrate quickly in the stomach.

Disadvantage:

1. They are easily damaged.
2. They do not protect the enclosed drugs from light and moisture.
3. They require moistening before swallowing.
4. They cannot be filled by large scale machinery.
5. The shell of cachets are fragile. So that drug contents cannot be compressed in cachets.

5. Compressed powders (Tablet triturate):

Tablet triturates are disc like masses moulded powders weighing 30mg to 250mg each prepared by the process of moulding. It consists of active medicament and bases.

It is prepared by taking required quantity of the drug is mixed with a little quantity of the diluent. This mixture is moistened with moistening agent and the wet mass is pressed into the perforations of the mould. If the mass is too wet shrinkage will occur. If mass is not properly wetted then the mass will not have proper cohesion to make a firm tablet. These are prepared by using hand moulding machine.

Powders requiring special consideration:

1. Eutectic powder: When two organic substances having low melting points are brought in physical contact with one another they may from a liquid or a semi-solid mass.
The liquefaction may be due to lowering the melting points in presence of impurities. When two substances are brought in contact each may act as impurity for the other. It results in lowering of melting points of the both ingredient. If the melting point lowered to below the room temperature ingredients liquefies.
Ex: The combination of any two of the following camphor, menthol, thymol, phenol, salicylic acid, acetyl salicylate, phenol salicylate, chloral hydrate.

Remedy:

1. If the eutectic combination is known each ingredient is mixed with an inert substances like starch, lactose, $MgCo_3$, then mixed the both and dispensed each ingredient in separate enclosures.
2. If the combination is not known allow liquefy then add the adsorbent like lactose or starch or $MgCo_3$ to get in the form of powder.

2. Effervescent Granules: Certain crystalline substances liberate water of crystallisation wholly or partly due to change in humidity or during triturations. As the result the powder becomes wet or liquefy.

Importance of ingredients:

1. $NaHCo_3$: It reacts with acids, when the preparation is added to water the liberated Co_2 produces effervescence.

2. Citric acid:

i) Provide water from crystallization and form partial interaction.

ii) Neutralize $NaHCo_3$,It neutralizes remaining $NaHCo_3$.

3. Tartaric acid: It neutralize remaining $NaHCo_3$

4. Medicaments: For therapeutic action, it should be anhydrous and soluble in water. In many cases the medicament is an in-organic salt.

5. Sugar: It acts as sweetening agent to mask bitter taste.

Method of preparation: It is prepared by two methods they are:

1. Heat method or fusion method

2. Wet method.

Heat method:

1. Place a porcelain dish on water bath the disk should be deep in water bath. Heat the bath to the boiling point.
2. All the ingredients are powdered, passed through sieve No-250, weighed and mixed them by ascending order.
3. Place all the powders in the hot porcelain dish on the boiling water bath.
4. Press the powders with a stainless steel spatula until it forms a loose cake or a damp coherent mass. It takes about 1-5 minutes.
5. Remove the dish from the water bath. The damp mass is passed through a sieve No-8 to get granules.
6. Granules are dried in an oven at a temperature less than degree 60.
7. The granules are then packed in wide mouthed and airtight containers.

Wet method:

1. Powdered each ingredient, weighed and mix them.
2. Mixed ingredients are moistened with alcohol with continuous stirring until a coherent mass is formed.
3. The mass is passed through sieve No-250 to obtain granules.
4. These granules are dried in an over below 60 degree.
5. Dried granules are again passed through sieve no-8 to break the lumps which may have been formed during drying.
6. Dried granules are packed in dry, wide mouthed and air tight container.

Containers: Screw capped wide mouthed bottle or plastic jar.

Auxiliary label: Store in a cool and dry place.

What are the possible errors in weighing?

1. If the balance is not kept on a uniform surface.
2. Before weighing the chemicals two equal weights of paper should be placed on both sides of the pan, if the weight of two papers is un-equal than error may occur.
3. If the small amount of the potent drug adheres to the paper, than error may be possible.
4. Spoilage of the powder may be possible during weighing and transferring of the material from the paper to the appropriate container.
5. Errors may be possible. If wear and tear on the bearings and corrosion of knife edges.

Geometric Dilution:

When the prescribed dose of the medicament is very small quantity (0.5-2.0). It cannot be weighed accurately in a dispensing balance. So a suitable triturate is prepared by mixing the medicament with diluents in order to increase the bulk so that it can be weighed correctly. This method is known as geometric dilution method.

1. In this method, small quantity of the drug is mixed with equal quantity of the diluents.
2. Total weight of this powder mixture is again mixed with same weight of the diluents.
3. This process is repeated as many times as possible until all the powder is mixed.

4. The main advantage of geometrical dilution is that the concentration of the active medicament is uniformly distributed in each dose.
   Ex: Lactose

Questions:

1. Define the term powder. Classify different types of powder.
2. Discuss the bulk powders that are meant for external use.
3. Write a note on: a) Eutectic powders b) Cachets c) Dusting powders
4. Explain the term geometric dilutions with the help of an example.

CHAPTER. 5
Monophasic liquid dosage forms

Def: A monophonic liquid contains only one phase i.e., solutes which is completely soluble in solvents. Monophasic liquids are homogenous systems of dosage forms containing either miscible liquids or solids which are completely soluble in water, intended for internal use or external use.

Classification/type of Monophasic liquids:

1. Monophasic liquid meant for internal use:

Ex: solutions, mixtures, syrups, elixirs, linctus etc.

Mixtures: A mixture is a liquid preparation containing medicaments meant for internal use. It contains several doses.

I. Mixture containing soluble substances:

Ex: Carminative mixture

Formula:

Na HCo_3	Compound tincture of cardamom
Aromatic spirit of ammonia	Weak tincture of ginger
Spirit of chloroform	Peppermint water

Procedure:

1. Dissolve the solid substances in little quantity of vehicle. Ex - $NaHCO_3$ in Peppermint oil.
2. If any foreign particle appears filter it.
3. Add any liquid ingredient.
4. Volatile liquids are added at the end just before adjusting the final volume with vehicle.
5. Final volume is adjusted with remaining vehicle.

Storage: It is stored in a well-closed greenish tinted graduated bottle.

Uses: It is used as carminative, $NaHCo_3$ act as antacid.

II. Mixture containing in-diffusible solids

In-diffusible solids are insoluble in water. So a suitable suspending agent should be included in the formula to increase the dispersion of insoluble solids. **Ex:** $CaCo_3$ mixture

Formula:

$CaCo_3$
Compound powder of tragacanth
Tincture catechu
Purified water

Procedure:

1. Finely powder the indiffusible solids with diffusible or soluble solids and compound tragacanth powder in a motor. Measure three quarters of vehicle and add a portion of it with trituration to form smooth cream.
2. The content in the motor is examined for the presence of foreign particle if any that can be removed with the help of glass rod or passing through muslin cloth in a measuring cylinder.

3. Add the liquid ingredient if any and volume is made up by adding vehicle.
4. The mixture is transferred into a bottle. Corked, polished to remove finger marks and labelled.
5. The label should be mention "shake well before use"

Storage: It is stored in a well closed greenish tinted graduated bottle.

Uses: It is used in the treatment of diarrhoeal, $CaCo_3$ and tincture catechu acts as anti-diarrhoeal agent. Compound powder of tragacanth acts as suspending agent.

III. Mixtures containing diffusible solids: Diffusible substances are slightly or partially soluble but diffuse uniformly on shaking for enough time to measure the dose so suspending agent is not necessary in the formulation.

Formula:

$MgSo_4$
Light magnesium water carbonate
Peppermint water

$MgCo_3$ is a diffusible solid while $MgSo_4$ is soluble in water.

1. Finley powder diffusible solid in a motor with soluble solid if any measure three quarter of the vehicle and pour a portion of it with trituration to form smooth cream. Then gradually add the remainder of the vehicle.

Stage II III and IV are similar to mixture containing in-diffusible solids.

Storage: It is stored in a well closed greenish tinted graduated bottle. Whole thing is to be taken at a time should be written on the label.

Use: It is used in the treatment of constipation $MgCo_3$ acts as a saline purgative, light $MgCo_3$ acts as an antacid and laxative peppermint water acts as flavoured vehicles.

IV. Mixture containing ppt. forming liquids: Certain liquid preparations contain resinous matter, when mixed with water, the resin is precipitated which may adhere to the sides of the bottle or form a clotted precipitate which will not re-diffuse upon shaking. To prevent this compound tragacanth powder or tragacanth mucilage are used.

Formula:		
	Potassium iodide	2.0g
	Tincture lobelia ether	4.0ml
	Tincture stramonium	16.0ml
	Chloroform water add up to	90.0ml

Procedure:

1. Mix 20.0ml of mucilage of tragacanth with equal volume of water.
2. Measure tincture lobelia ether and tincture stramonium separately in a dry measure and pour slowly into the centre of the mucilage with constant stirring.
3. Dissolve potassium iodide in water and mix it with above mixture.
4. Strain the mixture through muslin piece if foreign particles are present
5. Add more of chloroform water to produce the required volume.
6. Transfer the mixture into the bottle, cork, label and dispense.

V. Mixture containing slightly soluble liquids:

Ex: Paraldehyde mixture: On shaking the slights soluble liquids with the solutions of other ingredients and liquids. It readily mixes with them and distributed throughout the liquid for sufficient time to ensure uniform distribution in each dose.

Formula: Paraldehyde Syrup

Liquid extract of liquorice Water

Procedure:

Triturate the paraldehyde, liquid extract of liquorice, syrup and water in a motor. Transfer to a bottle and shake well.

Storage: It is stored in a well closed container.

Uses: Paraldehyde mixture is used to control convulsions in infants.
Paraldehyde is used as sedative.
Liquid extract of liquorice and syrup act as sweetening agent.
Water acts as vehicle.

Formulation of mixtures: The following are the additives or excipients which included in the preparation of mixtures.

1. **Vehicles: Ex:** Water, aromatic water, syrup vehicle.
2. **Medicament: Ex:** $CaCo_3$, $MgSo_4$
3. **Anti oxidants: Ex:** Sodium Meta bi-sulphate
4. **Flavours: Ex:** Lemon spirit, Orange syrup.
5. **Preservatives: Ex:** $CHCl_3$, benzoic acid

2. Linctus: Linctus is sweet viscous liquid preparations containing medicament meant for internal use. Linctus are commonly used in the treatment of cough. To obtain the maximum effect, they should be taken in small doses, sipped and swallowed slowly without addition of water.

Uses: These used in the treatment of cough. These have sedative or expectorant and demulcent property.

Ex: Codeine linctus B.P.C

3. Draught: It is a liquid medicament intended for internal use which consists of one dose only.

Container: Narrow mouthed, screw capped, colourless plain bottle.

Use: Used in emergency treatment as emetics in poisoning.

Ex: Ipecac emetic draught, Paraldehyde draught

4. Elixirs: Elixirs are clear, flavoured sweetened hydro-alcoholic liquid preparations for oral administration. Elixirs contain medicament, syrup, glycerol, water, flavouring agent and preservatives. Elixirs are commonly used as flavoured vehicle. Elixirs may be simple elixirs without medicament and medicated elixirs.

Ex: Elixir of vitrol
Piperazine citrate
Elixir simple
Terpin hydrate Elixir

Auxiliary label: Store in dark place

Uses: Used as flavoured vehicle.

5. Syrup: Syrup are sweet, viscous concentrated solution of sucrose. The concentration of sucrose in syrup is 66.7%. If purified water is used alone for preparing syrup, is known as simple syrup, when the syrup contains some medicinal substance it is known as medicated syrup. Syrups are used as sweetening agent, flavoured vehicle as demulcent and as a preservative.

Storage: Syrups should be freshly prepared unless special precautions have been taken to prevent contamination.

Uses: 1. Act as sweetening agent.
2. Act as preservative.
3. They increase the viscosity of the solution.

2. Monophasic liquid meant for external use:

Ex: Gargles, mouth washes, throat paints, eye drops, eye lotion, ear drops etc.

