2nd year

Qusetion: define the term prescription. discuss the parts of a prescription, explain them briefly.
ans: an instruction written by a medical practitioner that authorizes a patient to be issued with a medicine or treatment.

parts of a prescription :: date

date must be written on the prescription by the prescriber at the same time when it is written. the date on the prescription helps a pharmacist to find out the cases where prescription is brought for dispensing long time after its issue. prescriptions containing narcotic or other habit-forming drugs must bear the date.

name, age, sex and address of the patient

name, age, sex and address of the patient must be written on the prescription. if it is not written then, the pharmacist himself should ask the patient about these particulars and put down at the top of the prescription. this avoids the possibility of giving the finished product to a person other than the one it is meant for. patient's full name must be written instead of surname or the family name. age and sex of the patient especially in the case of children helps the pharmacist in checking the medication and the dose. therefore, there will be less danger of its being administered to the wrong member of the family or the hospital ward having similar names. the address of the patient is recorded to help for any reference at a later stage, to contact the patient or to deliver the medication personally.

superscription

the superscription is represented by a symbol, rx, which is always written at the beginning of the prescription. in the days of mythology and superstition the symbol was considered as a prayer to jupiter, the god of healing, for quick recovery of the patient but now this symbol is understood as an abbreviation of the latin word recipe, meaning "take thou" or "you take".

inscription

this is the main part of the prescription. it contains the names and quantities of the prescribed ingredients. the names of the ingredients are written each on a separate line, followed by the quantity ordered and the last item written is generally the vehicle or diluent.
in complex prescriptions containing several ingredients the inscription is divided into three parts:
i) the base or the active medicament which is intended to produce the therapeutic effect;
ii) the adjuvant which is included either to enhance the action of the medicament or to make the product more palatable;
iii) the vehicle which is either used to dissolve the solid substances and/or to increase the volume of the preparation for ease of administration.

subscription

this part of the prescription contains prescriber's directions to the pharmacist regarding the dosage form to be prepared and number of doses to be dispensed. since, nowadays only a few prescriptions are compounded therefore such directions are less frequent.

signatura/signa

it is usually abbreviated as "sig" on the prescriptions and consists of the directions to be given to the patient regarding the administration of the drug. it usually indicates the quantity of medicament or number or dosage units to be taken, how many times in a day or at what time it should be taken and the manner in which it is to be administered or applied.

signature, address and registration number of the prescriber

all other parts of the prescription may be printed or type-written but the prescriber's name must be hand-written and should be signed with ink. this eliminates the danger of dispensing medicament on a spurious order and it authenticates the prescription. the prescriptions containing narcotic or other habit-forming drugs must bear the address and registration number of the prescriber. this identifies the special license which a prescriber must have to prescribe the narcotic and other habit-forming drugs.

Qusetion: what is pharmaceutical incompatibility? what are the different types of pharmaceutical incompatibility? explain them examples

ans: incompatibility definition incompatibility refers to interactions between two or more substances which lead to changes in chemical, physical, therapeutic properties of the pharmaceutical dosage form.

classification incompatibility can be classified into three groups- 1) pharmaceutical or physical incompatibility 2) chemical incompatibility 3) therapeutic incompatibility physical incompatibility and chemical incompatibility together we can say physico-chemical incompatibility. 4

can be corrected by applying pharmaceutical skill.θdifficult to measure an accurate dose. θan unacceptable, non-uniform, unpalatable product is formed. θa visible physical change takes place θphysical incompatibility: interaction between two or more substances which lead to change in color, odor, taste, viscosity and morphology.

chemical incompatibility chemical incompatibility: reaction between two or more substances which lead to change in chemical properties of pharmaceutical dosage form. • types of chemical changes: 1. oxidation 2. hydrolysis 3. polymerization 4. isomerization 5. decarboxylation 6. absorption of carbon-di-oxide 7. combination 8. formation of insoluble complexes chemical incompatibility is two types: 1. tolerated 2. adjusted

1. synergistic and antagonistic drugs 11□ contraindicated drug. □improper dosage form. □overdose or improper dose of a single drug. □therapeutic incompatibility: therapeutic incompatibilities are

unintentional pharmacodynamic or pharmacokinetic interactions that take place in vivo after administration of medicinal products. example: amine containing drugs are incompatible with mono amino-oxidase inhibitors. causes: it may be due to the administration of :
excipient - packaging interaction 12⎫ drug - food interaction ⎫ excipient - excipient interaction ⎫ drug - excipient interaction ⎫ drug - drug interaction ⎫different kinds of drug interaction mainly two types of drug interaction: 1) pharmacodynamic interaction 2) pharmacokinetic interaction other interactions:

Question: what do you mean by eutectic mixtures? give examples.
ans: a eutectic mixture is defined as a mixture of two or more components which usually do not interact to form a new chemical compound but, which at certain ratios, inhibit the crystallization process of one another resulting in a system having a lower melting point than either of the components.
ibuprofen, thymol
genistein, peg 460
5. define the term antagonism and synergism of drug. explain them with examples.
ans: antagonism : an interaction between two or more drugs that have opposite effects on the body. drug antagonism may block or reduce the effectiveness of one or more of the drugs.
synergism: an interaction between two or more drugs that causes the total effect of the drugs to be greater than the sum of the individual effects of each drug. a synergistic effect can be beneficial or harmful.
6. define the term posology. what are the factor that influences the dose of a drug.
ans: the branch of medicine concerned with the determination ofappropriate doses of drugs or agents

body size pregnancy□ lactation□ age – peadiatric□& geriatric genetic factors□ disease states – kidney□& liver routes of drug administration□ environmental factors□ psychological factors□ tolerance□& resistance
7. define the term powders. give the classification of powders, explain them briefly.
fine, dry particles produced by the grinding, crushing, or disintegration of a solid substance.

bulk powders

bulk powders are nonpotent and can be dosed with acceptable accuracy and safety using measuring devices such as the teaspoon, cup, or insufflator. this practically limits the use of orally administered bulk powders to antacids, dietary supplements, laxatives, and a few analgesics. many bulk powders are used topically.

dusting powders

dusting powders are fine medicinal (bulk) powders intended to be dusted on the skin by means of sifter-top containers. a single medicinal agent may be used as a dusting powder; however, a base is frequently used to apply a medicinal agent and to protect the skin from irritation and friction. bentonite, kaolin, kieselguhr, magnesium carbonate, starch, and talc are used as inert bases for dusting powders. powder bases absorb secretions and exert a drying effect, which relieves congestion and imparts a cooling sensation. all extemporaneous dusting powders should be passed through a 100-200 mesh sieve to ensure that they are grit free and will not further mechanically irritate traumatized areas.

insufflations

insufflations are extremely fine powders to be introduced into body cavities. to administer an insufflation, the powder is placed in the insufflator, and when the bulb is squeezed, the air current carries the fine

particles through the nozzle to the region for which the medication is intended. all extemporaneously compounded insufflations must be passed through a 100 mesh sieve. pressurized packages provide an elegant approach to the administration of insufflations.

divided powders (chartulae; charts; powder papers)

divided powders or charts are single doses of powdered medicinals individually wrapped in cellophane, metallic foil, or paper. the divided powder is a more accurate dosage form than bulk powder because the patient is not involved in measurement of the dose. cellophane and foil-enclosed powders are better protected from the external environment until the time of administration than paper-enclosed powders.divided powders are commercially available in foil, cellophane or paper packs.

Question: give the method of preparation of effervescent granules.

ans: dry or fusion method in the fusion method, the one molecule of water present in each molecule of citric acid acts as the binding agent for the powder mixture. before mixing the powders, the citric acid crystals are powdered and then mixed with the other powders of the same sieve size to ensure uniformity of the mixture. the sieves and the mixing equipment should be made of stainless steelϖ or other material resistant to the effect of the acids. the mixing of the powders is performed as rapidly as is practical,ϖ preferably in an environment of low humidity to avoid absorption of moisture and a premature chemical reaction. after mixing, the powder is placed on a suitable dish in an oven at 34ϖ c to 40 c. during the heating process, an acid resistant spatula is used to turn the powder. the heat releases the water of crystallization from the citric acid, which, in turn, dissolves a portion of the powder mixture, setting the chemical reaction and consequently releasing some carbon dioxide.
this causes the softened mass of powder to become somewhat spongy, and when it has reached the proper consistency (as bread dough), it is removed from the oven and rubbed through a sieve to produce granules of the desired size. a no. 4 sieve produces large granules, a no. 8 sieve prepares medium size granules, and a no. 10 sieve prepares small granules. the granules are dried at a temperature not exceeding 54 c and areϖ immediately placed in containers and tightly sealed. wet method the wet method differs from the fusion method in that the source of binding agent is not the water of crystallization from the citric acid but the water added to alcohol as the moistening agent, forming the pliable mass for granulation. in this method, all of the powders may be anhydrous as long as water is added to the moistening liquid. just enough liquid is added (in portions) to prepare a mass of proper consistency; then the granules are prepared and dried in the same manner as previously described.

12. define the term suspension. explain briefly the flocculated and non flocculated suspension and give the packaging, labelling and storage of suspension.
ans: the term "disperse system" refers to a system in which one substance (the dispersed phase) is distributed, in discrete units, throughout a second substance (the continuous phase). y each phase can exist in solid, liquid, or gaseous state . y suspensions are heterogenous system consisting of 2 phases.
a pharmaceutical suspension is a coarse dispersion in which internal phase (therapeutically active ingredient)is dispersed uniformly throughout the external phase.

advantages and disadvantages .suspension can improve chemical stability of certain drug. e.g. procaine penicillin g. ¾drug in suspension exhibits higher rate of bioavailability than other dosage forms. solution> suspension > capsule > compressed tablet > coated tablet ¾duration and onset of action can be controlled.

e.g. protamine zinc-insulin suspension. ¾suspension can mask the unpleasant/ bitter taste of drug. e.g. chloramphenicol.

disadvantages: physical stability , sedimentation and compaction can causes problems. ¾ it is bulky sufficient care must be taken during handling and transport. ¾ it is difficult to formulate. ¾ uniform and accurate dose can not be achieved unless suspension are packed in unit dosage form.

applications ¾ suspension is usually applicable for drug which is insoluble (or) poorly soluble. e.g. prednisolone suspension ¾ to prevent degradation of drug or to improve stability of drug. e.g. oxy tetracycline suspension ¾ to mask the taste of bitter of unpleasant drug. e.g. chloramphenicol palmitate suspension ¾ suspension of drug can be formulated for topical application e.g. calamine lotion

¾ suspension can be formulated for parentral application in order to control rate of drug absorption. e.g. penicillin procaine ¾ vaccines as a immunizing agent are often formulated as suspension. e.g. cholera vaccine ¾ x-ray contrast agent are also formulated as suspension . eg: barium sulphate for examination of alimentary tract.

deflocculation and flocculation flocculated suspensions ¾ in flocculated suspension, formed flocs (loose aggregates) will cause increase in sedimentation rate due to increase in size of sedimenting particles. ¾ hence, flocculated suspensions sediment more rapidly. ¾here, the sedimentation depends not only on the size of the flocs but also on the porosity of flocs.

deflocculated suspensions ¾in deflocculated suspension, individual particles are settling. ¾ rate of sedimentation is slow , which prevents entrapping of liquid medium which makes it difficult to re-disperse by agitation. ¾this phenomenon called 'caking' or 'claying'. ¾ in deflocculated suspension larger particles settle fast and smaller remain in supernatant liquid so supernatant appears cloudy.

formulation of suspension:
the formulation of a suspension depends on whether the suspension is flocculated or deflocculated. ¾ three approaches are commonly involved 1. use of structured vehicle 2. use of controlled flocculation 3. combination of both of the methods

list of suspending agents alginates •methylcellulose •hydroxyethylcellulose •carboxymethylcellulose •sodium carboxymethylcellulose •microcrystalline cellulose •acacia •tragacanth •xantham gum •bentonite •carbomer •carrageen •powdered cellulose •gelatin

preparation of suspensding:
following consideration are important for manufacturing pharmacist *f* selection of right material that go into the manufacture. *f* the step involved and their sequence in the manufacture. *f* preservation and storage of the product
small scale preparation of suspensions: step 1: suspensions are prepared by grinding (or) levigating the insoluble materials in the mortar to a smooth paste with a vehicle containing the wetting agent
step 2: *f* all soluble ingredients are dissolved in same portion of the vehicle and added to the smooth paste to step1 to get slurry. step 3: the slurry is transformed to a graduated cylinder, the mortar is rinsed with successive portion of the vehicle.

step 4: decide whether the solids are ¾suspended in a structured vehicle ¾flocculated ¾flocculated and then suspended add the vehicle containing the suspending agent (or) flocculating agent make up the dispersion to the final volume . thus suspension is prepared.

packaging of suspensions:
pharmaceutical suspensions for oral use are generally packed in wide mouth container having adequate space above the liquid to ensure proper mixing. ¾ parenteral suspensions are packed in either glass ampoules or vials.

storage : ¾ suspensions should be stored in cool place but should not be kept in a refrigerator ¾ freezing at very low temperatures should be avoided which may lead to aggregation of suspended particles stored at controlled temperature from 20-25 c
evaluation of suspension:
sedimentation method ¾ rheological method ¾ electro kinetic method ¾ micromeritic method

Question: define emulsions. what are the types of emulsions, explain them briefly.
emulsions definition;
emulsion types emulsion types 1. oil-in-water (o/w) 2. water-in-oil (w/o) 3. water-in-oil-in-water (w/o/w) 4. oil-in-water-in-oil (o/w/o)
choice of emulsion types choice of emulsion types • fats or oils for oral administration: - o/w is formed to mask unpleasant taste • for i.v. administration: - o/w - w/o • for external application: - o/w for water soluble drugs easily wash from skin non greasy texture
w/o occlusive effect influence the absorption of drugs cleansing skin moisturizing creams (designed to prevent moisture loss from skin)
• the type of oil affect on: - viscosity - spread - film forming - the transport of drug into skin • i.e. liquid paraffin (hard, soft and light liquid paraffin), silicone, beeswax, fatty alcohol and so on emulsion
14. write a short note on instabilities in emulsion.
ans: phase separation and phase inversion
as the temperature increases, the water solubility of ethoxylated nonionic emulsifiers becomes poorer (the hlb decreases). ¾there is a temperature (pit) at which the hydrophilic and lipophilic characteristics of the emulsifier are equal (relative to the required hlb of the oil phase). ¾at this temperature the emulsion will exhibit a phase inversion. ¾the pit should be at least 20 °c higher than the storage temperature. choose emulsifiers, and concentrations, to raise the pit.

Question:. give the preparation of ointments.
ans: mix the ingredients properly (mortar and pestle , spatula and salb)
use the roller mill
levigate the powder (reduction of particle size in suspending agent compatible with the ointment base)
in porcelain dish all or some components of an ointment melted together and colled with constant stirring until congealed add non melting substances a sthe ointment is being cooled and stirred.
prepare the ointment. select an ointment jar that will just hold all of the formulation. being by taking some ointment and fill the bottom of the ointment jar.
use the spatula to put ointment into the crevices.
storage and dispensing

ointment should be stored in tightly closed and completely filled containers. change the temperature can lead to the crystallization of the drug and to change in the ointment base. they are dispensed in tubes or single dose units in order to protect the product against the contamination during use.
with tin tubes. there is a risk of corrosion with hydrophilic ointment.

Question: define suppositories and what are the various types of suppositories.
ans: suppositories are solid dosage forms intended for insertion into body orifices where they melt, soften, or dissolve and exert localized or systemic effects
dosage form characteristics: a. rectal suppositories for adults weigh 2 gm and are torpedo shape. ` children's suppositories weigh about 1 gm. b. vaginal suppositories or pessaries weigh about 3- 5gm and are molded in globular or oviform shape or compressed on a tablet press into conical shapes.
. urethral suppositories called bougies are pencil shape. those intended for males weigh 4 gm each and are 100-150 mm long. ` those for females are 2 gm each and 60-75 mm in length. d. nasal suppositories: called nasal bougies or buginaria meant for introduction in to nasal cavity. ` they are prepared with glycerogelatin base. ` they weigh about 1 gm and length 9-10 cm.
ear cones: ` aurinaria and meant for introduction into ear. ` rarely used ` theobroma oil is used as base. ` prepared in urethral bougiesmould and cut according to size.

Question: write a short note on preparation of the suppositories.
ans: method of formulation31: the following methods are used for the preparation of suppositories 1. hand molding 2. compression molding 3. fusion molding. 1. hand molding: one of the most premier and easiest method for preparing suppository is hand rolling method and is commonly used for preparing suppositories containing cocoa butter as base. in this the base is first minced and then blended with active ingredient in a mortar, until the resultant product is plastic and thoroughly blended. the active ingredient are usually finely powdered, or dissolved in water, or sometimes blended with little quantity of wool fat to help incorporation with suppository base. thebelnded mixture is than rolled into a cyndrical rod of desired length and diameter of intend weight. the rod is sliced into portions, and then one end is pointed. this method is practical and economical for the manufacture of small number of suppositories. 2. compressionmoulding: a more uniform and pharmaceutically elegant suppository can be made by compressing the cold grated mass into a desired shap. a hand turned wheel pushes a piston against the suppository mass contained in a cylinder, so that the mass is extruded into moulds. the cold compression method is simple and results in more elegant appearance than does hand molding. it avoids the possibilities of sedimentation of the insoluble solids in suppository base, but is too slow for large scale production. one of the major disadvantages in the use of cold compression technique for molding fat type base suppositories is air entrapment 3. fusion molding or pour molding the most frequently used method for the developing suppositories in both laboratory and industry is the molding technology. first the base material is melted, preferably on a water bath to avoid overheating, and then the active ingredients are wither emulsified or suspended in it. finally, the mass is poured into cooled metal moulds, which are usually chrome or nickel plated.

Question: define parenteral products give the advantages and disadvantages and types of parenteral products.
ans: parenteral preparations are sterile, pyrogen-free liquids (solutions, emulsions, or suspensions) or solid dosage forms packaged in either single-dose or multidose containers. • these preparations are administered through the skin or mucus membranes into internal body compartments. • these includes any method of administration that does not involve passage through the digestive tract

advantages provide rapid drug actions /responses.⎮provide complete drug bioavailability (100 % in i.v.).⎮provide prolonged drug actions.⎮avoids hepatic first pass effect⎮ low drug concentration hence low toxicity comparatively.⎮parenteral therapy provides the means of correcting serious⎮ disturbances of fluid and electronic balances. when food cannot be taken by mouth, total nutritional⎮ requirement can be supplied by the parenteral route. patient compliance problems are largely avoided.⎮

disadvantages:

most inconvenient route of administration /pain upon injection. generally need medical help for administration (like physician or nurse usually in hospital or clinic) if administered by patients themselves, need good training. it requires strict adherence to aseptic procedures. it requires more time than those administered by other routes

chances of improper dosing are more. chances of adverse effects are more. danger of blood clot formation is there. drugcan not be recovered in adverse conditions. the manufacturing and packaging requirements of parenteral dosage forms are more expensive than other dosage forms

Question:. define ophthalmic dosage form. what are the additives used in ophthalmic dosage form.

ans: they are specialized dosage form designed to be inye, administered inside or adjacent to the eye stilled onto the external surface of the eye or used in conjunction with an ophthalmic device .

examples: solutions, suspensions, ointments, implants, gel forming solutions.

additives used:

a) cationicnzalkonium wetting agents, the chelating agent edta has the ability to render the resistant strains.

b) organicmercurials: phenylmercuric nitrate, phenyl mercuric acetate

c) alcohol substitute: cholobutanol,phenylethanol.

d) p-hydroxybenzoic acid.

e) boricacidsodium acetate phosphate buffer,polysorbate 20 , polysoabate 80 , dioctylsulpho succinate

antioxidants : especially sodium bisulfate or metabisulfate and also, ascorbic acid or acetylcysteine .it is used for prevention oxidation of drug and inhibit free radical matters.2- surfactants : surfactant are often used to stabilize more hydrophobic drugs.nonionic surfactants, are used most often since they generally less irritating than ionic surfactants. polysorbate 80 is used in preparation of ophthalmic emulsions. polyoxyl 40 stearate and polyethylene glycol has been used to solubilize a drug in an anhydrous ointment.cationic surfactants, are used gradually in the eye solution but almost invariable as an antimicrobial preservative.

preservative :benzalkonium chloride as a preservative is used in large quantities in commercial eye solution and suspension, preservative should be use in multi ophthalmic dose but in single dose they arent demand .