1. Mouth washes: Mouth washes are simple aqueous intended to clean & deodorize the buccal cavity. Mouth washes used for its deodorants, rinsing, refreshing & antiseptic action. The vehicle may be water or combination of water & alcohol. Mouth washes generally contain astringent & antibacterial. Medicated mouth washes containing astringent anti-bacterial agents, Protein precipitants or other agents are also used but they must be used under the supervision of the dentist. A very simple preparation like compound Nacl mouth wash containing Nacl & $NaHCo_3$ in peppermint water is commonly used by a normal person. The continuous use may prove harmful.

Container:
Narrow mouthed, coloured fluted bottle closed with plastic screw cap.
Label:
1. Dilute it with an equal volume of warm water before use.
2. Rinse the mouth 3-4 times daily as required.
Storage: Preserve in a well closed container store in a cool place.

2. Gargles: Gargles are aqueous clear solutions used for the treatment of an infection of the throat. Gargles are generally dispensed in concentrated form. They must be diluted with warm water before use. Gargles are highly medicated than the mouth washes. Gargles are pleasantly flavoured & having P^H of 5-9.5.

Gargles are used by forcing the air from the lungs through the gargles which is in held in the throat. The gargles are brought into intimate contact with the mucous membrane of the throat & allowed to remain there for a few moments after which they are thrown out of the mouth.
Container: Narrow mouthed, colourless fluted bottles & screw capped.
Label: Must be diluted with warm water before use.
Storage: Preserve in a well closed container.
Use: To treat throat infections.
3. Throat paint: Throat paints are liquid preparations applied to the mucous membrane of buccal cavity. These are used to treat mouth & throat infections, throat paints contains antiseptic astringent & analgesic property.

They may contain volatile solvent that evaporates quickly to leave a dry resinous film of medicaments. Throat paints are more viscous due to high content of glycerin. These are sticky & adheres to the affected site & prolong the action of the medicaments.
Container: - Wide mouthed screw capped coloured bottles with brush.
Labeling: - For external use only.
Storage: -It should be stored in air tight containers & placed in a cool.
4. EAR DROPS: Ear drops are liquid preparations that are installed in to the ear. These are usually solutions or suspension. It contains one or more medicaments that are dissolved or suspended in a suitable vehicle. 15ml of ear drops should be dispensed.
Vehicle: - Water, alcohol, glycerine, propylene glycol, hexylene glycol.
Medicaments: - The following medicaments are used in the ear drops, depending on the purpose. They are
1. Boric acid
2. H_2O_2
3. Phenol
4. Chloromphenicol

Container: -Coloured fluted glass bottle with dropper.

Label: - Not to be taken
Not to be diluted
For external use only
Storage: -Store in a cool place
Dose: -3-5 Drops
Uses:
1. Cleaning the ear
2. Drying weeping surfaces
3. Softening in the wax
4. Treating mild infections

5. Nasal drops: Nasal drops are usually aqueous solutions intended for installation into the nostrils by means of dropper. They are commonly used for their antiseptic, anti-inflammatory, anti-histamine & local anaesthetic properties.

At one time, oily preparations containing liquid paraffin or vegetable oils as vehicles were used to prolong the action of the drug but now the use of oily vehicles in the preparation of nasal drops is discouraged because on prolong use the oil retards the capillary action of the nasal mucous or drops of oil may enter the trachea & cause lipoid pneumonia. Therefore the aqueous vehicle is advisable for nasal drops.

Container: Fluted coloured glass bottle with plastic screw cap & dropper.
Label: For external use only.
Storage: Store in a cool place.

6 Liniments: Liniments are solutions or suspensions or emulsions applied for external application. They are generally applied with massage. They posses analgesic, rubifacient, counter irritant & stimulating properties. These are not applied to broken skin. Liniment contain volatile ingredients so cool storage necessary & keep away from flame 50 ml of liniment be dispensed.Two types of vehicles are used for preparation of liniments. They are alcohol and oils.

Container: Narrow mouthed, coloured fluted bottle with screw capped.
Label: For external use only
Shake well before use
Not to be applied to wounds or broken skin inflammable.
Storage: Stored in well – filled well closed, air tight containers & place in a place.
Use: Counter – irritant, Rubifacient & analgesic.

7. Lotions: Lotions are liquids suspensions or dispersion used for external application to the skin. They are applied to the skin without rubbing. This is applied with the help of cotton wool. Cotton wool is soaked in the lotion and applied on the affected part. These lotions are applied on broken skin. Lotion may be employed for local cooling, soothing, protecting and moisturizing purpose. Dermatologists frequently prescribe lotion for antiseptic, anti-inflammatory, local anaesthetics & anti fungal action.

Container: Fluted bottle, closed with plastic screw cap
Label: For external use only
Shake well before use
Storage: Preserve in a well in a well-close container.
Use: protective.

Difference between elixirs and syrups:

Elixirs	Syrups
Elixirs are clear sweetened aromatic hydro-alcoholic liquid.	Syrups are concentrated or nearly saturated solution of Sucrose in purified water.
In elixirs the main ingredient Used as ethyl alcohol and it is Concentrated is 5.40% w/w.	In syrup the main ingredient used as sugar and its conc. is 66.7%.

What is the difference between lotion and liniments:

Liniments	Lotion
1. Applied with friction	Applied without friction
2. It is not applied to broken skin	It is applied to broken skin
3. It is applied with brush	It applied with absorbent material
4. It make contain camphor	It don't contain camphor
5. It act as counter – irritant and rubefacient	It act as anti - septic, anti - inflammatory and cooling effect

Questions:

1. Define Monophonic liquid dosage form and classify them with example
2. compare and contrast: 1. Syrups and Elixirs 2. Lotions and Liniments
3. Define the following: 1. Elixir 2. Douche 3. Syrup 4. Mixture 5. Throat spray 6. Ear Drops 7. Linctus 8. Poultice.
4. What are diffusible and indiffusible substances? How will you dispense mixtures containing them?
5. Write a note on Stabilizers and colorants.

. CHAPTER . 6
SUPENSIONS

Q.1 Define suspensions?

Suspensions are biphasic liquid dosage form consisting of finely divided solid particles dispersed in liquid medium with the help of suspending agent.

What are the requirements/charateristics for a good suspension?

1. It should be chemically stable.
2. The sediment should be easily re-dispersed.
3. The suspension should be easily removed from the container.
4. The suspension should be free from large particles.
5. They should be resistant to micro – organisms.
6. Suspension for internal use must be palatable & suspension for external use should be force from gritty sealing.

Q.2 Define flocculated & De-flocculated suspension.

Def: Flocculated suspension:

In flocculating system, when a suspending agent is added it should be well absorbed, due to the repulsive forces are low & the attractive forces are high. The individual particles are able to attract each other & form loose aggregates known as floccules. This suspension is said to be flocculated.

Def: Deflocculated suspension:

In deflocculated system, when a suspending agent is added. The individual particles are dispersed with the aid of suspending agent. Due to the repulsive forces are high & the attractive forces are low. The individual particles are not able to attract each other. So the particles remain dispersed & do not aggregate. This suspension is said to be de-flocculated.

Q.3 Write the differences between flocculated suspensions.

Flocculated suspension	Deflocculated suspension
1. Particles from loose aggregate	Particles exist in suspension as separate entity
2. Rate of sedimentation is high	Rate of sedimentation is low
3. Sediment is formed rapidly	Sediment is formed slowly
4. The floccules stick to the sides of the container	They do not stick to the sides of the container
5.On shaking the sediment is easily re-dispersed	On shaking the sediment is difficult to re-disperse
6. The suspension has a pleasing appearance	The suspension does not have a pleasing appearance

Questions:

1. Define suspensions. What are the requirements of good suspensions?
2. How do you differentiate flocculated and non-flocculated suspensions?

CHAPTER . 7
EMULSIONS

Q.1 Define & write the types of emulsion:

Def: - Emulsion is a biphasic liquid preparation containing two immiscible liquids one of which is dispersed as minute globules into the other with the help of an emulsifying agent. The liquid that is broken up into globules is called dispersed phase & the liquid in which the globules are dispersed in known as continuous phase..

Types of emulsion: They are two types

1. Oil in water:

In O/w type, oil is dispersed phase & water is continuous phase. In oil in water type, oil is surrounded by water. So the un-pleasant taste & odour of the oil is masked. Therefore o/w type of emulsion is preferable for internal use.

2. Water in oil type:

In w/o type water is the dispersed phase & oil is in the continuous phase. In w/o type, water is surrounded by oil. So application on the skin may be easier. Therefore w/o type of emulsion preferable for external use.

Q.2 Describe the different tests for the identification of emulsion type.

o/w type	w/o type
1. Dilution test: If water is added to o/w type the preparation remains homogeneous. But if oil is added, oil separates out as layer. **2. Dye test:** Mix scarlet red an oil soluble dye with o/w type. Take one drop is placed on the	1. If water is added to w/o type the preparation remains homogeneous. But if water is added, the water separates out as layer. 2. Mix scarlet red with w/o type of emulsion. Take one drops with w/o is placed

glass slide & focused under microscope. If dispersed phase appears in colour, it is said to be o/w type. **3. Electrical conductivity test:** O/w type conducts electricity. A pair of electrodes is connected to a low voltage lamp. The electrodes are dipped in o/w type of emulsion & current is passed. The bulb glows. **4. fluorescence test:** Water does not produce fluorescence in uv light under microscope. A drop of emulsion is examined in uv light under microscope. The spotty fluorescence is produced providing that oil in dispersed phase.	on a glass slide & focused under the microscope. If the dispersed phase appears colourless. It is said to be w/o type. 3. W/o type does not conduct electricity. A pair of electrodes is connected to a low voltage lamp. The electrodes dipped in w/o type emulsion & current is passed. The bulb does not glow. 4. Many oils produce florescence when expose to uv light A drop of Emulsion is examined in uv light. The entire field is produced. Florescence proving that oil in continues phase

Give example for natural emulsion:

Milk is an example for o/w emulsion.

Butter is an example for w/o emulsion.

Q.3 Define Emulsifying agent/ surfactants and classify it with examples.

Def: - Surfactants are materials get adsorbed at the interface between the two phases. The surface adsorption lowers or decreases the tension between the two phases. It causes the inter mix of the phases with each other. Hence to reduce surface tension surfactants are used.

They are classified as follows:

1. Natural Emulgents from vegetable sources: These are anionic in nature & produce o/w type emulsions. They act as primary emulgents & stabilizers. **Ex:** acacia, tragacanth, agar, pectin

2. Natural emulsifying agents from animal sources:

a) Gelatin: It occurs in two forms

Pharmagol A- used in acidic P^H

Pharmagol B-used in alkaline P^H

b) Egg Yolk

c) Wool Fat

3. Semi synthetic polysaccharides: These produce o/w type of emulsion

Ex: Methyl cellulose, sodium CMC

4. Synthetic Emulgents:

a) Anionic: Its anionic part is responsible for emulsifying activity.

Ex: - Soaps & sodium lauryl sulphate

b) Cationic: Its cationic part is responsible for emulsification.

Ex: - Cetrimide, Benzalkonium chloride.

They produce o/w type emulsion.

c) Non-Ionic: They do not ionize in aqueous solution. These are stable at wide range of p^H & are not affected by addition of acids & electrolytes.

5. In-organic Emulgents: Ex: - Milk of magnesia, magnesium oxide, magnesium aluminium silicate & bentonite.
6. Alcohols: Ex: - Cetyl alcohol, stearyl alcohol, glycerol mono- stearate. Carbo waxes.

Q.4 Write the different methods of preparation of emulsions?

I. Small scale method:

In small scale method, stable emulsions are prepared by 3 methods. They are

a) Dry gum method: It involve the following steps

1. The mortor & pestle should be absolutely dry.
2. Measure the required quantity of oil in a clean measuring cylinder & transfer it into a dry motor.
3. Add the calculated amount of gum acacia to the mortor.
4. The gum (1 part) is triturated with oil (4parts) in a dry motor thoroughly to form a uniform mixture.
5. Add required quantity of water (2parts) and triturate till clicking sound is produced & the product becomes white. This indicates the formation of emulsion, called primary emulsion.
6. If any solid ingredients are present in the formation. They should be dissolved in small portion of water.
7. If any other soluble ingredients are to be added it must be incorporated after making primary emulsion.
8. Then more water is added to produce the required value.