Question. Define prescription. Write the various parts of prescription.Explain handling of prescription.

Ans: Prescription is an order written by a physician, dentist or any other registered medical practitioner to a pharmacist, to compound and dispense a specific medication for the patient. It acts as a common link among the practitioner, pharmacists and patient. It consists of RMP's directions for the pharmacist and patient about the formulation.

Parts of a prescription:

(1) **Date:**Date must be written on the prescription by the prescriber at the same time when it is written. It helps a pharmacist to find out the date of prescription and date for filling the prescription.

(2) Name, age, sex and address of the patient: Name, age, sex and address of the patient must be written on the prescription because it serves to identify the prescription.Age and sex of the patient especially in case of children helps the pharmacist in checking the medication and dose.

(3) Superscription: The superscription is represented by a symbol R_x which is always written at the beginning of the prescription. In the olden days, the symbol was considered as a prayer to Jupiter, the God of healing, for quick recovery of the patient but now this symbol is understood as an abbreviation of the Latin word recipe, meaning 'You take'.

(4) Inscription: This is the main part of prescription. It contains the names and quantities of the prescribed ingredients. In complex prescription containing several ingredients the inscription is divided into three parts.

Base: The active medicaments which are intended to produce the therapeutic effect.

Adjuvant: It is included to enhance the action of the medicament.

Vehicle: It is either used to dissolve the solid substances or to increase the volume of preparation.

(5) Subscription: This part of prescription contains direction to the pharmacist regarding the dosage form to prepare and number of doses to be dispensed.

(6) Signature: It consists of the directions to be given to the patient regarding the administration of drug. It is usually written as 'Sig'.

(7) Renewal instructions: Prescriber indicates on every prescription, whether it may be renewed and if so, how many times. It is very important particularly in the prescription containing the narcotic and other habit forming drugs to prevent its misuse.

(8) Signature, address and registration number of the prescriber: All other parts of the prescription may be printed or type written but the prescriber name must be hand written and should be signed with ink. The prescription containing narcotic or other habit-forming drugs must bear the address and registration no. of the prescriber.

Handling of prescription: The following procedure should be adopted by the pharmacist while handling the prescription:

(1) Receiving: The prescription should be received from the patient by the pharmacist himself. While receiving a prescription, a pharmacist should not change his facial expression.

(2) Reading & checking: On receiving a prescription, always check it that it is written in a proper format and signed by prescriber along with date.

(3) Collecting and weighing the material: Before compounding the prescription, all the material required for it, should be collected on the left hand side of the balance. After weighing the material should be shifted to the right hand side of the balance.

(4) Compounding, labeling and packaging: Compounding should be carried out in a neat place. Only one prescription should be compounded at one time. The compounded medicaments should be filled in suitable container according to its quantity and use. The filled containers are suitably labeled.

Question. Define incompatibility.Explain the chemical and therapeutic incompatibility in detail.

Ans:Incompatibility:- Incompatibility occurs as result of mixing of two or more antagonistic substances and an undesirable product is formed, which may affect safety, efficacy and appearance of the pharmaceutical preparations.

Types of incompatibility:

(1) Physical incompatibility (2) Chemical incompatibility(3) Therapeutic incompatibility

Chemical Incompatibility: It may be as a result of chemical interaction between the ingredients of a prescription and a toxic or inactive product may be formed. It is of two types.

(i) **Tolerated:** In this, the chemical interaction can be minimized by changing the order of mixing but no alteration is made in the formulation.

(ii) **Adjusted:** In this, the chemical interaction can be prevented by addition or substitution of one of the reacting ingredients of a prescription with another of equal therapeutic value.

In the precipitate yielding interactionsthe precipitateformed may be diffusible or indiffusible. The method A and B is used in dispensing the prescription yielding diffusible and indiffusible precipitates respectively.

Method A: The method is followed when diffusible precipitates are formed in very small quantity. Divide the vehicle into two equal portions. Dissolve one of the reacting substances in one of the portion and other in the other portion. Mix the two portions by slowly adding one portion to the other by rapid stirring.

Method B: The method is followed when indiffusible precipitates are formed in large quantity. Divide the vehicle into two equal portions. Dissolve one of the reacting substances in one of the portion. Weigha suitable quantity of compound tragacanth powder and transfer in a mortar and use part of second portion of vehicle to produce smooth mucilage. Mix the two portions by slowly adding one portion to the other with rapid stirring.Examples of this type of chemical incompatibility are:

(I) Alkaloidal incompatibility:

(a) Alkaloidal salts with alkaline substances: Alkaloids are weak bases. They are almost insoluble inwater but alkaloid salts are soluble in water. If these salts are dispended with alkaline preparations such asstrong solution of ammonium acetate, ammonium bicarbonate, the free alkaloid may be precipitated asdiffusible precipitate. Hence method A can be used.

(b) Alkaloidal salts with soluble iodides: Whenthealkaloidal salts reacts with soluble iodide, they fromthe diffusible precipitates so method A is applicable.

(c) Alkaloidal salts with salicylates: When alkaloidal salts combinewith salicylates, they form indiffusible precipitate.So method B is applicable.

(II) Soluble salicylate incompatibilities:

(a) Soluble Salicylate with alkali bicarbonates: When sodium salicylate is administered orally it reacts with hydrochloric acid present in the stomach to form salicylic acid, which is precipitated and may irritate the gastric mucosa,causing pain in the stomach.

Method of correction: If sodium salicylate is prescribed, it is usually gives along with double the quantity of sodium bicarbonates as that of sodium salicylate to partially neutralize the gastric juice and thus minimizing the formation of salicylic acid.

(iii) Chemical incompatibilities causing evolution of carbon- dioxide gas:

(a) Bismuth sub nitrate and sodium bicarbonate: Bismuth sub nitrate when combined with sodium bicarbonate in the presence of water, CO_2 librated

$2BiONO_3 + 2NaHCO_3 \rightarrow (BiO)_2CO_3 + 2NaNO_3 + CO_2 + H_2O$

This reaction proceeds slowly at ordinary temperature, hence reaction should accelerated by using hot water and the mixture should be transferred to a bottle until the effervescence stops.

Therapeutic incompatibilities: When a drug is administered into the body of a patient with the intention to produce a specific degree of pharmacological action, but the nature or intensity of the action produced is different from that intended. This occurs due to the following reasons:-

(1) **Errors in the dosage:**Many therapeutic incompatibilities result from errors in writing or interpreting the prescription. The most serious type of dosage error in the dispensing is overdose of a medicament results in toxicity.

(2) Wrong dose or dosage form: There are certain drugs which have quite similar names and there is always a danger of dispensing the wrong drug e.g. prednisone and prednisolone, digoxin and digitoxin.

(3) Contra-indicated drugs: There are certain drugs which may be contra-indicated in a particular disease or a particular patient who is allergic to it e.g. corticosteroids are contra-indicated in patients having an active peptic ulcer.

(4) Synergistic and antagonistic drug: Many drugs exhibit synergism and antagonism when administered in combination. When two drugs are prescribed together, they tend to enhance the activity of each other known as synergism e.g. a combination of aspirin and paracetamol increases the analgesic activity. When two drugs having the opposite pharmacological effects are prescribed together shows antagonism e g. acetyl salicylic acid and probencid.

(5) Drug interactions: The effect of one drug is altered by the prior or simultaneous administration of another drug. The drug interaction can be corrected by the proper adjustment of dosage e g. acetophenetidin and asprin are analgesic but acetophenetidin depresses the CNS so asprin can be used instead of acetophenetidin.

Question. What is posology. Explain the factors affecting the dose of drug.

Ans: Posology: It is a branch of medical science which deals with dose or quantity of drugs which can be administered to a patient to get the desired pharmacological actions.

Factors affecting the calculation of dose of a drug:

The optimum dose of a drug, which produces the desired therapeutic effects may vary from person to person so there are some of the factors, which influence the dose:

(1) Age: Children and old people need lesser amount of drug than the normal adult dose because they are unable to excrete drugs to that extent as adults.

(2) Sex: Women do not always respond to the action of drugs in the same manner as it is done in man. There are certain drugs which on the administration to the mother are capable of crossing the placenta and affecting the fetus e.g. alcohol and barbiturates.

(3) Body weight: The average dose is mentioned in terms of mg per kg body weight or as a total single dose for an adult weighing between 50-100kg.

(4) Route of administration: Intravenous dose of drug are usually smaller than the oral doses because the drugs administered intravenously enter the blood stream directly and provide fast action.

(5) Time of administration: The presence of food in the stomach delays the absorption of drugs so the amount of drug which is very effective when taken before a meal may not be much effective when taken after meals.

(6) Environmental factors: Hypnotics are more effective at night.The amount of barbiturate required to produce sleep during daytime is much higher than the dose required producing sleep at night. Alcohol is better tolerated in cold environment than in summer.

(7)Emotional factors: The female are more emotional than male and requires lesser doses of certain drugs.

(8) Presence of diseases: If a person has one disease then the drug for other diseases may be less effectivee.g. streptomycin is excreted mainly by kidney may prove toxic if the kidney of the patient is not working properly.

(9) Accumulation: The drugs which are slowly excreted may build up a sufficient high concentration in the body and produce toxic symptoms.

(10) Synergism: When two or more drugs are used in the combinations form, there action is increased.The phenomenon is called synergism e.g. procaine and adrenaline.

(11) Antagonism: When the action of one drug is opposed by the other drug on the same physiologicalsystem is known as drug antagonism e.g. adrenaline and acetylcholine.