Type of oil	Primary emulsion formula		
	Oil	Water	Gum
1. fixed oils ex: - Arachis oil castor oil	4	2	1
2. Mineral oil Ex: - Liquid Paraffin	3	2	1
3. Volatile oil Ex: - Turpentine oil cinnamon oil	2	2	1
4. Oleo – resin Ex: - male fern extract, balsam of tolu, balsam of Peru	1	2	1

2. Wet gum method: -

The proportion of oil, gum, water is same as dry gum method for primary emulsion. The method of preparation of primary emulsion is similar to dry gum method but it a slower technical. But it gives better result than dry gum method. It is as follows.

1. Calculated quantity of gum acacia is triturated with required quantity of water form a mucilage.
2. To this, add oil in small portions with rapid triturating until the product becomes white & clicking sound is produced. I.e the formation of primary emulsion.
3. If any solid ingredients are present in the formation. They should be dissolved small portion of water.

4. If any should ingredients is to be added it must be incorporated after make primary emulsion.
5. The more water is added to produce the required volume.

3. Bottle method:

1. In this method, oil is taken in a large bottle and then powdered dry gum is added.
2. The bottle is shaken vigorously until the oil and gum are mixed thoroughly.
3. Then the calculated amount of water is added all at once and the bottle is shaken vigorously until primary emulsion is formed.
4. If any solid ingredients are present in the formulation, they should be dissolved in small portion of water.
5. This solution and other liquids are added to the primary emulsion and shaken thoroughly. Then more water is added to produce the required volume.

II) Large scale method:

In large scale method, stable emulsions are prepared by using homogeniser & colloidal mill.

Q.5 Discuss briefly the H.L.B. scale and its application.

1. H.L.B means Hydrophilic – Lipophyllic balance.
2. It is used for the selection of emulsifying agent for the preparation of emulsion.
3. It made balance between the hydrophilic & Lipophyllic portion of the emulgent.
4. As the emulsifying becomes more hydrophilic, its solubility in water increases & the formation of an o/w type emulsion.
5. As the emulsifier becomes more Lipophyllic , its solubility increased & the formation of an w/o type emulsion.
6. The H.L.B Scale is a numerical scale extending from 1-20.
7. A number is given to the emulgent depending on the strength of the hydrophilic, lipophyllic segment of the molecule.
8. The system mostly used for non-ionic emulgents.
9. Emulsifying agents with the higher H.L.B numbers produce o/w emulsion & lower numbers produce w/o type emulsions.
10. Emulsifying agents with 3-6 value produce w/o emulsion & emulsifying agents with 8-18 value produce o/w type emulsion.

Application:

The following are the H.L.B values of few important emulsifying agents.

Ranges	Application
1-3	Antifoaming agents
3-6	Emulsifying agents (w/o type)
7-9	Wetting agents
8-18	Emulsifying agents (o/w type)
13-18	Detergent
15-18	solubilising agents

Q.6 Stability of Emulsions:

Stability: A formulated emulsion should retain its original characters like size of the emulsion and their uniform distribution throughout the contiuous phas

The following are some of the symptoms of instability of emulsions:

1. Creaming: Creaming is defined as the upward movement of the dispersed phase towards the surface and form a thick layer at the surface of the emulsion.

Reason for creaming:

1. The size of globules.
2. The viscosity of continuous phase.
3. The difference between the densities of the dispersed phase and continuous phase.
4. The temperature.

To prevent creaming:

1. By reducing size of globules
2. By increasing the viscosity if continuous phase
3. By reducing the difference between the densities of the dispersed phase and continuous phase.
4. By storing the emulsion in a cool place.

2. Sedimentation:

Definition: It is defined as the downward movement of the dispersed phase towards the bottom & form a separate layer over the sedimented particles.

Reasons for sedimentation:

1. The size of the globules
2. The difference between the densities of the dispersed phase & continuous phase.

Prevention: Sedimentation can be reduced by the following ways.

1. By reducing the size of the globules.
2. By reducing the difference between the densities of dispersed phase & continuous phase.

3. Cracking: Cracking can be defined as the separation of the dispersed phase and continuous phase as two separate layers. They cannot be re-dispersed on shaking. Cracking may be caused by physical or chemical or microbial effects. They change the nature of the emulsifying agent & reduce the emulsifying property.

Factors Effecting the cracking of emulsions:

i) Chemical factors: Decomposition or precipitation of emulsifying agents.

a) Acids: Acids decompose alkali soaps & the emulsion separate into two phases

b) Electrolytes: Electrolytes like sodium chloride precipitate the sodium soap & the emulsion separates into two phases.

c) Alcohols: Alcohol precipitates the gum & the protein emulsifying agent. The emulsion is separated into two phases.

ii) Physical factors:

a) Addition of opposite type of emulsifying agent emulsifying agent: By adding of o/w type of emulsifying agent to a w/o type of emulsion, the emulsion separates into two phases.
Ex: Agitation of soft to a calcium soap emulsion.

b) Addition of common solvent: Addition of solvent in which both dispersed phase & the continuous phase are soluble. The emulsion from the phase system & destroy the emulsion.
Ex: Addition of alcohol to turpentine oil, for soft soap emulsion.

c) Addition of excess dispersed phase: If the dispersed phase is incorporated to the emulsion the dispersed globules coagulate & the emulsion separates into two phases.
Ex: Addition of turpentine oil to the turpentine oil soft soap emulsion.

d) By increasing the temperature: If increase in temperature the viscosity of the emulsion will be decreased & causes creaming. The creaming is more liable to crack the emulsion.

iii). Microbial factor: If the emulsion is not used immediately & does not contain preservative. There may be growth of mould & bacteria in the emulsion. It destroys the emulsifying agent. It causes separation of emulsion into two phases.

4. Phase inversion: Change of phase that is o/w type of emulsion changes into w/o type of emulsion and vice versa is known as phase inversion.

Reason for phase inversion:

1. By the addition of electrolyte.
2. By changing the phase volume ratio
3. By temperature changes.

To minimise phase inversion:

1. By using the proper emulsifying agent in sufficient concentration.
2. By keeping the concentration of dispersed phase between 30 to 60 percent.
3. By storing the emulsion in a cool place.

Questions:

1. Define Emulsion and classify them.
2. Discuss methods of preparation of Emulsion.
3. Discuss the tests to find the type of Emulsions.
4. Discuss briefly H.L.B Scale and its application.
5. Write a note on stability of emulsion.
6. Classify Emulsifying agents with examples.

CHAPTER . 8
OINTMENTS

Q.1 Define ointment and classify it.

Definition: Ointments are soft semi-solid preparations containing medicaments meant for external application to the skin or mucous membrane.

Types/classification of ointments:

1. Dermatological ointments: Ointment applied on the skin.
2. Ophthalmic ointment: Ointment introduction into the ophthalmic cavity
3. Rectal ointment: Ointment applied in the rectum

Q.2 **what is an ointment base? Give requirements of an ideal ointment base.**

Def: Ointment base is a soft semisolid vehicle in which medicaments is incorporated or dispersed or suspended.

Requirements:

1. The absorption and penetration should be high.

2. It is compatible with skin secretions.
3. It is miscible with skin secretions.
4. It should be compatible with many ingredients.
5. It should be smooth & pourable.
6. It should chemically stable & physiologically inert.
7. It should be non-toxic, non-irritant & non-sensitive.
8. It should be easily washable.
9. It should be non-staining.
10. It should release the incorporated medicament readily.

Q.3 Classify the various types of ointments bases with examples:

The ointment various bases are classified into
1. Oleaginous bases
2. Absorption bases
3. Emulsion bases
4. Water soluble bases

1. Oleaginous bases: These consist of water insoluble hydrophobic oils & fats. They may contain a single hydrophobic substances or combination of two & more substances.
They are: Non-greasy, Anhydrous, Hydrophobic, Insoluble in water, Non-washable
They do not release the medicament easily.
They are very difficult to remove the skin.
Ex: Soft paraffin, Hard paraffin, Liquid paraffin, Castor oil, Coconut oil

2. Absorption bases: They can absorb a large amount of water due to their high water number they are: Anhydrous, Hydrophilic (water can be incorporated)
Insoluble in water, Not water washable
Ex: Wool fat, Wool alcohol, Cholesterol, Bees wax

Advantages:
1. They are compatible with majority of medicament.
2. They are heat stable.
3. These bases may be used either in anhydrous form or in emulsified form.
4. They can absorb a large quantity of water or aqueous substances.

3. Emulsion bases: Emulsions bases are classified into

1. Oil in water type:
This type of ointment base is hydrous, hydrophilic, and insoluble in water & water washable. Ex: Emulsifying wax, Sodium lauryl sulphate.

2. Water in oil type: This type of ointment base is hydrous, hydrophilic, and insoluble in water & not water washable. Ex: Wool alcohol, Wool fat and bees wax

3. Water soluble bases: They are anhydrous, hydrophilic, and soluble in water & water washable.Ex: Poly ethylene glycol, Sodium carboxyl methyl cellulose, Glycerol mono-stearate.

Q.4 Factors which govern the selection of an ideal base for ointments: There are two factor:

I) Dermatological factors II) Pharmaceutical factors

I) Dermatological factors:

1. Absorption & penetration: Absorption is systemic absorption & entry into the stream while penetration means passage through the skin.
Ex: Cutaneous absorption, Penetration of the ointment occurs through
1. Hair follicle.

2. Sebaceous glands.
3. Non keratinized cells.

2. Effect of skin function: The greasy base interferes with normal skin functions. They are irritant to the skin. O/w emulsion bases are more compatible with skin function & having cooling effect rather than healing effect & mix readily with skin secretions. The ointment base should not interfere with normal skin functions.

3. Miscibility with skin secretions: The skin secretions are oily as well as aqueous. Emulsion bases are readily miscible with secretions.

4. Freedom for irritant effect: Ointment base should not cause any irritation to the skin.

5. Compatibility with skin secretions: The ointment base should not react with skin secretions.

6. Emollient properties: Dryness & brittleness of skin cause dis-comfort, so ointment base should have emollient. **Ex:** Wool fat has the good emollient property.

7. Ease of application and removal: Water miscible bases are readily removed by simple washing with water.

II) Pharmaceutical factors:

1. **Stability:** Fats and oils obtained from animal and vegetable sources are liable to undergo oxidation unless they are suitably preserved. Liquid paraffin is also stable but on prolonged storage it gets oxidised therefore an antioxidant like tocopherol may be incorporated.
2. **Solvent properties:** Most of the medicaments used in the preparation of ointment are insoluble in the ointment bases therefore they are finely powdered and distributed uniformly through the base.
3. **Emulsifying properties:** Hydrocarbon bases can absorb only a small amount of aqueous substances where as animal fats can absorb an appreciable amount of water.
4. **Consistency:** The ointments produced should be of suitable consistency. They should neither be too hard nor too soft. They should be with stand the climatic conditions. The consistency of an ointment can be adjusted by incorporating a suitable proportion of high melting point substances like hard paraffin, bees wax etc.

Q.5 Describe the method of preparation of ointment:

Ointment are prepared by four methods namely

1. Fusion method: This method is prepared when the base is hard & the medicaments are soluble in the base. All the ingredients such as white soft paraffin, stearic acid are melted together. The medicament is then added to the melted base & stirred thoroughly until the melted base cools down & a homogenous product is formed.

Ex: Simple ointment, emulsifying ointment.

2. Triturations method: This method is preferred when the base is soft & the medicaments are insoluble in the base. All the solid ingredients are finely powdered & passed through a sieve of appropriate size. Then the medicaments are insoluble in the base. All solid ingredients are finely powdered & passed through a sieve of appropriate size. Then the medicaments are triturated with a small amount of the base on the ointment slab with the help of stainless steel spatula. To this the remaining quantities of the base are added & triturated until the medicaments are homogeneously mixed with the base. The ointment is passed (if necessary) through an ointment until mill to remove the gritty particles.