(12) Metabolic disturbances: Changes in water electrolyte balance and acid base balance, body temperatureand other physiological factors may modify the effects of drugs.

Calculation of doses:

The doses are also calculated in proportionate to age, body weight and surface area of the patient

(1) Dose proportionate to age: - There are number of methods by which the dose for a child can be calculated from the adult dose.

(a) Young's formula:

$$\text{Dose for the child} = \frac{\text{Age in years}}{\text{Age in years} + 12} \times \text{adult dose}$$

(b) Dilling's formula:

$$\text{Dose for the child} = \frac{\text{Age in years}}{20} \times \text{adult dose}$$

(2) Dose proportionate to body weight:

Clark's formula: $\text{Dose for the child} = \frac{\text{child's weight in kg}}{70} \times \text{Adult dose}$

(3) Dose proportionate to surface area:

$$\text{Dose for a child} = \frac{\text{Surface of child}}{\text{Surface area of adult}} \times \text{Adult dose}$$

$$= \frac{\text{Surface of child}}{1.73\text{m}^2} \times \text{Adult dose}$$

$$\text{Percentage of adult dose} = \frac{\text{Surface of child}}{\text{Surface area of adult}} \times 100$$

Question. Define powder. Write classification, advantages and disadvantages.

Ans: Powder: It is mixture of finely divided drug and/or chemicals in dry form. These are solid dosage forms of medicament, which are meant for internal and external use.

Types of powders:

(1) Bulk powder for internal use

(2) Bulk powder for external use.

(3) Simple and compound powder for internal use.

(4) Powders enclosed in cachets and capsules.

(5) Compressed powder (tablets).

(1) Bulk powder of internal use: Powders are dispensed in bulk, when accuracy of dosage is not important. Bulk powder contains several doses of powder. They are supplied in wide-mouthed containers that permit easy removal of a spoonful of powder.Example: powder for laxative purpose.

(2) Bulk powder for external use: Bulk powders meant for external use are non-potent substances. These powders are supplied in cardboard, glass or plastic containers. The bulk powders, which are

commonly used for external applications, are :(i) Dusting powder (ii) Insufflations (iii) Snuffs (iv) Dentifrices

(i) **Dusting powders:** These are meant for external applications to the skin and are generally applied in a very fine state off subdivision to avoid local irritation. Hence, dusting powders should be passed through sieve no. 80 to enhance their effectiveness.These powders are of two types: (a) Medical (b) Surgical. The dusting powders are preferably supplied in perforated or sifter top containers.

(ii) **Insufflations:** These are medicated dusting powders meant for introduction in to the body cavities such as nose, throat, ears and vagina with the help of an apparatus known as insufflators.The insufflators are available in the form of pressure aerosols.

(ii) **Snuffs:**These are finely divided solid dosage forms of medicament, which are inhaled in to nostrils for its antiseptic, bronchodilator and decongestion action. These are applied in flat metal boxes with hinged lid.

(iv) **Dentifrices:**These are applied with the help of a toothbrush for clearing the surface of teeth.
e.g. Calcium sulphate, sodium carbonates.

(3)**Simple and compound powders for internal use:**Simple powder contains only one ingredient either in crystalline or amorphous form. Compound powder contains two or more than two substances which are mixed together and then divided in to desired number of individual doses.

(4) **Powder enclosed in cachets:**Cachets are the solid unit dosage form of drugs these are moulded fromrice paper, which is made by pouring a mixture of rice flour and water between two hot, polished, revolving cylinders.These are used to enclose nauseous or disagreeable powders. These are also known aswafer-capsule. These are of two types: wet seal cachets and dry seal cachets.

Advantages:

1) They can be made easily.
2) They disintegrate quickly in the stomach.
3) The drug can be easily dispensed in cachets.

Disadvantages:

1) They must be softened before swallowing.
2) They are easily damaged.
3) They cannot protect the enclosed drug from light and moisture.

Advantages of powders:

1) Powders are one of the oldest dosages form and used both internally and externally.
2) Powders are more stable than liquid dosage form.
3) It is convenient for the physician to prescribe a specific amount of powdered-medicament depending upon the need of the patient.
4) The chances of incompatibility are less as compared to liquid dosage form.
5) The onset of action of powdered drug is rapid as compared to other solid dosage form, e.g. tablets, capsules or pills.
6) Powders are easier to carry than the liquid dosage forms.
7) Large quantity of powdered drugs can be easily administered in a suitable liquid.
8) Small children and elder patients cannot swallow solid dosage forms, such as, tablets and capsules. They can easily take the powdered drug as such or dispersed in water or any other liquid.
9) Powders are more economical as compared to other solid dosage form, because these are prepared extemporaneously without involving any special machinery and techniques.

Disadvantages of powders:

1) Drugs having bitter, nauseous and unpleasant taste cannot be dispensed in powdered form.
2) Deliquescent and hygroscopic drugs cannot be dispensed in powder.
3) The dispensing of powder is a time consuming.
4) Quantity less than 100 mg or so, cannot be weighed conveniently on dispensing balance.

Question. (a) What are the parenteral products? Write the formulation of parenteral preparations.

(b) Describe the various tests for evaluation of parenteral products.

Ans:05 (a) Parenteral products: Parenteral preparations are those pharmaceutical products that are given by other than oral routes. Transfusion fluids and injections are parenteral preparations.Injections are the sterile solutions or suspensions of drugs in aqueous or oily vehicle meant for introduction in to the body.

Classification of parenteral preparations:

(1) Solutions or emulsions of medicaments suitable for injections: These are commonly called as injections. The parenteral preparation in this form may be supplied in single dose containers e.g. dextrose injection.

(2) Sterile solids: Drugs, which are not stable in solution, are prepared and supplied as dry sterile solids which are dissolved in a suitable solvent immediately before its administrations e.g. benzyl penicillinG sodium injection.

(3) Sterile suspensions: These are sterile suspension of drugs in a suitable solvent, which are administrated, by intramuscular route e.g. sterile hydrocortisone acetate suspension.

(4) Transfusion fluids: These areparenteral preparations which are administered by intravenous route. They are generally used for nutrition and to maintain the electrolyte balance e.g. ringer's solution.

Formulation of parenteral preparation: In the preparation of parenteral products, the following substances are added to make a stable preparation:

(1) Vehicles: There are two types of vehicles which are commonly used for the preparation of injections.

i) Aqueous vehicles: Water is used as vehicle for majority of injections because water is tolerated well by the body and is safest to administer. The aqueous vehicles used are:

a) Water for injection.
b) Water for injection free from CO_2.
c) Water for injection free from dissolved air. Water for injection is sterile water, which is free from volatile, non-volatile impurities and also from pyrogens.

ii) Non-aqueous vehicles: The commonly used non-aqueous vehicles are oils and alcohols.Fixed oils, such as arachis oil, cottonseed oil, almond oil and sesame oil are used as vehicle.

(2) Adjuvant: These substances are added to increase the stability or quality of the product. The following adjuvants are commonly used in preparing the stable parenteral preparations:

a) Solubilising agent: These are used to increase the solubility of drugs which are slightly soluble in water e g. tweens, polysorbate.

b) Stabilizing agents: The drug in the form of solutions is more liable to deteriorate due to oxidation and hydrolysis. The stabilizers are added in the formulation to prevent this e g. thiourea, ascorbic acid.

c) Buffering agents: The degradation of the preparation which is due to change in pH, can be prevented by adding a suitable buffer to maintain the desired pH e.g. citric acid and sodium citrate acetic acid and sodium acetate.

d) Antibacterial agents: These substances are added in adequate quantity to prevent the growth of micro-organism during storage e g. sodium benzoate.

e) Chelating agents: Chelating agents such as EDTA are added in the formulation, to chelate the metallic ions present in the formulation. They form a complex which gets dissolved in the solvent.

f) Suspending, emulsifying and wetting agents: The suspending agents are used to improve the viscosity and to suspend the particles for long timee.g. methyl cellulose, carboxymethyl cellulose. Emulsifying agents are used in sterile emulsions. For this purpose lecithin is generally used. The wetting agents are used to reduce the interfacial tension between the solid particles and the liquid, so as to prevent the formation of lumps. They also act as antifoaming agents to subside the foams produced during shaking of the preparation.

g) Tonicity factors: Parenteral preparation should be isotonic with blood plasma or other body fluids. e.g.sodium chloride, dextrose, acid.

Ans:05(b) Evaluation testsfor parenteral preparations: The finished parenteral products are subjected to the following tests, in order to maintain quality control.

(1) Sterility (2) Clarity test (3) leakage test (4) pyrogen test (5) Assay.

(1) Sterility testing: All the parenteralpreparationswhich aresupplied in sterile form must confirm to the test for sterility as prescribed in the Pharmacopoeia. Test for sterility is intended for detecting the presence of viable forms of bacteria, fungi and yeasts in substances, preparations or articles which are required to be sterile.

Principle: The test is based on the principle that if bacteria or fungi are placed in a medium which provides nutritive material and water, and kept at a favorable temperature, the organism will grow and their presence can be indicated by turbidity in the clear medium.

Method of testing: Test for sterility may be carried out by

i) Membrane filtration method

ii) Direct inoculation method

The test samples of parenteral preparation are transferred into test tubes containing sterile culture media for aerobic, anaerobic bacteria and fungi. These test tubes are incubated for stated period in the incubator. The presence of turbidity in the culture media indicates the growth of micro-organisms and the sample fails to comply with test for sterility. This can be confirmed by repeating the test.

(2) Clarity test: Clarity test is performed to ensure that the parenteral products are free from foreign particles. Each parenteral preparation in its final containers is subjected individually to a visual inspection to check out the possibility of foreign particles.The contents of the containers are slowly inverted and rotated in front of black and white screen, for detection of light and dark coloured particle. The solution is examined for the presence of foreign particles. If any foreign matter is visible, the same container is rejected.

(3) Leakage test: This test is performed for ampoules that have been sealed by fusion to ensure that there should not be any leakage in them. Leakage test is performed in vacuum chamber, the ampoules are dipped in 1% solution of methylene blue in vacuum chamber and vacuum is applied. When vacuum is released the coloured solutions will enter the ampoule with defective sealing. The presence of dye in the ampoule confirms the leakage and hence rejected.

(4) Pyrogen testing: Pyrogen test is done to check the presence or absence of pyrogen in all aqueous parenteral preparations. Pyrogen is the metabolic byproducts of microorganism and is produced by all microorganisms.

Principle: The test involves the measurement of rise in body temperature of rabbit following intravenous injection of a sterile solution of a substance being examined. Rabbits are used to perform this test because their body temperatureincreases when pyrogen is introduced in to their bodies by parenteral route.Increase in body temperature of rabbit shows the presence of pyrogen in parenteral formulation.

(5) Assay: Assay is performed accordingto the method given in the monograph of that parenteral preparation in the pharmacopoeia. Assay is done to check the quantity of medicament present in the parenteral preparation.

Question Write a short note on:

(a) Ophthalmic products & explain eye drop in detail. Describe the handling of ophthalmic products.(b) Write short note on contact lens solution.

Ans:(a)Ophthalmic products: Ophthalmic products are the sterile products, meant for instillation into the eye in the space between the eye lids and the eye balls. These products must be sterile and are prepared under the same conditions and by the same methods as other parenteral preparations. Ophthalmic products include Eye-drops, Eye-lotions, Eye-ointments, Eye-suspensions and Contact lens solution

Eye drops: Eye drops are sterile aqueous or oily solutions or suspensions of drugs that are instilled into the eye with a dropper. They usually contain drugs having antiseptic, anti-inflammatory, mydriatic properties.

The eye drops are prepared in four stages. These stages are follows:

(1) Preparation of bactericidal and fungicidal vehicle: Aqueousor oily vehicle may support bacterial or fungal growth, so one of the following bactericide may be used to preserve the eye drops.

i) Phenyl mercuricnitrate/acetate - 0.002%

ii) Benzalkonium chloride -0.01%

iii) Chlorohexidine acetate -0.01%

(2) Preparation of solution of medicament and adjuvants: The medicament is dissolved in the aqueous vehicle containing suitable antimicrobial agent. The adjuvants are also dissolved in the vehicle at this stage to form a stable preparation adjuvant used in the preparation of eye drops are: -

i) Thickening agent: These are used to increase the viscosity of eye drops. It will also help to prolong the contact time of the drug in the eye e.g.Methyl cellulose polyethylene glycol.

ii) Buffers: Buffers are added to adjust and maintain the pH of the eye drops. The pH of eye drops is adjusted to maintain chemical stability to reduce discomforts e.g.boric acid, sodium citrate.

iii) Anti-oxidants: They are added in eye drops to provide protection from oxidation e.g. sodium metabisulphite, sodium thiosulphate.

iv)Wetting Agents: They are used for proper penetration of eye drops in to the cornea of the eye e.g.polysorbate 20 and polysorbate 80.

3) Clarification: The eye drops are clarified by passing the solution through membrane filter having pore size of 0.8um. The clarified solution is immediately transferred in to final containers.

4) Sterilization: The eye drops are sterilized by autoclaving or heating with bactericide at 98^0 to 100 ^{0}c for 30 minutes or filtration through bacteria proof filters.

Containers: The eye drops should be packed in neutral glass containers or in a suitable plastic container. The plastic squeeze bottles heaving rigid plastic cap and polythene friction plug that produces uniform drops.

Handling of Ophthalmic products: All ophthalmic products should be handled carefully as contaminated preparation can cause irritation, redness or damage to the eyes. The following precautions are required to be considered while using ophthalmic preparations:

1) In case of eye drops, if the dropper is separate always hold it with its tip down. Never touch the dropper surface.
2) Never use ophthalmic preparation that has changed color.
3) Never rinse the ophthalmic preparations.
4) Avoid the contamination during use and discard any unused part after expiration date.
5) Eye suspension should be shaken thoroughly before use in order to distribute the drug particles uniformly.
6) After instillation of medicament, do not close eyes tightly or blink more than usual as this may remove the medicine from the place where it is needed.

Ans: (b) Contact lens solutions: Wearer of contact lenses generally uses two solutions.

(1) Wetting solution: It is used primarily for treating the lenses before insertion. Due to hydrophobic nature of hard lenses are poorly wetted by lachrymal fluid of the eye. Hence, the contact lenses require moistening with a wetting agent to make the insertion easy and comfortable. The formulation of contact lens solution may contain a wetting agent, thickening agent, antimicrobial agent etc.

(2) Storage solution: It is used for overnight cleansing, soaking and storage. The contact lenses after its removal from the eye are cleaned with wetting solution and rinsed with purified water. Then they are stored in a storage solution to prevent dehydration.

Question. What is suspension? Write differences between flocculated suspension and non-flocculated suspension.

Ans: Suspensions: These are the biphasic liquid dosage form of medicament in which the finely divided solid particles ranging from 0.5 to 5.0 micron are dispersed in a liquid or semisolid vehicle.

Flocculated and non-flocculated suspensions: -The suspensions are said to be flocculated, when the individual particles are in contact with each other and form a network like structure.

In case of non flocculated suspensions, the individual particle exists as separate entity.

Difference between flocculated suspension and non-flocculated suspension:-

Flocculated suspension	**Non-flocculated suspension**
1. Particles form loose aggregates and form a network like structure.	1. Particles exist as separate entities.
2. The rate of sedimentation is high.	2. The rate of sedimentation is slow.
3.Sedimentis rapidly formed.	3. Sediment is slowly formed.
4. Sediment is easy to redisperse.	4. Sediment is difficult to redisperse.
5. Sediment is very loosely packed and does not form a hard cake.	5. Sediment is very closely packed and forms a hard cake.
6. Supernatent liquid is clear.	6. Supernatent liquid is not clear.

7. The floccules stick to the side of the bottle.	7. The floccules do not stick to the side of the bottle.
8. Suspension is not pleasing in appearance.	8. Suspension is pleasing in appearance.

✓ **Question. Define emulsion. Write its classification and causes of instability of emulsion.**

Ans:Emulsion: An emulsion is a biphasic liquid preparation containing two immiscible liquids, one of which is dispersed as globules in to the other.The liquid which is converted in to minute globules is called the dispersed phase and the liquid in which the globules are dispersed is called continuous phase.

To make two liquids miscible with each other by reducing interfacial tension between two immiscible liquids an agent is added to the preparation called emulsifying agent.

Types of an emulsion: There are two types of emulsions.

1) Oil in water type (o/w) (2) Water in oil type (w/o)

(1) **Oil in water type:** In this type of emulsion the oil is in dispersed phase where as water is in the continuous phase. This type of emulsion is preferred for internal use. The emulsifying agents used in this type of emulsions are gum acacia tragacanth methylcellulose and soaps formed from monovalent bases.(2) **Water in oil type:** In this type of emulsion the water is in the dispersed phase where as oil is in the continuous phase.This type of emulsion is preferred for external use. Emulsifying agents used in this type of emulsions are wool fat, resin etc.

Causes of instability of an emulsion:

The emulsion become unstable due to the changes usually occurs during the storage of an emulsion. The changes are:Cracking, Creaming and Phase Inversion

(1) **Cracking:** Cracking means the separation of two layer of disperse and continuous phase, due to the coalescence of disperse phase globules, which are difficult to redisperse by shaking cracking occurs due to following reasons: -

(i) By addition of emulsifying agent of opposite type.

(ii) By decomposition or precipitation of emulsifying agents.

(iii) By addition of a common solvent.

(iv) Changes in temperature.

(2) **Creaming:** Creaming may be defined as the upward movement of dispersed globules to from a thick layer at the surface of the emulsion.The rate of creaming depends on the number of factors, which can be explained by the following equation:

$$V = \frac{2r^2(d_1-d_2)\,g}{9\eta}$$

Where v = rate of creaming, r=radius of globule , d_1 =density of dispersed phase , d_2= density of continues phase ,g= gravitational constant , η =viscosity of the dispersion medium

(3) **Phase Inversion:** Phase inversion means the change of one type of emulsion in to the other type i.e. oil in water emulsion changes to water in oil type. It may be due to following reasons (i) by the addition of an electrolyte (ii) by changing the emulsifying agent.

Question. Write a short note on: (a) identification tests of type of emulsion (b) emulsifying agent.

Ans: 09 (a) Tests for identification of type of emulsion: The following tests are done to distinguish between o/w and w/o emulsion:

(1) Dilution test: Theemulsion is diluted with water. In case the emulsion remains stable after its dilution, it is o/w emulsion. The w/o emulsion breaks on its dilution with water but remain stable when diluted with oil.