Ex: Sulphur ointment, Boric acid ointment.

3. Chemical reaction method: Certain ointments containing free iodine combined iodine are prepared by chemical reaction method.

Ex: Ointment containing free iodine: Iodine is slightly soluble in most fats & oils. But when iodine is combined with KI, I forms poly-iodides which are more soluble in water, alcohol & glycerine. The solvent used in this preparation should be non-volatile otherwise the medicament may crystallize when the solvent evaporates. So glycerine is choosen as solvent.

Formula: Iodine, KI, Glycerine, Wool fat, Yellow bees wax, Yellow soft paraffin.
Procedure: Dissolve iodine & KI in glycerine using a glass motor. Melt the wool fat, yellow bee's wax & yellow soft paraffin in a china dish over a water bath & stir well. Add the iodine solution to the melted base & mix thoroughly.
Storage: It is stored in well closed container and kept in a cool place.
Use: Used in the treatment of myalgia and arthritis.
Action: Iodine acts as anti-septic, disinfectant and counter irritant. KI increases the solubility of iodine. Glycerine acts as a solvent. Wool fat, yellow soft paraffin acts as base.

4. Emulsification method: In emulsification method, an ointment emulsion is formed if a non-fatty liquid (one which is immiscible with fats) is distributed throughout a solid fat by trituration. Ex: Wool fat emulsion, Wool alcohol emulsion, Bees wax emulsion. Soap emulsion

Q.6 Write the containers & storage of ointments:

Containers: Generally ointments are packed in ointment jars or collapsible tubes. Amber coloured glass jars are used for light sensitive preparation. While filling the ointment jars care must be taken to avoid the entrainment of air, packing of ointments in collapsible tubes are more hygienic. Collapsible tubes are made up of tin.
Storage: Ointments should be stored in well closed containers and in a cool place. It should be protected from light, high temperature cause deterioration of ointments.
Labelling: "for external use only"

Questions:

1. Differentiate between ointment and paste.
2. Describe in detail the dermatological and pharmaceutical factors to be considered in the selection of a suitable ointment base.
3. Classify ointment bases with examples.

CHAPTER. 9
PASTES

Q.1 Write a note on Paste.

Def: Pastes are semi-solid preparations intended for external application to the skin. The pastes are generally very thick and stiff. They do not melt at ordinary temperature and thus form a protective coating over the area where they are applied. They are used mainly as antiseptic protective or soothing dressings which are often spread on lint before being applied.

Bases used for pastes: The following types of bases are used for the preparation of pastes:

1) Hydrocarbon bases: Soft paraffin and liquid paraffin are commonly used bases for the preparation of pastes.
2) Water miscible bases: Emulsifying ointment is used as a water miscible base for the preparation of pastes. Glycerine is also used as water miscible base for the preparation of pastes.
3) Water soluble bases: Suitable combination of high and low molecular weight polyethylene glycols are mixed together to get product of desired consistency which soften or melt when applied to the skin. Ex: macrogol base.

Method of preparation of pastes: Pastes are prepared by trifurcations and fusion methods just like ointments. The trituration method is used only in those cases where the base is liquid or semi-solid. The fusion method is used when the base is semi solid or solid in nature.

Storage of pastes: The pastes should be stored in a well closed container and in a cool place so as to prevent evaporation of moisture present in the paste. Pastes should be stored and supplied in containers made up of materials which do not allow absorption or diffusion of the contents.

Q.2 Differentiation between pastes and ointments:

Pastes	Ointments
1. They contain large amount of finely powdered solids such as starch, zinc oxide, calcium carbonate etc.	1. They contain medicaments which are generally dissolved /suspended/emulsified in the base.
2. They are very thick and stiff.	2. They are soft semi solid preparations.
3. They are less greasy.	3. They are more greasy.
4. They are generally applied with a spatula or spread on lint.	4. They are simply applied on the skin.
5. They form a protective coating to the area where it is applied.	5. They are used as protective or emollient for the skin.
6. Paste contains large amount of powder which is porous in nature, hence perspiration can escape.	6. They are used for the protection of lesions.
7. They are less macerating than ointments.	7. They are more macerating in action.

Questions:

1. Write a note on paste.
2. Differentiate between ointment and paste.

CHAPTER. 10

JELLIES

Q.1 Write a note on Jellies.

Def: Jellies are transparent or translucent non-greasy, semisolid preparations meant for external application to the skin or mucous membrane. They may be prepared by using gums such as tragacanth, pectin, sodium alginates, methyl cellulose and sodium carboxymethyl cellulose.

Types of jellies: There are three types of jellies

1) Medicated jellies: These are chiefly used on mucous membrane and skin for their spermicidal, local anaesthetics and antiseptic properties. These jellies contain sufficient water. After evaporation of water, jellies provide a local cooling effect and residual film gives protection. **Ex:** Ephedrine sulphate jelly is used as a vasoconstrictor(to arrest the bleeding of nose). Phenyl mercuric nitrate jelly is used as spermicidal contraceptive.

2) Lubricating jellies: These jellies are used for lubrication of diagnostic equipment such as, surgical gloves, cystoscopes, fingerstalls, catheters, rectal thermometers etc. These jellies should be thin, transparent and water soluble. These jellies should be sterile because these are used as lubricants for articles to be inserted into sterile regions of the body such as urinary bladder etc.

3) Miscellaneous jellies:

i) Patch testing: These jellies are used as a vehicle for allergens which are applied on to check the sensitivity. On drying, the residual film is formed which helps to keep the patches separate and avoid confusing results.

ii) Electro-cardiography: The jelly is applied on the electrode to reduce the electrical resistance between the patient's skin and the electrode. They jelly contains sodium chloride, pumice powder and glycerine. The sodium chloride is a good conductor of electricity where glycerine acts as humectants.

Formulation of jellies:

1. Gelling agents: These are usually organic hydrocolloids. Some inorganic hydrocolloids are also used as gelling agents.

i) Tragacanth: It is used for the preparation of lubricating, medicated and contraceptive jellies. The concentration of gum required for the preparation of jellies varies from 2-5%. The jelly prepared with tragacanth usually contains lumps which can be avoided by using a dispensing agent like alcohol, glycerine and volatile oil.

The tragacanth jellies are becoming less popular because of the following reasons:

a) They cannot be stored for a long time.
b) They are prone to microbial growth.
c) They vary in viscosity because the gum is obtained from natural sources.
d) The residual film formed after the evaporation of jelly tends to flake.
e) They lose viscosity beyond pH range 4.5-7.

ii) Sodium alginate: Sodium alginate jellies are used as lubricants (1.5-2%) and dermatological vehicles (5-10%). The viscosity of sodium alginate jelly can be increased by adding trace of soluble calcium salt.

iii) Pectin: Pectin is a valuable gelling agent for acid products. Pectin jelly is prone to microbial growth, so a suitable preservative is needed to preserve it properly during its storage

iv) Starch: Starch mucilage is prepared with water alone lead to bacterial growth, so a suitable preservative must be added. Starch in combination with other substances like gelatin and glycerine is commonly used for the preparation of jellies.

V) Gelatin: Gelatin is soluble in hot water. A 2% gelatin solution in hot water forms a jelly on cooling. Very stiff medicated jelly can be prepared by incorporating about 15% gelatin.
Vi) Cellulose derivative: Methyl cellulose and sodium carboxymethyl cellulose are widely used for the preparation of jellies. These substances produce natural jellies of very stable viscosity and afford good resistance. Sodium carboxymethyl cellulose is used for the preparation of lubricating jellies as well as used for sterile jellies.
2. Preparation of jellies: The pharmaceutical jellies are usually prepared by adding a thickening agent, such as tragacanth, carboxymethyl cellulose etc. to an aqueous solution of drug. The mass is triturated in a mortar until a uniform product is obtained. The glass pestle and mortar is used in case of dark coloured drug.
3. Preservation of jellies: The jellies contains large amount of water so these are prone to bacterial and fungal growth. The jellies must be suitably preserved by adding a preservative like **Ex:** Methyl p-hydroxybenzoate (0.1- 0.2% w/v), Propyl p-hydroxybenzoate (0.05 %), Chlorocresol (0.1- 0.2%), Benzalkonium chloride (0.02%)
4. Storage of jellies: Jellies are stored in well filled and well closed containers to minimise the evaporation of water. Jellies are stored in a cool place to prevent drying out. The sterile jellies, such as catheter lubricants are packed in collapsible tubes.

Questions:
1. Write a note on Jellies.

CHAPTER. 11
POULTICES

Q.1 Write a note on poultices.
Def: Poultices are soft, viscous wet masses of solid substances applied to the skin for their fomentation action in order to provide relief from pain or reduce inflammation or to act as a provide counter- irritant. Heavy kaolin is commonly included in the formula for preparing poultice because acts as a carrier of heat. Poultice is applied to the affected part after heating it in a china dish with occasional stirring, until the heat is tolerated on the back of the hand. The melted poultice is spread as thick film on a dressing material and applied as hot as the patient can bear it to the affected area.
Storage of Poultice: Poultices are supplied in glass or plastic jar fitted with screw caps along with impermeable liners or close fitting slip-on lids. Poultices are stored in a well closed container to prevent absorption of moisture by glycerine and loss of volatile constituents.
EX: Prepare and dispense 100.0g of kaolin poultice B.P.C

Heavy kaolin, dried at 100^0 and finely sifted	56.5 g
Boric acid, finely sifted	4.5 g
Thymol	0.05 g
Peppermint oil	0.05 ml
Methyl salicylate	0.2 ml
Glycerin	38.7 g

Method: 1. Mix the heavy kaolin and boric acid with glycerine to form a smooth paste in a china dish.2. Heat the mixture at 120^0C for one hour on a sand bath with occasional stirring and allow to cool.3. Dissolve the thymol in methyl salicylate and peppermint oil.4. Add this solution to the cooled mixture and mix thoroughly.5.Transfer it into a suitable container. 6. Tightly close the container to prevent absorption of moisture by the glycerine and loss of volatile constituents. 7. Heavy kaolin is heated at 120^0C for one hour to kill the spores of

clostridium tetani, which are often present in it. Kaolin poultice is never heated above 120^0C to prevent the decomposition of glycerine.

Questions:

1. Define Poultice
2. Write a note on Poultice

CHAPTER. 12
SUPPOSITORIES

Q.1 Define suppositories and write advantages and disadvantages of suppositories.

Def: Suppositories are solid dosage form containing medicament intended for insertion into the body cavities other than mouth. They may be inserted into rectum, vagina, ear and nose. After insertion the suppositories may melt at body temperature or dissolve in the cavity fluids and release the medicament.

Suppositories are used to produce:

1. Local action: Ex- Antiseptic astringent and local anaesthetic effect.
2. Systemic action: Ex- Analgesic, anti-spasmodic, sedative effect.
3. To evacuate the bowels

Advantages:1. The drugs which cannot be taken orally (which irritates GIT or which produces vomiting) such drugs can be administered in the form of suppositories.
2. Suppositories can be administered to a person who is un-able to swallow the drug. (When he is un-conscious).
3. The drug which is decomposed or inactivated by gastric HCL or by the enzymes present in the stomach, such drugs can be administered in the form of suppositories.
4. These can be easily administered to children and the old person.
5. Drugs sensitive to acidic P^H can be administered safely.
6. When-ever local effect is required. It can be placed directly at the site of action.
7. Drugs are more rapidly absorbed in rectal mucosa without ionization.
8. Non-sealing and biter drugs can be given in this from without difficulties.

Disadvantages: 1. Irritant drugs cannot be administered in the form of suppositories.
2. Large quantities cannot be administered in the form of suppositories.

Q.2 Write different types of suppositories.

Different types of suppositories: The suppositories are marketed in different sizes and shapes for use in the different body cavities. The common types are

1. Rectal suppositories: They are meant for introduction into the rectum. Weight – 1 to 2 grams, Shape – cone.

2. Vaginal suppositories or pessaries: They are meant for introduction into the vagina. Weight – 4-8grams, Shape- either cone, rod and wedge in shape

3. Urethral suppositories: They are meant for introduction into the urethra. Weight – 1grams, Length – 8 cm, Shape – pencil shaped pointed at one end then cylindrical.