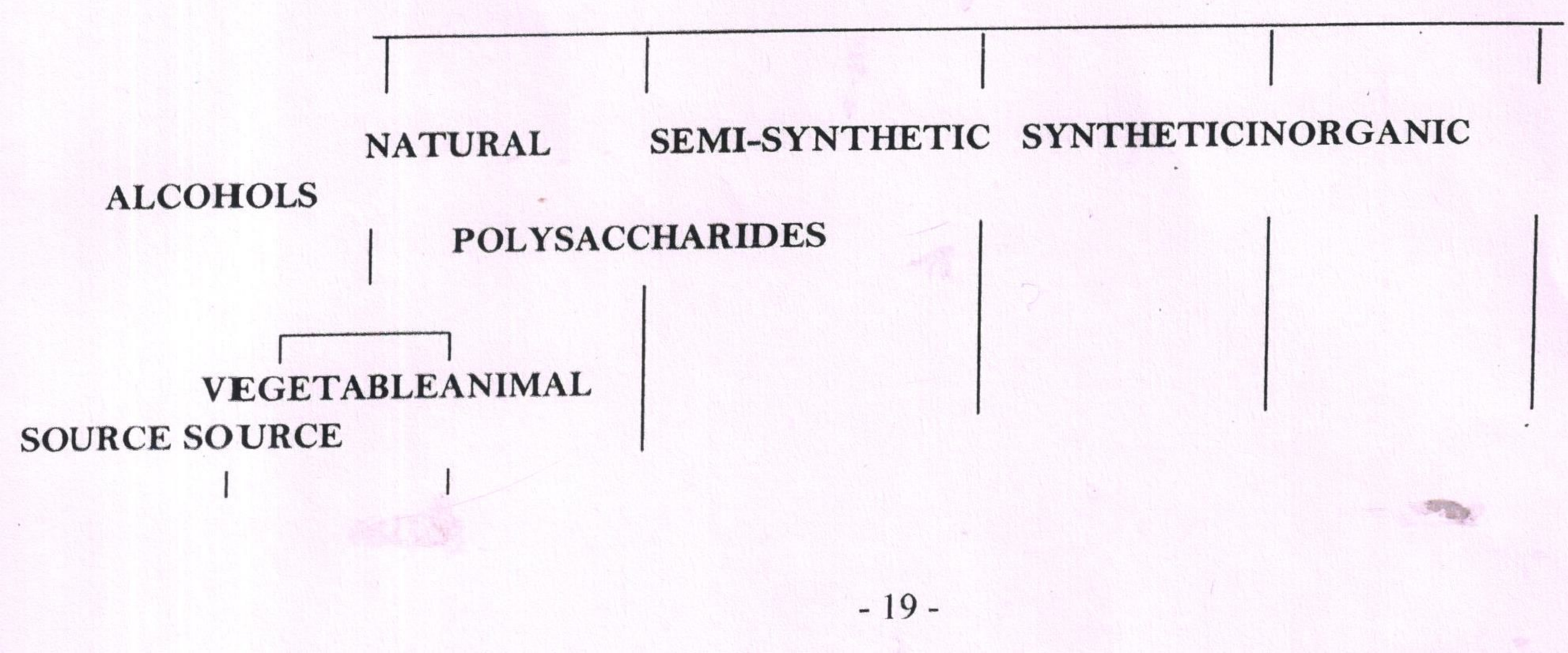
(2) Dye test: The scarlet red dye is mixed with the emulsion on a microscope slide and observed under microscope. If the disperse globules appear red and the continuous phase appearscolourless, the emulsion is o/w type. The reverse condition occurs in w/o type emulsion i.e. the disperse globules appear colourless in the red 'back ground'.

(3) Conductivity test: Water is a good conductor of electricity, whereas oil is non-conductor of electricity. The conductivity test can be performed by dipping a pair of electrodes connected through a low voltage bulb in the emulsion. If the bulb glows on passing the electric current, the emulsion is o/w type, because water is in the continuous phase. In case the bulb does not glow, the emulsion is w/o type, because oil is in the continuous phase.

(4) Fluorescence test: Certain fixed oils possess the physical property of fluorescing in the presence of ultraviolet radiation. On microscopic observation of emulsion under ultraviolet, the whole field fluorescence indicates that oil is present in continuous phase and droplets fluorescence indicates that oil is present in disperse phase.

Ans. (b)Emulsifying agent: The emulsifying agent reduces the interfacial tension between two phases i.e., oily phase and aqueous phase and thus makes them miscible with each other and from a stable emulsion. Emulsifying agentis also known as emulgents or emulsifiers. There are large numbers of emulsifying agent which are available to prepare a stable emulsion. Every emulsifying agent is given a number on HLB(Hydrophilic Lypophilic Balance) scale, which is divided into 18 units. Emulgents with higher numbers (8 - 18) indicates hydrophilic properties and produces o/w type emulsions. Emulgents with lower number (3-6) represent lipophilic properties and produces w/o type emulsions.

Emulsifying Agents



Gum acacia	Wool fat	Methyl Cellulose	Anionic	Milk of Magnesia
Carbowaxes				
Tragacanth	Egg Yolk	Sodium Carboxy	Cationic	Magnesium Oxide
Cholesterols				
Agar	Gelatin	Methyl Cellulose	Non-Ionic	Magnesium Trisillicate
Lecithins				
Pectin			Magnesium Aluminium-Silicate	
Starch				
Irish moss				Bentonite

Question No.10Defineointment and write the classification of ointment bases. Explain the various methods for the preparation of ointment.

Ans: Ointment: These are semi-solid preparation meant for external applications to the skin or mucous membrane.

Ointment Bases: The ointment base is that substance or part of an ointment, which serve as carrier or vehicle for the medicament.An ideal ointment base should possess the following properties.

1) It should be inert, odourless and smooth.
2) It should be compatible with skin.
3) It should be physically and chemically stable.
4) It should not produce irritation or sensitization of the skin.

Classification of ointment Bases:

(1) Oleaginous Bases: These bases consist of water insoluble, hydrocarbons, vegetableoil,animal's fats and waxes. The constituents of oleaginous bases are:

(i) Soft paraffin (ii) Hard paraffin (ii) Liquid Paraffin

Disadvantages

1) They are greasy.
2) They are sticky and are difficult to remove both from skin and clothing.
3) They retain body heat, which may produce an uncomfortable feeling of warmth.
4) They do not help in absorption of medicament.

(2) Absorption bases: These bases are generally anhydrous substances which have the property of absorbing considerable quantities of water but still retaining their ointment like consistency.

The absorption bases are of two types: (i) Non-emulsified bases (ii) Water in oil emulsions

The constituent of absorption bases is as follows (i) wool fat (ii) hydrous wool fat (iii) wool alcohol (iv) bees wax.

Advantages:

1) These bases are compatible with large number of medicament.
2) These bases can absorb a large quantity of water.
3) These bases are relatively heat stable.

(3) Emulsion Bases: These bases are semisolid and have a cream-like consistency. Both oil in water and water in oil type emulsions are used as ointment base.The oil in water type of emulsion bases can be easily removed from the skin.The water in oil type of bases is greasy and sticky.

(4) **Water-soluble bases:**These are commonly known as greaseless ointment bases. The water-solublebases consist of water-soluble ingredients such as polyethylene glycol polymerstragacanth, gelatin, pectin cellulose derivatives are used as water-soluble bases.

Methods of preparation of ointment: The ointment can be prepared by any one of the following methods:-

(1) Trituration method(2) Fusion method(3) Chemical reaction method (4) Emulsification method

(1) Trituration method: It is most commonly used method for preparation of ointments. This method is used when the base is soft and the medicament is insoluble in the base. The procedure of preparing the ointment by this method is as follows:

i) Finely powder the solid medicament \s.

ii) Weigh the required quantity of an ointment base. Triturate the solid medicaments with a small amount of base on ointment slab with the help of a stainless steel ointment spatula until a homogenous product isformed.

iii) Add remaining quantities of the base until the medicament is uniformly mixed with it. Incorporate anyliquid ingredient if present.

(2) Fusion method: It is generally used to prepare the non-medicated preparations and the ingredients used should be resistant of formulation are melted on water bath in a porcelain china dish because it does not react with the ingredients. After melting, cool the method mixture and stir it continuously with a glass rod and dispensed.

(3) Chemical Reaction method: Certain chemical reactions are involved in the preparation of several ointments.

Ointment containing free iodine: Iodine is slightly soluble in most of the fats and vegetables oils. But it is readily soluble in concentrated potassium iodide solution in water, due to formation of polyiodides. These polyiodides are readily soluble in water, alcohol and glycerin. There solutions may be incorporated with the absorption-type ointment base.

(4) Emulsification methods: In this method, the fats, oil and waxes are melted together on a water bath at a temp. 70°c. Solution of all of the heat stable water-soluble components is also heated almost at the same temperature as that of melted bases. The solution is slowly added to the melted bases with continuous stirring until the product cools down and semisolid mass (ointment) is prepared.

Question: Write the difference between: (a) Paste and ointment (b) Liniment and lotion

Ans: 11(a) Differences betweenpaste and ointment

Pastes	Ointments
1. They contain large amount of finely powdered solids such as starch, zinc oxide.	1. They contain medicaments which are generally dissolved, suspended emulsified in the Bases.
2. They are very thick and stiff.	2.They are soft semisolid preparation.
3. They are less greasy.	3.They are more greasy.
4. They are generally applied with a spatula or spread.	4. They are simply applied on the skin.
5. Paste contains a large amount of powder Which is porous in nature.	5. They are used for protection of lesions.

6. They form a protective coating to the area where it is applied.	6.They are used as protective or emollient for the skin.
7. They are less macerating than ointments.	7. They are more macerating in action.

Ans: 11(b) Difference between liniments and lotion.

Liniments	**Lotion**
1. Liniments are liquid or semi-liquid preparation.	1. Lotions are liquid preparation.
2. Most of them are to be applied with slight friction.	2. They are to be applied without friction.
3 These are used for application to the unbroken skin.	3. Lotions are used for application to mucous membrane and skin.
4. It may contain camphor.	4.It doesnot contain camphor.
5. It is applied on the skin directly.	5. It is applied on the skin with the help of cotton gauze.

Question:Explain the following:

(a) Deodorant (b) Dentifrices (c) Shampoo (d) Face powder (e) Enemas

Ans: 12(a) Deodorants: These are the cosmetic product which are used to reduce the under arm and body odour. These are used to inhibit the formation of bad odour in perspiration by suppressing the growth of bacteria or mask the unpleasant odour.

Antiperspirants differ from deodorants: Antiperspirants are cosmetic products, which inhibit the flow of perspiration. But deodorants used to inhibit the formation of bad odour.

Deodorants are available as clear liquids for direct, spray or aerosol application, powder sprays, sticks, creams and lotions. Deodorant may be antiseptic or may be can astringent depending on its use.

The materials used in formulation of deodorants are: Boric acid, Benzoic acid, aluminium acetate, aluminum chloride etc.As no one material possesses all properties for an effective deodorant hence it become necessary to utilize two or more substances to produce a desired product.

Qualities of good deodorant are:

1) It should be non-toxic.
2) It should be non-irritant to skin.
3) It should have pH between 4 to 4.5.
4) It should have no effect on fabrics.
5) It should possess sufficient astringent property.

Ans (b) Dentifrices: These are the preparations meant to be applied to the teeth with a toothbrush for the purpose of cleaning the accessible surface of the teeth.They are used in the following cases for:

1) Cleansing of teeth.
2) Polishing of tooth root.
3) Removal of stains from the teeth.
4) Reduce incidence of tooth decay.

5) Reduction of mouth odour.

Qualities of a good dentrifrice are:

1) It should be economical.
2) It should be non-toxic.
3) It should be properly sweetened and flavored.
4) It should give fresh and clean sensation.
5) It should be efficient in removing food substances.
6) It should clean the teeth.

Formulation: In the formulation of dentifrices the following ingredients are used:

Abrasives: These are also known as polishing agents and are used to remove debris and residual stains from the tooth surface without damaging it. Commonly used abrasives are: Calcium carbonate, Calcium phosphate.

Binders: These are used to keep the solids and liquids in the united form and to maintain the consistency e.g. Gum Tragacanth, methylcellulose.

Detergents: These are surface active agents which are used to enhance the action of abrasives e.g.Sodium lauryl sulphate.

Flavoring agents: These are added in the preparation to impart flavour to the preparation e.g. peppermint oil, cinnamon oil.

Humectants: These are used in toothpaste to retain moisture and will not allow the paste to become dry e.g.Glycerin. It is used in the concentration of 0.5to2%.

Preservatives: These are added to prevent the growth of bacteria in the toothpaste e.g.Methyl paraben& propyl paraben.

Sweetening Agents: These are agent added for sweet taste in the preparatione.g.Saccharin.

Therapeutic Agents: These are added only in medicated tooth paste in order to check dental disease and to remove bad smell e.g. antibiotics, fluorides etc.

Method of preparation:

1) The solid ingredients are weighed and mixed thoroughly in ascending order of their weights.
2) Flavoring agents are sprayed during mixing.
3) A mixture of binder and humectants is dispersed in a liquid containing saccharin and preservative.
4) It is then allowed to swell to form a homogenous gel. The homogenous gel is then pumped in to suitable mixing tank.
5) Add slowly the abrasive agent with agitation in order to form a smooth and uniform paste.
6) Flavouring agent and detergent is then added.
7) Finely packed in a collapsible tube.

Ans:(c) Shampoo: It may be defined as preparation containing surface-active agents that are used to remove dirt, grease and debris from the hair, scalp and other parts of body without affecting the natural structure of hair.

Qualities of an ideal shampoo are:

1) It should be capable of removing grease, dirt and skin debris from the hair and scalp.
2) It should be non toxic.
3) It should be non-irritant.
4) It should provide sufficient fragrance to the hair after its use.
5) It should be effective in small amount.
6) It should get easily removed by washing with water.
7) It should produce sufficient foam, both in hard and soft water.
8) It reduces the fluffing and smoothen the hair shafts. It makes the hair soft and shiny.

Types of shampoos: The shampoos are available in market indifferent forms which are as under:
(1) Medicated antidandruff shampoos (2) Powder shampoos (3) Clear liquid shampoos (4) Gel shampoos
(5) Soap shampoos (6) Cream or paste shampoos (7) Lotion shampoos (8) Baby shampoos (9) Aerosol shampoos

Formulation of shampoos:

1) Conditioning agents: These are used in lubricating the hair and improve the texture of the hair. It makes the hair soft and shiny e.g. lanolin and its derivatives, glycerin and propylene glycol are used as hair conditioners.

2) Thickening agents: These are used to increase the viscosity of the shampoos and provide the desired consistency to the preparation e.g.Methyl cellulose and sodium alginate.

3) Solubilizing agents: These are used to solubilizing poorly soluble substances so as to get a clear shampoo e.g.ethyl alcohol, glycerol, propylene glycol.

4) Opacifying agents: These are used to make the shampoo opaque e.g. glycol, cetyl alcohol.

5) Preservatives: These are required to preserve the preparation against bacteria by adding preservatives e.g.methyl paraben and propyl paraben.

Ans: (d) Face powder: Face powder is cosmetic preparation meant for improvement of overall attractiveness of the face. It is applied on the face by means of a powder puff. It provides a visual covering to skin and imparts smooth finish to it. There is no single ingredient which possesses all the qualities of a ideal face powder, a blend of ingredients are used. Face powders generally contain talcum powder, kaolin, precipitated chalk, magnesium carbonate, zinc oxide, titanium dioxide, starch, colour and perfumes.

There are three types of face powder:

1) Light type: These are used for dry skin. These powders contain large quantity of talc.
2) Medium type: These are used for normal or moderately oily skin. These powders contain lesser quantity of talc but compensated by zinc oxide.
3) Heavy type: They have more covering power and are used for very oily skin. These powders contain lesser quantity of talc but higher quantity of zinc oxide.

Qualities of a good face powder: An ideal face powder should have the following properties:

1) It should be very fine and should not have any gritty particles.
2) It should be non toxic.
3) It should be non irritant to the skin.
4) It should be look natural.
5) It should not remove from skin immediately after its application.
6) It should be stable both physically and chemically.
7) It should have good absorbing properties.
8) Its ingredients should be evenly distributed.

General method of preparation: All the solid ingredients are powdered and pass through sieve no. 120 and mix them thoroughly. Incorporate the required quantity of perfume.

Ans:(e)Enemas: Enemas are solutions, suspension or oil in water emulsion that are introduced into the rectum for cleansing, therapeutic or diagnostic purposes. Evacuation enemas are rectal injections employed to evacuate the bowel in constipation or before an operation e.g. enemas of soap, Sodium phosphate enemas, olive and archis oil enemas. Retention enemas are usually employed to influence the general system by absorption or to affect locally the seat of disease. Large volume enemas are administered from douche can and should be warmed to body temperature before use. Small volume

enemas are available in polythene or polyvinyl chloride bags sealed to a rectal nozzle and these are more convenient for personal administration since the patient has simply to insert the nozzle and squeeze the bag.

Question: Define suppositories. Write its advantages and disadvantages and suppositories bases in detail. What are requirements of ideal suppositories base?

Ans: Suppositories: These are solid dosage form of medicament for insertion in to body cavities other than mouth. They may be inserted in to rectum, vagina or nasal cavity.

Advantages:

1) These can be easily administered to children, old persons and to unconscious patients who cannot swallow the drug easily.
2) These are inserted in to body cavity to produce local effect of the medicament.
3) These are inserted in to the rectum to exert a direct and rapid action on the rectum.
4) These are inserted in to the rectum to promote evacuation of the bowel.
5) Suppositories are unit dosage form of drugs.
6) Easy mode of administration for those drugs which irritate GIT.

Disadvantages:

1) The irritant drugs cannot be administered by this route.
2) Suppositories cause pain to the patient, when a drug is administered by inserting a suppository in to a body cavity.
3) They are required to be stored at freezed condition; otherwise their shapes may be distorted.
4) There is leaking problem of material through suppositories.

Suppository bases: The various type suppositories bases are used to prepare suppositories, so that they can retain its shape and firmness during storage and administration. An ideal suppository bases should have the following properties:

1) It should melt at body temperature.
2) It should keep its shape when being handled.
3) It should release the medicament readily.
4) It should be compatible with large no. ofdrugs.
5) It should be good in appearance.

Classification of suppository bases:

Suppository bases can be broadly classified three categories:

1) Fatty bases/ oleaginous bases
2) Water-soluble and water miscible bases
3) Emulsifying bases

(1) Fatty Bases/ oleaginous bases:

a) Theobroma oil: It is yellowish white solid obtained from crushed and roasted seeds of theobroma cocoa. It is considered a most suitable base for rectal suppositories but not suitable for nasal and urethral boogies.

Disadvantages:

This base has most of the qualities of an ideal suppository base but it has a number of disadvantages:

1) It shows the phenomenon of polymorphism.
2) It becomes rancid and melts in warm weather.
3) It is relatively costly.
4) It is immiscible with body fluids.

5) It has a tendency to stick to the sides of the mould when solidified.

b) Emulsified theobroma oil: This may be used as a base when large quantities of aqueous solutions are to be incorporated.

c) Hydrogenated oils: These are obtained by hydrogenation of various vegetable oils such as cottonseed oil, coconut oil. It is used as a substitute of theobroma oil because it has number of advantages over theobroma oil. These are:

i) They are resistant to oxidation.

ii) Lubrication of the mould is not required.

iii) Over heating does not affect the solidifying point.

iv) They produce colorless, odourless suppositories.

(2)Water soluble and water miscible bases:

a) Glycero-gelatin base: It is a mixture of glycerin's and water which is made stiff by the addition of gelatin. To avoid incompatible reactions, any one of the two type's gelatin are used as suppository base.

Type A or pharmagel A: It acidic in nature and used for acidic drugs having iso-electric point (7-9).

Type B or pharmagel B: It is alkaline in nature and used for alkaline drugs having iso-electric point (4.7to5.0).

Disadvantages:

1) The solution time depends on the content and quality of gelatin used.
2) Gelatin is incompatible with many drugs such as tannic acid, ferric chloride.
3) There are more chances of bacterial and mould growth.
4) They are more difficult to prepare and handle.

b) Soap-glycerin suppositories: In glycerol-gelatin base, the gelatin is replaced with either curd soap or sodium stearate, which makes the base sufficiently hard to prepare good quality of suppositories.

c) Polyethylene glycols: Polyethylene glycol polymers are known as macrogols. The macrogols having molecular weight less than 1000 are liquids and those with mol.wt. higher than are wax like solids.

Advantages:

1) They are chemically stable and non-irritant.
2) They do not stick to the side of mould.
3) They do not allow the bacterial or mould growth to take place.
4) They have clean and smooth appearance.

Disadvantages:

1) They are hygroscopic and require special storage condition to store them.
2) They are incompatible with certain drugs like tannins.

(3) Emulsifying bases: These are synthetic bases and a number of synthetic bases are available in the market. Some of these are (i)Witepsol (ii)Massa estarinum (iii) Massuppol

Advantages:

1) They solidify rapidly.
2) They are non-irritant.
3) The lubrication of mould is not required.
4) They can absorb fairly large amount of water or aqueous liquids.
5) Overheating does not affect the physical properties of base.
6) They are less liable to get rancid.