4. Nasal suppositories: They are meant for introduction in the nasal cavity. Weight – 1gram, Length – 9-10cms, Shape – thin cylindrical in shape.

5. Ear cones: They are meant for introduction onto the ear, Weight – 1 gram, Shape – Thin and cylindrical shape they are very merely used.

Containers for suppositories: Suppositories are usually dispensed in shallow, partitioned boxes which hold the suppositories in n upright position and do not allow them to come in contact with each other.

Suppositories containing volatile substances must be dispensed in tightly closed glass containers.

Storage: All suppositories are required to retain the shape at room temperature. It is therefore necessary that suppositories be stored at 10-25^0C temperature.

Q.3 Define suppository base. Write a ideal properties suppositories bases.

Def: Suppository bases are used to prepare suppositories, so that they can retain its shape and firmness during storage and administration.

Ideal properties suppositories bases:

1. Melt at body temperature and dissolve or disperse at body fluids.
2. Non-toxic, non-irritant and non sensitive.
3. Compatible with large variety of drugs.
4. Stable on storage.
5. It should be easily moulded.
6. It should release medicament.
7. It should not adhere to the mould by pouring or by cool compression.
8. It should be stable if it is heated above its melting point.
9. It should keep its shape while handling.
10. These have wetting and emulsifying properties.
11. It is vegetable or animal fat, following standard must comply.
    Acid values less than – 3
    Iodine value less than – 7
    Saponification value – 200-275
12. It has a wetting and emulsifying property.
13. Melting and solidification points should be closed.

Q.4 Give the classification of suppositories base with examples:

These are classified into three types they are

1. Oily bases: Ex – cocoa butter: It is also known as theobroma oil. It is obtained from crushed and roasted seeds of theobroma cocoa.

Properties:

1. Melting point lies between 30-35^{0}C.
2. It is composed of mixture of glyceryl esters of stearic, palmitic, oleic and other fatty acids.
3. It has smell and taste like chocolate.
4. It is a yellowish white solid.
5. Cocoa butter melts at body temperature and releases them.
6. It shows the phenomena of polymorphism, when melted and cooled,

It solidifies into different crystalline form:

1. α form: It melts at 24^{0}C, obtained by sudden cooling of cocoa butter at 9^{0}C.

2. β^1 form: It crystallizes out from liquefied cocoa butter by stirring at 18-23^{0}C. Its melting point lies between 28-31^{0}C.

3. β-form: It changes slowly in form which melts between 34 – 35^0 C.

4. ϒ-form: Its melting point is 18^{0}C is obtained by pouring a cooled cocoa butter 2^{0}C into a container, cooled at deep freeze temperature.

Advantages: 1. Solid at even high room temperature but melt quickly at body temperature. 2. It is very stable.3. It is chemically inert.4. It is non-reactive.5. Miscible with many ingredients.

Disadvantages:

1. Over heating changes its physical characters because of polymorphism. Each has different melting points

α form	-24^{O}C
β^1 form	-28^O – 31^{O}C
β form	-34^O– 35^{O}C
ϒ form	-18^{O}C

β1 changes slowly into stable β form.

2. Melt in warm weather.3. Adherence to mould. 4. It cans rancidity. 5. Deterioration during storage due to oxidation. 6. Poor water absorbing base. 7. It is costly. 8. Leakage of melted base. 9. It melting is lowered by overheating and by incorporation of substances like camphor, phenol.

Hydrogenated oil: It is used as a substitute for theobroma oil. It is obtained by hydrogenation of various vegetable oils, such as Arachis oil, cotton seed oil, coconut oil, palm oil etc. It is used as a substitute for theobroma oil. These have certain advantages over theobroma oil.1. Resistant to oxidation. 2. Good emulsifying and water absorbing capacities. 3. Lubrication of mould is not necessary.

2. Water soluble or water miscible base:

I) Glycerol-gelatin base: It is also known as glycerine suppositories. It is a mixture of glycerine and water which is made stiff by the addition of gelatine. Suppositories prepared from this base are translucent gelatinous solids. This base is hydrophilic in nature slowly dissolves in the aqueous secretions and release the medicaments slowly and continuously. This base may be used to prepare all types of suppositories but it is particularly used as a base in vaginal suppositories. These suppositories if required to be stored, must have preservatives like methyl paraben and propyl paraben.

To avoid incompatibility reactions suitable type of gelatin is used two grades of gelatin are available.

1. Pharmagel A (Type A): It is acidic in nature and used for acidic drugs. Its iso-electric point lies between 7 to 9.
2. Pharmagel B (Type B): It is alkaline in nature and used for alkaline drugs. It iso-electric point lies between 4-7.5

Disadvantages: 1. They are more difficult to prepare and handle. 2. They are hygroscopic therefore they must be stored in well closed containers.3. Gelatin is incompatible with many drugs. Ex-Tannic acid, $Fecl_3$.4. They support bacterial and mould growth.

II) Poly- ethylene glycol: These are known as macrogols or carbo- waxes. They are widely used for preparing suppositories. They are chemically stable and physiologically inert. They do not support bacteria and mold growth. Poly ethylene glycols are available in different physical forms.1. Molecular weight 200-1000 is liquids.2. Molecular weight higher than 1000 are was like solids.

Advantages:

1. These are non irritant and chemically stable.
2. These absorb water and have excellent solvent property.
3. Physical properties can be varied by addition of high and low molecular weight polymer.

Disadvantage:

1. High solubility of PEG leads to supersaturations which in turn makes crystals and fracture the product on storage.
2. They are hygroscopic and hence require special storage conditions to store them.
3. They are incompatible with certain drugs like tannins and phenol etc.

III) Soap glycerine base: It is mixture of gelatin and sodium stearate. It contains 95% of glycerine. The soap is generally produced by interaction of stearic acid and Na_2CO_3. Glycerin-90g, $NaCO_3$ -4.5g, Stearic acid-7.5g

Disadvantages: It is very hygroscopic

3. Emulsifying bases: It contains mono-glycerides as emulsifying agent. It forms w/o type emulsion. It can absorb very easily.

I) Massa esterinum: It is mixture of mono, di, tri glycerides of saturated fatty acids. It is a white brittle solid. It melt at 33-35^{o}C.

II) Witepsol: It consists of glyceryl esters, mainly of lauric acid, to which a very small amount of glyceryl mono-sterate is added to improve its water absorbing capacity.

Advantages:

1. Lubrication of mould is not required
2. Non-irritant and resistant to oxidation.
3. Over-heating does not affect solidifying points.
4. These solidify rapidly
5. Their emulsifying and water absorbing capacities are good.

Disadvantages:

1. They should not be cooled in refrigerator because they become brittle.
2. They are less viscous on melting which results in sedimentation of other substances.

Q.5 Give an brief account of displacement value.

Def: The quantity of the drug which displaces one part of the base is known as displacement value. The volume of suppositories prepared from a particular mould is uniform. Their weights will vary when compare to the plain suppositories. It is due to the variation of the medicament with the density of the base. That means the weight of the medicament may not displace the same volume, because of the variation in the densities. But the medicament displaces the same volume of the base. To prepare an accurate suppository an allowance (extra weight) may be given or the alteration in the density of the mass due to the added medicaments. It is calculate by applying displacement value.

Ex- Iodoform – 0.9g, Cocoa butter base – 2.0g.

Make into suppositories send 8 Nos. one to be inserted into rectum at bed time. Displacement value of lodoform is 4.0

Calculation: Calculate 2 suppositories extra. The base given is 2g so 2g weight suppositority mould is used.

Weight of cocoa butter for the suppository 2g

Therefore weight of cocoa butter for 10 suppositories 2*10g =20g

Weight of iodoform for the suppository =0.9g

Therefore of iodoform for 10 suppositories =0.9g *10=9g.

Displacement value of cocoa butter required.

$$= \text{Total amount of base} - \frac{\text{total amount of drug.}}{\text{Displacement value.}}$$

$$= 20 - \frac{9.0}{4.0}$$

$$= 20 - 2.25 = 17.75g$$

Formula for 10 iodoform -9.0g

Cocoa butter – 17.75g

Determination of displacement value. Displacement value of a medicament can be calculated as follows.

1. Prepare and weight 10 suppositories containing theobroma oil or any other base =a grams
2. Prepare and weight 10 suppositories containing 40% of medicament =b grams.
3. Calculate the amount of theobroma oil present in the medicated suppository =60/100*b =c grams.
4. Calculate the amount of medicament present in the medicated suppository =40/100*b=d grams.
5. Calculate the amount of theobroma oil displayed by d grams of medicament. Let it be (a-c) grams

Displacement value of medicament= $\frac{d}{}$

(a-c)

Displacement value of some drugs:

Drug		Displacement value
Chloral hydrate	-	1.5
Hydro-cortisone	-	1.5
Aminophylline	-	1.5
Tannic acid	-	1.0
Phenobarbitone	-	1.0
Bismuth subgallate	-	2.5
ZnO	-	5.0

Q.6 Write down the different methods of Preparation of Suppositorries:

It can be prepared by following method:

1. Heat process: I) Fusion method

2. Cold process: I) Cold compression method

II) Hand moulding (Rolling Method)

1. Heat process:

I) Fusion method:

1. The suppository mould is thoroughly washed and dried.
2. The inner surface of the mould (cavities) is lubricated with liquid paraffin or any suitable lubricant.
3. Calculate the base required as per displacement value of medicament.
4. Heat the dish over the water bath or steam bath.
5. Take calculated amount of base place on dish and is melted at 30-35^{o}c.
6. Remove the dish when 2/3 of the base melts.
7. Place the weighed quantity of medicaments on a warmed tile. Over it pour the melted base.
8. Mix it thoroughly with a flexible spatula and transfer the mixed mass to a dish and stir to from a homogenous mass.
9. Warm the dish over water bath for few seconds so that mass becomes pourable.
10. Pour this melted mass into cavities of mould kept over ice. Fill each cavity to overflowing to prevent the formation of hollow voids on cooling.
11. Precaution must be taken while filling the cavities to stir continuously to ensure uniform distribution of medicament.
12. Mould is kept in a cool place or over ice for 10-15 minutes.
13. The excess mass is scrapped off with a knife.
14. The mould joint is then separated and the suppositories are removed and packed. This method is useful for both small and large scale method.
15. For a large scale method, pouring, cooling and removal can be performed by machine.

2. Cold process:

I) Cold compression method:

1. This method does not require heat and stirring so it is best suitable for thermolabile and insoluble drugs.
2. It is un-suitable for glycerol-gelatin Suppositories.
3. In this method mass is prepared by first mixing the powered medicament with an equal amount of cocoa butter in a motor.
4. Allowance (extra weight) is made for un-avoidable wastage.
5. It is prepared by using machine. This machine contains cylinder pistons, narrow opening, mould and stop plate.
6. Then add remaining quantity of grated cocoa butter gradually.
7. The mixture is then transferred to the cylinder of the machine and pressure is applied.

8. The pressure forced the material from cylinder to mould through narrow opening.
9. The suppositories are formed at mould.
10. The pressure is further applied stop plate F is removed and the finished suppositories are taken out.
11. The operation is repeated for the next set of suppositories.

II) Hand moulding (Rolling Method): It is ancient method of preparing the suppositories. The suppository base is rolled and then desired shape is given with the hand. This method I not used nowadays.

Questions:

1. Define Suppository. Write advantages and disadvantages of suppositories.
2. Displacement value and its application.
3. What are the ideal properties of suppository base?
4. Different types of suppository bases.
5. Define Pessaries.

CHAPTER .13
DENTAL AND COSMETIC PREPARATIONS

Q.1 Define and classify cosmetics with examples.

Cosmetics are defined as substances or preparations intended to be rubbed or sprinkled or applied to any part of the external surfaces of the human body (Ex-Face, lips, nails) beautifying, promoting attractiveness or perfuming or protecting them or keeping them in good condition or altering their appearance or masking body odour or perspiration or to the teeth for the purpose of cleaning. Generally cosmetic preparations are not used to prevent or to treat any disease.