Disadvantages:

1) They should be cooled rapidly in a refrigerator because they become brittle.
2) They are not very viscous on melting, so the medicaments incorporated with the base settle down rapidly.

An ideal suppositories base should have following properties:

1) It should melt at body temperature.
2) It should keep its shape when being handled.
3) It should release the medicament readily.
4) It should be non toxic and non irritant to the mucous membrane.
5) It should be stable on storage.
6) It should be compatible with large no. of drugs.
7) It should be easily moulded and should not adhere to the mould.
8) It should be good in appearance.

Question : Define the following terms:-
(a) Syrup (b) Elixirs (c) Linctuses (d) Mouthwash (e) Jellies (f) Displacement Value (g) Proof spirit (h) Cream (i) Gargle (j) Inhalation

Ans:(a)Syrup: Syrup is concentrated or nearly saturated solution of sucrose in purified water. The concentration of sugar is 66.7% w/w. the syrups are sweet viscous preparations. The syrups containing medicinal substances are called "medicated syrups" and those containing aromatic or flavoured substances are known as "flavoured syrups".

Ans: (b) Elixirs: These are clear, sweetened, aromatic, hydro alcoholic liquids intended for oral use. Ingredients of elixirs are ethyl alcohol, water, glycerin or propylene glycol, flavouring agent, colouring agent and some suitable preservative. The medicated elixirs usually contain a potent drug such as, antibiotics, antihistamines or sedatives.

Ans: (c) Linctuses: Linctuses are viscous, liquid and oral preparations that are generally prescribed for the relief of cough. They contain medicaments which have demulcent, sedative or expectorant action. Linctuses should be taken in small doses, sopped (soaked) and swallowed slowly without diluting it with water in order to have the maximum and prolonged effect of medicaments.

Ans: (d) Mouthwash: Mouthwashes are aqueous solutions with a pleasant taste and odour used to make clean and deodorize the buccal cavity. Generally, they contain antibacterial agents, alcohol, glycerin, sweetening agents, flavouring agents and colouring agents.

Ans: (e) Jellies: These are thin transparent or translucent non- greasy semisolid preparations meant for external application to the skin.They are chiefly used on mucous membranes for their lubricating, antiseptic or spermicidal purposes e.g. Vaginal jellies and contraceptive jellies.

Ans: (f)Displacement value: The quantity of the drug which displaces one part of the base e.g. the displacement value of aminophylline is 1.5.

Ans: (g) Proof spirit: Proof spirit is that mixture of alcohol and water which at $51^{o}F$ weighs $12/13^{th}$ of an equal volume of water. So proof spirit is any alcoholic solution which contains 57.1% v/v alcohol is said to be 100 proof. Any strength above proof strength is expressed as over proof (O.P.) and below proof strength is expressed as under proof (U.P.).

Ans: (h) Creams: These are viscous semi-solid emulsions which are meant for external use. The creams are of two types, aqueous and oily creams. In case of aqueous creams, the emulsions are oil-in-water type and in case of oily creams, emulsions are water-in-oil type.

Ans: (i)Gargles: Gargles are aqueous solution used to prevent or treat throat infections. They are usually in concentrated form with direction for dilution with warm water before use. They are brought into intimate contact with the mucous membrane of the throat and allowed to remain in contact for few seconds.

Ans: (j) Inhalation: These are liquid preparations containing volatile substances and are used to relieve congestion and inflammation of the respiratory tract. The inhalation containing the volatile substances which are volatile at room temperature may be placed on an absorbent pad or handkerchief to inhale therefrom.

Question (a) What are requirements of aseptic area?
(b) Explain dialysis fluids.
(c) Write method of preparation of effervescent granules.
(d) Flocculating agents.

Ans: (a)Aseptic Area: From preparation area the parenteral formulation will be transferred to aseptic filling area. The requirements to maintain the aseptic area are following:

1)The entry of personnel into aseptic area should be through an air lock.

2) To maintain sterility, specially trained persons should be selected to work. They are required to wear sterile clothes and should be subjected to physical examination at regular intervals to ensure that they are not carrier of any infectious disease.

3) There should be minimum movement in the aseptic area.

4) Ceilings, walls and floor of aspetic area should be sealed and painted, so that they can be washed or treated with aseptic solution or sprayed before use.

5) Stainless steel counters should be fitted on walls.

6) Mechanical equipment that will come in contact with parenteral products should be separated so that they can be sterilized.

7) The air in the aseptic area should be free from fibres, dust and micro-organism.

Ans: (b) Dialysis fluids: Dialysis is a process by which the substances are separated from one another due to their difference in diffusibility through membranes. The fluids use in dialysis is known as dialysis fluids. In case of renal failure, transplantation of kidney or certain case of poisoning, dialysis is needed to save the patient.

Ans: (c) Effervescent granules: Effervescent granules are the specially prepared solid dosage form of medicament, meant for internal use. They contain a medicament mixed with citric acid, tartaric acid and sodium bicarbonate. Before administration, the desired quantity is dissolved in water, the acid and bicarbonate react together producing effervescence.

Method of preparation of effervescent granules:

(1) Heat method (2) Wet method

(1) Heat method: A large porcelain or stainless steel evaporating dish is placed over the boiling water bath. The dish must be sufficiently hot before transferring the powder into it, to ensure liberation of the water of crystallization from citric acid. If heating of the dish is delayed, the powder which is

added to it, will heat up slowly and the liberated water of crystallization will go on evaporating simultaneously.

$3NaHCO_3 + C_6H_8O_7.H_2O \rightarrow C_6H_5Na_3O_7 + 3CO_2 + H_2O$

Sodium Bicarbonate — Citric acid — Sodium citrate

(2) Wet method: In this method, the mixed ingredients are moistened with a non aqueous liquid (e.g. alcohol) to prepare a coherent mass which is then passed through a number 8 sieve and dried in an oven at a temperature not exceeding 60°C. The dried granules are again passed through the sieve to break the lumps which may be formed during drying. The dried granules are packed in air tight container.

Ans: (d)Flocculating agent: - In suspension, the solid particles are well disersed in dispersion medium. The dispersion can be improved by adding a surfactant or protective colloid which acts as flocculating agent. The flocculating agent acts by reducing the surface tension and thereby improving the dispersion of solids and minimize flocculation e.g. sodium lauryl sulphate, tweens, spans, and carbowaxes etc. The flocculating agents may be electrolytes, polymers or surfactants. Ionic as well as non-ionic surfactant may also bring about flocculation of particles. Ionic surfactants may act by neutralizing the surface charges while non-ionic surfactants may get adsorbed and help in formation of bridges.

Question.(a) What are mixtures? Describe the formulation of mixtures.

(b) What is isotonic solution & write the general principles for adjustment of isotonicity.

Ans:(a) Mixture:A mixture is a liquid preparation meant for oral administration in which medicament or medicaments are dissolved or suspended in a suitable vehicle.

Formulation of Mixture:

1) Vehicles: The vehicle commonly used for the preparation of mixture are:

a) Water: Purified water should be used for the preparation of mixtures. The mixtures should never be prepared with potable water because it contains volatile and nonvolatile impurities which may produce undesirable changes in the medicines dissolved in it.

b) Aromatic water: These are saturated solution of volatile oil and volatile substance in purified water. Aromatic water is mainly used for its flavoring properties e.g. camphor water, chloroform water, peppermint water and cinnamon water.

c) Medicated vehicle: Sometimes a vehicle with definite therapeutic activity is prescribed e.g. compound gentian infusion (bitter that stimulate appetite) orange peel infusion (bitter and carminative).

2) Adjuvant: The following adjuvants are generally used to improve the stability, colour and flavour of the mixtures:

a) Chemical stabilizers: Certain chemicals having antioxidants or reducing properties are used to improve the chemical stability of the mixtures e.g. ascorbic acid, sodium metabisulphite.

b) Coloring agents: No special coloring agents are added but many mixtures contain coloured medicaments.

c) Flavoring agents: The following flavoring agents are commonly used in mixtures:-

i)Aromatic water such as anise water.

ii) Syrup and glycerol for sweetening children's preparation.

iii) Liquid extract of liquorices to mask the saline taste of certain mixtures.

d) **Preservatives:**Diluted vegetable extract and flavoring agents are the source of growth of bacteriaand fungi in mixture e.g.chloroform, benzoic acid.

Ans: (b) Isotonic solution: Solution having the same osmotic pressure are called iso-osmotic it is not necessary that solutions which are iso-osmotic will also be isotonic. If a red blood cell is in contact with a solution that has the same osmotic pressure as that of blood plasma, the cell wall will neither swell nor shrink i.e. it will retain its tone and therefore the solution is said to be "isotonic".

The solutions which are not having the same osmotic pressure are called 'paratonic'. Whole comparing a solution with the one of known osmotic pressure, those which exert a greater pressure are called 'Hypertonic' and those with a lower pressure are called 'hypotonic'.

A solution containing 0.9% of sodium chloride is, therefore, practically isotonic with blood plasma and is regarded as standard. A solution containing more than 0.9% sodium chloride is called 'hypertonic' and one containing less than that is called 'hypotonic'.

General principles for adjustment to isotonicity:

1) Solutions for i/v injection: Approximate isotonicity is always desirable.

2) Solutions for s/c injection: Isotonicity is needed but it is not essential, since they are injected into fatty tissues and not in blood stream.

3) Solutions for i/m injection: The aqueous solutions should be slightly hypertonic to promote rapid absorption.

4) Solutions for intra-cutaneous injection: The parenteral preparations which are meant for diagnostic purpose should be isotonic in order to avoid the false reaction.

5) Solutions for intra-thecal injection: These must be isotonic, because the volume of C.S.F. (cerebro spinal fluid) is only 60 to 80 ml. hence; a small volume of a paratonic solution will disturb the osmotic pressure and may cause vomiting and other side-effects.

6) Solutions used for nasal drops: Isotonicity is needed, since paratonic solution may cause irritation.

7) Solutions used as eye drops and eye lotion: Eye lotion should be isotonic with lachrymal secretion, since a large volume is brought in contact with the eye. Eye drops may not be isotonic, because only a small volume is used which quickly get diluted by the lachrymal secretion.