Classification: Cosmetics are classified on the basis of part of the organ where they are applied.

1. Cosmetics for the skin: Ex: Cleansing creams, cold cream, vanishing creams, and calamine lotion, deodorants.

2. Cosmetics for face: Ex: Face power, lipstick, and rouge

3. Cosmetics for nails: Preparations concerned with cleaning and decoration of the nails Ex: nail polish (Manicure preparations)

4. Cosmetics for the hairs: Ex: Shampoos, hair sprays, hair dressings, hair tonics, hair colorants

5. Cosmetics for teeth and mouth: Ex: Dentifrices (tooth power, tooth paste) mouth washes

6. Depilatories: Preparation used to remove unwanted hair in the area of face, legs and axillae without causing injury to the skin.

7. Shaving preparations: Ex: Shaving soap, saving cream.

8. Cosmetics for eye: Ex: Eye preparation known as mascara.

Q.2 Define Dentifrices and classify Dentifrices with examples.

Dentifrices: Dentifrices are preparations used to clean and polish the teeth adequately and keep the mouth and teeth fresh and clear.

Basic requirements of dentifrices:

1. Dentifrices should keep the mouth and teeth fresh and clean
2. Dentifrices are used to
   a. Removal of food debris
   b. Removal of plaque
   c. Removal of foreign matter
3. Decrease tooth decay
4. The dentifrices must be harmless, pleasant and convenient to use.

5. The product should be stable during storage
6. It should not be expensive.

Types of dentifrices:

1. Tooth paste: Tooth paste is a suspension of abrasives in glycerol/water mixture with other substances such as detergents, binding agents, sweetening agents, flavouring agents etc.

Formulation: The following ingredients are generally used for preparing tooth pastes.

1. Abrasives (polishing agents): Abrasives are substances used to clean and polish the teeth and remove the debris from the tooth surface without damaging it.

Ex: Precipitated chalk ($CaCo_3$), Dicalcium phosphate dehydrate, Tricalcium phosphate

2. Detergents (surfactants): Detergents are substances used to clean the teeth and also support the polishing action of abrasives.

Ex: Sodium lauryl sulphate. Sodium N-lauryl sarcosinate. Sodium ricinoleate

3. Humectants: Humectants are substances which prevent quick drying of the preparation

Ex: Glycerol, propylene glycol, sorbitol syrup (70%).

4. Binding agents: These are substances which give good consistency to the preparation. Their protective colloidal effect stabiles the preparation and they thicken the paste.

Ex: Tragacanth, CMC, Sodium CMC, Guar gum.

5. Flavouring agents: They give sensation of freshness and good flavour to the preparation.

Ex: Peppermint oil rose oil, clove oil, menthol etc.

6. Sweetening agents: They give pleasant taste to the preparation

Ex: Sodium cyclamate, saccharin, sorbitol etc.

7. Preservatives: Binding agents in the form of mucilage's promote the growth of micro-organism so to prevent the growth of micro – organism and to preserve the preparation preservatives are included. Ex: Formalin, sodium benzoate, Para hydroxyl benzoate etc .

8. Anti corrosive agent: Precipitated CaCo3 give alkalinity to the tooth paste and makes it corrosive to the aluminium tubes, when the tooth paste is packed in aluminium tubes. To prevent the corrosion, sodium silicate is used as anti corrosive agent.

9. Colours: They give good appearance to the preparation red, blue, green colouring pigments are used in tooth pastes. Ex: Carmine, phloxin, Erythrosine, Eosine

10. Bleaches: These are used to increase whitening effects

Eg: Sodium perforates ppt chlorate.

11. Therapeutic agents: Tooth cleaning agents which contain some drugs or chemicals which for reason of its bacterial Bacteriostatic, enzyme inhibiting or acid neutralizing qualities reduce the incidence of dental caries or acid in the control of periodontal disease.

Ex: Urea, Ammonium, Dibasic ammonium phosphate chlorophyll derivatives, penicillin enzymes and fluorides.

Formula :

$Caco_3$	-20g
Dicalcium phosphate	-34g
Sodium lauryl sulphate	-1.2g
Sodium CMC solution	-2.2g
Glycerine	-6g
Mineral oil	-1g
Sorbitol 70% solution	-32ml
Saccharin sodium	-0.6ml
Purified water	-4ml
Peppermint oil	-Q.s
Methyl paraben	Q.s

Method of preparation:

1. Glycerol sorbitol and methyl paraben solution are poured over sodium CMC to from a mucilage

2. Saccharin sodium is dissolved in this mucilage. Then $CaCo_3$ di-calcium phosphate and sodium lauryl sulphate are incorporated into the above mass with constant stirring.
3. Then small amounts of mineral oil, flavouring agent, colouring agent and remaining preservatives are added to the above mass.
4. The whole mass is stirred continuously until a uniform consistency is obtained.
5. Finally the completed product is milled or homogenized.

Advantages:

1. The tooth pastes spread easily on the tooth brush convenient to use.
2. The wastage is very minimum spillage because they are available in tubes.
3. Their consistency, flavour and colour are more attractive than tooth powder.

Disadvantages:

1. They are expensive than tooth powder.
2. The method of preparation of tooth paste is complicated than tooth powder.

Storage: It is packed in a collapsible tube.
Use: Used to clean the teeth.

2. Tooth powder: Tooth powders are tooth cleansers, consisting of abrasives detergents flavouring agent and sweetening agent in a fine powder form.

General method of preparation: The flavouring agent, sweetening agent and colouring agent (if any) are mixed thoroughly with abrasive and detergent ingredients and then passed through a sieve number 0.3mm mesh.

Ex: Formula:	Di-calcium phosphate dihydrate	-79%
	$CaCo_3$	-20%
	Sodium lauryl sulphate	-1%
	Peppermint oil	-Q.s
	Saccharin sodium	-Q.s

Preparation: 1. Sodium lauryl sulphate, saccharin sodium and peppermint oil are mixed thoroughly with small portion of Dicalcium phosphate dihydrate and $CaCo_3$.
2. Then the remaining portion of Dicalcium phosphate dihydrate and $CaCo_3$ are added and mixed thoroughly.3. Then the final product is passed through a sieve number 0.3 mm mesh.

Advantages:

1. They are not more expensive when comparing tooth pastes.
2. The method of preparation is simple when comparing tooth paste.

Actions: Dicalcium phosphates dihydrate and $Caco_3$ acts as abrasives. Sodium lauryl sulphate acts as detergent. Peppermint oil as flavouring agent. Saccharin sodium acts as sweetening agent.
Storage: it is packed in a narrow mouth small tin.
Use: It is used to clean the teeth.

Q.3 Define Shampoos and give ideal properties of shampoos.

Shampoos: Shampoos are the formulations for cleaning and conditioning hair. The shampoos are used for removal and residues of hair growing preparations.

Ideal properties of shampoos:

1. It should be easily soluble even in hard water
2. It should not produce ppt with hard water
3. It should spread easily over the hair and should not immediately sink into the hair.
4. It should have a good cleaning effect.
5. It should not remove excess of natural oils from the hair.
6. It should not have any un-pleasant odour
7. It should not be too expensive.
8. It should not give roughness and tangling tendency to hair.

9. It should not have any corrosive effect on the eye.
10. It should give gross and lusture to the hair.
11. It should not have any irritation effect.
12. It should make hair free, smell clean and fresh.

Q.4 Classify Shampoos with examples.

Different types of shampoos:

I. Shampoos are classified according to the physical properties:

1. Clear liquid shampoo
2. Liquid cream shampoo
3. Solid cream shampoo
4. Herbal shampoo
5. Oil shampoos
6. Dry powder shampoo
7. Aerosol shampoos
8. Dry shampoos (liquid type)
9. Anti-dandruff shampoo and medicated shampoos
10. Egg shampoos

II. According to their function:

1. Conditioning shampoos
2. Baby shampoos
3. Anti-dandruff and medicated shampoos
4. Acid balanced shampoos.

Formulation of shampoos: Shampoos mainly containing the following ingredients

1. Detergents: These are used in shampoo to clean the hair. Single or combination of detergents can be used. **Ex:** Sodium lauryl sulphate, Tri-ethanolamine oleate, Tiepol, Fatty oil soap & Poly-ethylene glycol 400 distearate.

2. Disinfectants and Germicides: These are used in shampoo to prevent itching caused by the bacteria. **Ex:** Hexachlorophene, Di-Chlorophene, Actamer.

3. Anti-Dandruff agents: Anti-dandruff agents are used to prevent the formation of scaly scurf on the skin under the hair. **Ex**: Benzalkonium chloride, Cetrimide, Hyamines.

4. Conditioning agents: These agents improve the condition of hair. They give smoothness and softness to the hair. **Ex:** Lanolin, Mineral oils, Amino acids, Egg yolk, Lecithin.

5. Viscosity modifiers: Viscosity means increases the thickness of the shampoo.
Ex: NH_4 & NaCl, Alginates, Karaya gum, Tragacanth, CMC, and Carboxy vinyl polymer.

6. Opacifying and clarifying agents: Opacity and pearl like shining is provided by finely dispersed ZnO to titanium oxide.

7. Preservatives: Natural additives make shampoo prove to microbial attacks. There preservatives like hydroxyl benzoates esters, quaternary ammonium salt, and formaldehyde are added.

8. Sequestering agents: These are required to prevent the formation and deposition of Ca & Mg soaps on the hair, while rinsing with hard water. **Ex:** EDTA & Pyrophosphates.

9. Colouring agents: They give attractive colour to the preparation.
Ex: Quinizarin green, Tertrazine yellow.

10. Perfumes: These are used in shampoos to provide pleasant feeling.
Ex: Lavender oil, Rosemary oil, Jasmine oil.

Methods of preparation:

a) The detergents, preservatives and other ingredients are dissolved in a suitable solvent
Ex: Water, alcohol.
b) The colouring agent is dissolved in a suitable solvent.
c) The colouring agent solution is added to the detergent solution and mixed well.

d) Finally the preparation is flavoured.

4. Deodorant: Deodorants are the agents which mask the unpleasant odour of the body is known as deodorants. A deodorant reduces the body odour without affecting any body function. **Ex:** Emcol, alcohol, mineral oil, carbopol, glycerine, water.

Mechanism of action: The P^H of sweat is 4.0 to 6.8 it is secreted. Sweat is odourless at the time of secretion but after sometime, the sweat is decomposed by the micro-organisms on the skin. As the result the bad odour develops. Deodorants prevent the decomposition of the sweat by inhibiting the bacterial activity or by inhibiting the growth of bacteria. Generally micro-organisms do not thrive below P^H-4. Deodorants react with sweat and it brings down the P^H below 4.0 and these stop the bacterial growth.

Composition of deodorants: Deodorant preparation mainly contains the following ingredients. They are

a) Anti-bacterial agents: Hexa – methylene tetranine, Hexachlorophene, trichloro-carbonilide, zinc ricinoleate are used as deodorants.

b) Ethyl alcohol: It is used as a vehicle, deodorant products also act as anti-bacterial.

c) Essential oils: like thyme contains thymol and clove oil contains eugenol. They act as deodorants and anti-bacterial agents.

Types of deodorants: Deodorants are available in various forms mainly

a) Liquid deodorant) Sticks deodorant) Creams) Jellies) Powders ,f) Soaps) Aerosols

Method of preparation: Composition:

Phase-A: Emcol, Hex chlorophene, alcohol, mineral oil, menthol

Phase-B: Glycerin, water

Phase-C: Carbopol

Method of preparation:

1. Dissolve all the ingredients of phase-A
2. Dissolve all the ingredients of phase –B separately
3. Add phase a solution to phase B solution with stirring.
4. To this mixture, add carbopol and stir vigorously for 30min
5. Keep the mixed solutions in a closed container for at-least for 48hours, then filter the solution and kept in a suitable container.

Facial cosmetics: Facial cosmetics are preparations intended to be applied on and around the face including checks, eye shadow, eye liner, eye brow, lips for the purpose of cleaning protecting them or keeping them in good condition or changing their appearance.

Classification:

1. Cleansing and cold cream Ex - Cold cream, Cream, cleansing cream
2. Night and massage creams Ex – Night cream, massage cream
3. Foundation and vanishing cream Ex – Foundation and cream, emollient cream
4. Moisturizing and emollient cream Ex – Moisturizing and emollient cream
5. Astringent lotions and skin tonics Ex – Antiperspirant lotion, calamine lotions skin tonics
6. Face powders Ex – Face powders
7. Coloured make up preparations: Ex – Lipsticks, lip salves, Rouge, eye make – up preparations.
8. Skin nourishing preparations: The cream containing vitamins and hormones provide nourishment to the skin.

1. Face powders: Face powder is one of the make – up preparations applied to the face beautifying, promoting attractiveness and altering the appearance.

Function of face powder: a) To give a smooth velvet line finish to the skin

b) To mask minor visible imperfection. c) To mask only appearance of the face due to sweat.

Ideal properties of face powders: The face powder must possess the following properties

a) Covering properties: It should cover the skin effects such as scars, enlarged pore and blemishes (some black spot)
b) Spreading properties: It should have good spreading quality so that it produces a smooth feeling on the skin.
c) Absorbing property: It should absorb sebaceous secretions of the skin and perspirations.
d) Adhesion property: It should adhere to the face adequately
e) Blooming property: It should give smooth velvet like appearance to the face.

Formulation of the face powders: The following ingredients are used in the face powders. They are
a) Covering agents: It covers the skin defects such as scars, enlarged pores and blemishes. The range of concentration is 10-25%. **Ex:** Titanium dioxide, ZnO, Magnesium oxide & kaolin.
b) Adsorbing agents: It absorbs sebaceous (oily) secretions and perspiration so that it produces a smooth feeling on the skin. The range of concentration is up to – 30%.
Ex: precipitated chalk, Mg Co_3, Starch, Kaolin.
c) Adhering agent: It improves the adherence power of face powder to the face. The range of adhering is 3-10%. **Ex:** Talc, Zinc stearate, Mg stearate, the adhesion of powders to the face can also be improved by including certain emollients such as cetyl alcohol or stearyl alcohol in the formula.
d) Slipping agent: It improves the spreading property of the face powder and it gives characteristic smooth feeling. **Ex:** Talc, Zinc stearate, starch
e) Blooming agent: It gives smooth, velvet like appearance to the face. **Ex:** Chalk, starch
f) Colouring agents: It gives good appearance to the preparation
Ex: In Organic pigments like iron oxide which gives yellow, red and brown colour and ultramarine give green and blue colour.
g) Perfumes: It gives fragrant and pleasant smell to the face powder.
Ex: lavender, jasmine oil, Rose oil.

Q.5. Write a note on Cold Cream.
Cold Cream: It is an emulsion when applied to skin, a cooling effect is produced due to slow evaporation of water present in the emulsion. Cold creams are o/w type emulsion but after application on the skin, sufficient water evaporates to produce phase inversion w/o type.
Rx
Bees wax
Liquid paraffin
Borax
Water
Perfume and preservative
Method of preparation: 1. Heat bees wax and liquid paraffin at 70^0C. 2. Dissolve borax in water and heat the solution to 70^0C. 3. Add this hot solution into the melted mixture and continuously until a smooth cream is formed. 4. Continue the stirring until it is cold.
Storage: It is packed in a well closed container.
Actions: 1. Bees wax acts as base.2. Liquid paraffin acts as emollient.3. Borax acts as emulgent.4. Water acts as vehicle.

Q.6. Write short notes on Vanishing Cream.
Vanishing Cream: It is a soft semisolid cosmetic preparation. When it is applied on the face, a very thin layer is formed. These creams can be quickly washed off with water due to the presence of o/w type of emulsifiers.
Rx
Stearic acid

Potassium hydroxide
Glycerin
Water
Methyl paraben
Rose oil

Method of preparation: 1. Melt stearic acid at 70^0C.
2. Dissolve potassium hydroxide in water, to this add glycerine and heat this solution to 70^0C.
3. Add this hot solution into the stearic acid and stir well until a smooth cream is formed.
4. Maintain temperature during stirring, continue stirring until it cools to 30^0C.
5. To this add methyl paraben solution and rose oil, continue the stirring until it gets cold.

Storage: It is packed in a well closed container.

Actions: 1. Stearic acid acts as a base.2. Potassium hydroxide reacts with free fatty acid present in stearic acid to form soap which acts as emulgent.3. Glycerin acts as an emollient and antidrying agent.4. Water acts as vehicle.

Questions:
1. Define Cosmetics.
2. Write short notes on Vanishing Cream.
3. Write a note on Cold Cream.
4. Write a note on Shampoos.
5. Give a formula for tooth powder.
6. Write a note on Dentrifices.

CHAPTER . 14
PARENTERAL DOSAGE FORMS

Q.1 Define parenterals and classify it.

Parenterals preparation: Parenterals preparations are sterile preparations intended for administration under or through one or more layers of skin or mucous membranes.

General requirements:

1. Parenterals preparations shotild be free from living microbes.
2. Parenterals should be free from microbial products such as toxins, pyrogen
3. It should be free from physical contaminants such as particulate matter, fibres
4. It should be matching osmotic qualities with respect to body fluids
5. It should be free from chemical contamination
6. It should be matching specific gravity with respect to some body fluid.

Classifications of parenterals preparations

1. Small volumeParenterals

1. Solutions of medicaments
   a) Aqueous
   b) Oily
2. Suspensions
3. Emulsions
4. Dry solids to be dissolved in

a suitable vehicle before use
5. Dry solids to be suspended in a Suitable vehicle before use.

2. **large volume Parenterals**

1. Aqueous volume
2. 10% I.V fat emulsion

Q.2 Advantages and disadvantages of parenterals preparations:

Advantages:

1. Exact dose-can be administered
2. Purity and sterility of the medicament are ensured
3. Stability of the drug is prolonged
4. Numerous incompatibilities are over come
5. Quick therapeutic response of a drug
6. Unconscious and in vomiting patient this route is possible
7. Substances like in-activated or not absorbed by GIT can be administered
8. Physiologic action is localized when desired.

Disadvantages:

1. Painful and un - comfortable
2. Dependent – administered by physician
3. More expensive, more danger than other dosage forms
4. Difficult to correct toxic effect.

Q.3 Discuss the various vehicles used in parenterals.

Vehicles for parenterals products: Pyrogen free water is commonly used as vehicle for injections. Non-aqueous vehicle (Eg: oil) can also be used as vehicle when the medicament is insoluble in water and when a depot effect is desired. Vehicles are three types. They are

1. Aqueous vehicles: There are three types of aqueous vehicle, namely

a) Water for injection free from pyrogen: If water for injections contains pyrogen, it produces rise in body temperature so pyrogen should be removed.

b) Water for injection free from CO_2 : If waters contain Co_2, the sodium salt of drugs (Eg- barbiturates and sulphonamides) may decompose and free base is precipitated. So Co_2 should be eliminated by boiling water for injection for 10min.

c) Water for injection free from dissolved air: If water contains air, oxidation of the medicaments may take place. So dissolved air should be removed by boiling water for 10 minutes. They are isotonic vehicles **Ex:** Nacl Inj, lactated ringer's Inj, Ringer's Inj, Dextrose and Nacl Inj, Dextrose Inj

2. Water miscible vehicles: To effect solubility of drug, to reduce hydrolysis

Ex: Ethyl alcohol, Propylene glycol, Polyethylene glycol – 400,600, Glycerine.

3. Non-Aqueous Vehicle: The non – aqueous vehicles are used when the use of water is contra-indicated in one way or the other. It is used due to following reasons.1. When the medicament is insoluble or slightly soluble in water 2. To increase the stability of the preparation. 3. To prolong the duration of action of a drug. These oil should be free from rancid odour and taste. **Ex:** Fixed oil, Sesame oil, Cotton seed oil, peanut oil.

Fixed oil is used in certain hormone preparations. Propylene glycol is used in injection of phenobarbitone. Non aqueous vehicle should be non-toxic, non-irritating and compatible.

Q.4 Discuss the different additives employed in the formation parenterals preparations.

Additives: Additives are other than the active medicament, added to a preparation to improve the quality of the product. The additives act to prevent the physical, chemical or biological degradation of a product.
Properties: They should be non-toxic, they should be non-irritant, they should be compatible with many ingredients, they should not interfere with the therapeutic effect of the preparations, and they should be physically stable and chemically inert.

Additives are as follows:
1. Vehicles: It is required to dissolve or suspended the medicament. It must meet the special purity and the other standards assuring its safety by injection. They are two types
a) Aqueous Vehicle: Water is used; it should be free from irons and pyrogen, O_2 and Co_2
b) Non-Aqueous vehicles: Depending on the physical and chemical factor, limit of solubility of hydrolysis of medicament in water, a non-aqueous vehicle is used. **Ex**: Fixed oil, Propylene glycol.
2. Solubilizers: Purges with poor solubilties may have to be solubilised with the acid of solubilisers or co-solvents. **Ex:** Propyl glycol or glycerin, tweens, is used as solidifiers to increase the solubility.
3. Anti-oxidants: Anti oxidants are used to protect the active medicament from oxidation. Anti-oxidants act by blocking an oxidative chain reaction. **Ex:** Sodium Meta bisulphate, Ascorbic acid, Propyl gallate.
4. Chelating agents: The presence of trace of metal ion causes destructive changes in medicaments. The chelating agents produce oxidation or decomposition of medicament. These effects can be prevented by adding a chelating agent. The chelating agent combines with metal ion to form a soluble co-ordination compound and thereby it suppresses the effect of metal ion. **Ex:** EDTA, Citric acid, ca EDTA.
5. Buffers: Buffers are added to maintain the P^H of the products. A change in P^H affects the therapeutic effect of the preparation. Change in P^H may be due to
a) The dissolution of the glass constituents in the product during storage.
b) Dissolution of gases from the atmosphere.
c) Release of constituents from rubber closure or plastic containers to the product.
Ex: Acetate, citrate and phosphate buffers are commonly used to maintain the P^H of the product.
6. Isotonicity contributors: All injections should be made isotonic in order to minimize tissue damage, irritation, to reduce haemolytic of blood cells and to prevent electrolyte imbalance injection are made isotonic by using 0.9% w/v of sterile Nacl.

7. Preservatives: Preservatives are essential in parenterals preparations in order to prevent contamination and to maintain the stability of the preparation. Preservatives may not be included to intravenous injections of large volume.
Ex: Phenol, Cresol, Chlorocresol, Phenyl mercuric nitrate, phenyl mercuric acetate.

Flow chart of the area for the manufacture of sterile products:

<table>
<tr><td rowspan="2">Stock Room</td><td>Preparation Room</td><td>Aseptic Filling Area</td><td>Quarantine</td><td rowspan="2">Finishing Goods Room</td></tr>
<tr><td>Cleaning up Room</td><td>Sterilization</td><td>Packing & Finishing</td></tr>
</table>

The production for parenterals is divided into 8 sections:
1. Stock room
2. Clean up area
3. The preparation room
4. Sterilization room

5. Aseptic room
6. Quarantine room
7. Packing and finishing room
8. Finished goods room

Q. 5 Describe the formulations of parenterals dosage form.

Preparation/ formulation of parenterals products:

Aseptic procedure should be followed in preparing the parenterals products. The area where parenterals products are prepared are made bacteria free through the use of ultra-violet light, a filtered air supply, sterile manufacturing equipments such as flasks, connecting tubes and filters and sterilized clothing worn by the personal in the area.

The following steps are involved in the preparation of parenterals preparation:

1. Selection of ingredients
2. Formulation of parenterals products
3. Filtration
4. Filling
5. Sealing
6. Sterilization

1. Selection of ingredients: Vehicles and other additives are carefully selected. They should be compatible with medicament. They should be chemically stable and physiologically inert they should be non-toxic and free from pyrogen.

2. Formulation of parenterals products: The medicament is dissolved or suspended in water for injection or in non-aqueous solvent. Then required ingredients are added to vehicle containing medicament.

3. Filtration: The solution so obtained is passed through bacteria proof filter.

Ex: Sintered glass filter, Sintered glass filters grade No.3&4 having pore size from 25-40 and 5-10 micron respectively are used for filtration by applying positive or negative pressure.

4. Sealing: It should be done immediately as soon as possible to prevent the contamination ampoules are sealed manually or a small scale by melting a portion of glass by melting a portion of glass neck with.

Fire jet of flame: For rapid sealing, a high temperature gas oxygen flame is most suitable a variety of automatic sealing device are available today for making full seal.

The vials and transfusion bottles are sealed by closing its opening with a rubber closer. The rubber closers are held in place by crimping the aluminium caps. The criping is done manually or by mechanical means.

5. Filling: After filtration, the solution is transferred as rapidly as possible under aseptic conditions. The containers and closures must be properly cleaned, sterilized and made available for use in the process of small scale. Filling is done manually by using hypodermic syringe or needle. A large scale filling is done by automatic filling machine. The sterile powders are filled into containers by weighting or semi-automatic machine.

6. Sterilization: The parenterals products are sterilized immediately after sealing in its final container. The method of sterilization depends on the nature of medicament. Thermostable medicaments are sterilized either by autoclave at $120^{O}C$ for 30 minutes or by heating in hot own over at 1600 for 1 hour. Only injections are sterilized by heating in hot air oven and aqueous injections are generally sterilized by autoclaving. Themolabile medicaments are sterilized by non-thermal methods. These are generally sterilized by filtration through bacteria proof filters which contain a suitable Bacteriostatic agent to prevent the growth of micro – organism.

Q.6 Write a note on pyrogen:

1. Pyrogen are metabolic by product of micro-organism. It consists of lipo-poly saccharine. Generally gram negative organisms produce potent pyrogenic substances.
2. Pyrogen are soluble filterable, thermostable and non-volatile
3. When pyrogens injected in human being, they cause chills, fever, headache, backache and discomfort.
4. Major sources of pyrogens are water anti-biotic. Produced by fermentations and equipments.
5. Pyrogens can be destroyed by heating at 175^0 C for 3 hours in presence of acids, alkali or oxidising agents.
6. Pyrogens are removed by adsorbent like charcoal, asbestos pad and aluminium hydroxide gel.

Q.7 Discuss the quality control tests on parenterals products:

Quality control test for parenterals products are:-

1. Pyrogen test:

i) Rabbit test: Pyrogen test is performed for all aqueous parenterals preparations. The suitable amount of sample to be tested is injected into the marginal vein of the healthy rabbit. The thermo meter is inserted into the rectum the temperature of the animal as recorded for 3 hours. If the temperature is raised more than 0.6^0C above the normal sample fails to pass the test. If there is no rise in temperature the sample passes the test.

ii) Leukocyte count test: The sample to be tested in injected. After several hours, the blood is examined. If the sample contains pyrogens they cause changes in the white cell picture. Ex: Fall in small lymphocytes and a rise in young neutrophills.

2. Sterility test: The sterility test is performed as per specification of the drugs and cosmetics act and rules. The entire test is performed aseptically.

a) The sample to be tested is transferred to culture tubes containing a measured volume of a suitable culture medium. Ex: Aerobic medium, Nutrient agar medium, anaerobic medium, Thioglycollate medium.
b) The tubes are plugged with sterilized cotton wool and incubated for 7 days at 30-35^0C
c) If there is no growth of micro-organisms in the tube, the sample is said to be sterile.
d) If there is any growth of micro-organisms, the test may be repeated third time very carefully.
e) If the second test also shows growth, the test may be repeated third time very carefully.
f) If the third test also shows growth, then the sample is said to be contaminated and the whole preparation is to be discarded.

3. Leaker test: Ampoules which have been sealed by fusion to ensure that there should not be any leakage in them. It is intended to defect incompletely sealed ampoules.

Method: Sealed ampoules are dipped in coloured dye (methylene blue 1%) solution and vacuum (-ve pressure) is produced for 15minutes. When vacuum is released the coloured solution will enter inside ampoules. Defective ampoules will contain coloured solution (blue).

4. Clarity test: The presence of any solid particles in injections causes serious effect. The contents of the containers are inverted, rotated and the solution is examined in front of strongly illuminated light for the presence of dust or any foreign particles. If any particles are visible, the sample is rejected.

5. Assay: Quantitative estimation is done to check the stated quantity of medicament present in the parenterals preparation. It is done according to method prescribed in monograph mentioned in the pharmacopoeia.

Q.8 Write a note on total parenterals nutrition.

Total parenterals nutrition (TPN): Large amounts of nutrients (Eg. Proteins, amino acids, carbohydrates vitamins) are administered intravenously to a patient who is unable to take

food orally so as to maintain the patients for a period up to several months without any major deterioration in their physical conditions.

Method of administration: Total parenterals nutrition involves continuous administration of the nutrient solution into the superior venacava by means of an indwelling catheter.

Contents of total parenterals nutrition: It contains

Glucose -20%
Fibrin hydrolysate -5%
Amino acid
Vitamins
Mineral
Electrolytes
Traces of elements like Zn, cu

Uses: Total parenterals nutrition is used as life saving or sustaining nutrients. It is used to comatose patients undergoing treatment for esophageal obstruction, GIT diseases (including cancer, ulcerative colitis, hepatic failure, renal failure and burns.

Dialysis fluids: Dialysis fluids are sterile solutions used to remove toxic substances and excessive body waste and serum electrolyte and thereby make the excretory function of the kidney to normal.

Composition of dialysis fluids: Dialysis fluids contain 1.5% to 4.5% dextrose with any one or more additives namely tetracycline's heparin and Kcl dialysis fluids are made hypertonic to plasma with Nacl in order to avoid absorption of water into the intravascular compartment.

Types of dialysis fluids:

1. Peritoneal dialysis solutions:

1. Peritoneal dialysis solutions are administered directly into the peritoneal cavity. This solution is permitted to flow into the abdominal cavity (peritoneal cavity) continuously and it remains in the cavity for 30-90min. afterwards it is drained by a siphon. This procedure is repeated many times.
2. A patient may require 30-50 litre solution for daily treatment.
3. Peritoneal dialysis solution is used to remove toxic substances. Excessive body waste and serum electrolytes from the blood and thereby allow the kidneys to regain their excretory function normal.

2. Haemodialysis solution:

1. In haemodialysis, dialyzing machine acts as an artificial kidney is used. In the dialyzing machine, dialyzing membrane and dialysis fluids are present.
2. Through a cannula, the blood from the artery entered into the dialyzing machine. The toxic substances and other body waste from the blood diffuse into the dialyzing fluid through the dialyzing membrane. The required substances (electrolytes) present in the dialyzing fluid are transfused into the blood through the dialysis membrane by the process of osmosis. Thus toxic substances and other body wastes are removed from blood. Through other cannula, the purified blood enters into the vein.
3. Haemodialysis solution is used to remove toxic substances and other body wastes from the blood and thereby allow the kidneys to regain their excretory function normal.

Isotonic solutions:

1. To minimise tissue damage and irritation, to reduce haemolysis of blood cells and to prevent electrolyte imbalance, all injections should be made isotonic.
2. Solutions having same osmotic pressure as that of blood plasma are said to be isotonic.
3. Solutions having lower osmotic pressure than that of blood plasma is said to be hypotonic.
4. Solutions having higher osmotic pressure than that of blood plasma is said to be hypertonic.
5. Both hypotonic and hypertonic is said to be paratonic.

6. When hypotonic solutions are injected, they cause haemolysis. When hypotonic solutions are injected, they cause shrinkage of cells.
7. Hence isotonicity is essential for injections. Solutions are made isotonic by using 0.9 % w/v of sterile sodium chloride solution.

Questions:

1. Describe the formulations of parenterals dosage form
2. Discuss the various vehicles used in parenterals.
3. What are pyrogens? Explain the test for pyrogens.
4. Write a note on leakers test for glass ampoules.
5. Describe the sterility test for injection.
6. Write a note on total parenterals nutrition.

CHAPTER . 15
OPHTHALMIC PRODUCTS

Q.1 Define ophthalmic products and classify it.

Def: - Ophthalmic products are sterile preparations intended for application to the eye lids or installation into the space between the eye ball and the eye lids.

Classification: - These are classified as follows

1. Eye drops
2. Eye lotions
3. Eye ointment
4. Eye packs
5. Eye discs
6. Intra ocular dosage forms

1. Eye drops: Eye drops are sterile aqueous or oily solutions or suspensions intended into the conjuctival sac.

Ideal characters of eye drops:

1. They should be free from foreign particles.
2. They should be free from pain and irritating effect
3. They must be sterile at all time
4. They must contain suitable preservatives
5. They should be cheimically stable
6. All the eye drops must be isotonic with the lachrymal secretions

Containers: Eye drops are dispensed in glass or suitable plastic containers with a screw cap fitted with a rubber teat and glass dropper for easy application of the drops or the containers may be fitted with a nozzle from which the drops can be directly instilled into the eye.

Storage: Eye drops are stored in a closed sterile container.

Labelling: "For external use only" if irritation occurs dis-continues use.

2. Eye lotion: Eye lotions or eye washes are sterile aqueous preparations used for washing the eye to remove the foreign particles and discharges from the eye.

Types of eye lotions: Eye lotions are broadly classified into two types they are:

1. Eye lotion containing anti-bacterial agents and used for eye infections. It can be used over a period of 1-7 days. Ex: Boric acid eye lotion.
2. Eye lotion containing no anti bacterial agents and used for irritation purpose. It should be freshly prepared and used within 24-48 hours. Ex: - Nacl eye lotion.

Eye lotion should be sterile and isotonic with lachrymal tears. Sterilization may either be done by autoclaving or filtration. The lotion is applied to the eye by means of an eye bath and it allowed to run from the inner to the outer corner of the eye. $NaHCo_3$ eye lotion is used for the first aid purpose in the treatment of acid burns. Nacl eye lotion is used for irritating

the eye. These are simple preparation by dissolving the Nacl/Na HCo_3 in purified water. These are sterilized by filtration and finally sterilizing by heating in autoclave in a container.
Containers: - Eye lotions are dispensed in coloured fluted bottles with screw cap.
Labelling: - For external use only, Not to be used after 24 hours or 7 days, Not to be diluted.

3. Eye ointment: Eye ointment is defined as soft, sterile semi solid preparations containing medicaments intended for applications to the conjunctival sac or to the eye lid margin.
Eye ointment base: -Eye ointment base contains the following ingredients they are.

Wool fat	-10%
Liquid paraffin	-10%
Yellow soft paraffin	-80%

Wool fat: It is used to produce emulsification of the aqueous solution and it promotes absorption of the medicament.
Liquid paraffin: It produces smooth consistency to the preparation so that application to the eye lids is easier.
Yellow soft paraffin: It acts as base white soft paraffin should not be used because it produces irritation.

Preparation of eye ointment: Melt Wool fat, Yellow soft paraffin on a water bath. Add Liquid paraffin .Filter through coarse filter paper placed in heated funnel. It is sterilised by dry heat method ($160^{O}C$ for 2 hrs).Incorporate the medicament with the eye ointment base. Pack in sterile containers.
White soft paraffin is not used in the preparation of ointment base because it is prepared by bleaching the yellow soft paraffin. Some of the bleaching agent may remain sticking to the base even after careful washing agent when used in the eye may leads to irritation. Wool fat is used in order to ensure satisfactory emulsification of the solution and helps in the absorption of active ingredients. Liquid paraffin is incorporated to reduce the viscosity of the base, so that it can be easily expelled from the collapsible tube and apply to the eye.
Storage: - Eye ointments are packed in small, sterilized collapsible tube of suitable metal or plastic containers (multi dose container). Eye ointments are also packed in soft gelatin capsules (single dose container) with applicator tips.
Labelling: - "Sterile" "for external use only"

Questions:

1. Describe the requirements of eye lotion
2. What are ophthalmic drops? Mention their ideal characteristics.
3. What are the appropriate containers, closures and storage conditions for eye drops and ear drops?