

## Pharmaceutical Dosage Form

### POWDERS

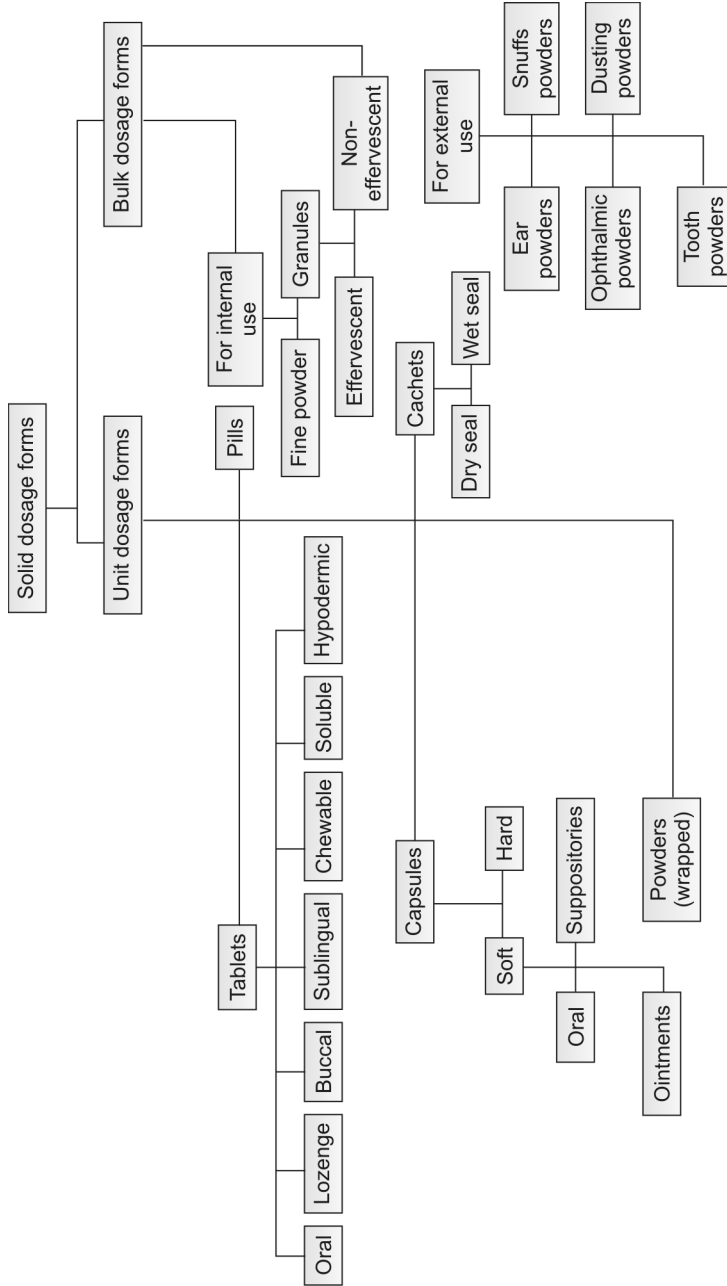
The solid dosage forms are available mostly in unit dosage forms (consisting of doses which are taken by numbers), such as tablets, capsules, pills, cachets or powders. When drugs are to be administered orally in dry state, tablets and capsules are the most convenient dosage form. They are effective and patients have no problem in their handling and administration. Some solids are packed and supplied in bulk powder. The bulk powders meant for external use are dusting powders, insufflations, snuffs and tooth powders. The bulk powders meant for internal use are supplied either as granules or fine powder (Flowchart 8.1).

A pharmaceutical powder is a mixture of finely divided drug and/or chemicals in dry form. These are solid dosage form of medicament which are meant for internal and external use. They are available in crystalline or amorphous form. The particle size of powder plays an important role in physical, chemical and biological properties of the dosage forms. There is a relationship between particle size of powder and dissolution, absorption and therapeutic efficacy of drugs.

### Advantages

1. Powders are one of the oldest dosage form and are used both internally and externally.
2. Powders are more stable than liquid dosage form.

Flowchart 8.1: Various solid dosage form



3. Free flow
4. Good spreadability and covering capability
5. Adsorption and absorption capacity
6. Very fine state of subdivision
7. Capacity to protect the skin against irritation caused by friction, moisture or chemical irritants.
8. Flow properties of powders
9. Angle of repose
10. Bulk density
11. Carr's index

$$\text{Carr's index} = \frac{\text{Tapped density} - \text{Poured density}}{\text{Tapped density}}$$

12. Hausner ratio

$$\text{Hausner ratio} = \frac{\text{Tapped density}}{\text{Poured density}}$$

### **Classification**

Powders are classified as:

1. Bulk powder for external use
2. Bulk powders for internal use
3. Simple and compound powders
4. Effervescent granules
5. Cachets.

#### **1. Bulk Powder for External Use**

External bulk powders contain nonpotent substances for external applications. These powders are dispensed in glass, plastic wide mouth bottles and also in cardboard with specific method of application. Bulk powders for external use are of following types:

- a. Dusting powders
- b. Snuffs
- c. Douche powders
- d. Dental powders
- e. Insufflation.

**Dusting powders:** Dusting powders usually contain substances, such as zinc oxide, starch and boric acid or natural mineral substances, such as kaolin or talc.

Talc may be contaminated with pathogenic microorganisms, such as clostridium tetani, etc. and hence it should be sterilized by dry heat. Dusting powders should not be applied to broken skin. If desired, powders should be micronized or passed through a sieve #80 or 100. Dusting powders should preferably be dispensed in sifter-top containers. Such containers provide the protection from air, moisture and contamination as well as convenience of application. Currently some foot powders and talcum powders have been marketed as pressure aerosols.

Dusting powders are employed chiefly as lubricants, protectives, absorbents, antiseptics, antipruritics, astringents and antiperspirants.

Rx	
Zinc oxide	200 parts
Salicylic acid	20 parts
Starch powder	780 parts (qs)

**Snuffs:** These are finely divided solid dosage forms of medicaments dispensed in flat metal boxes with hinged lid. These powders are inhaled into nostrils for decongestion, antiseptic, and bronchodilator action.

**Douche powders:** These powders are intended to be used as antiseptics or cleansing agents into the body cavity; most commonly for vaginal use, although they may be formulated for nasal, otic or ophthalmic use also. As douche powder formation often includes aromatic oils, it becomes necessary to pass them through a # 40 or 60 sieve to eliminate agglomeration and to ensure complete mixing. They can be dispensed either in wide mouth glass bottles or in powder boxes.

Rx	
Zinc sulfate	2.5 g
Magnesium sulfate	200 g
Boric acid	30 g
Oil of lemon	0.2 g
Water	1000 mL (qs)

**Dental powders:** Dental powders are meant for cleaning the teeth. Dental powders contain detergents, abrasives, antiseptics and coloring and flavoring agents incorporated in a suitable base. Generally the base is calcium carbonate. The detergent is in the form of soap and finely powdered pumice stone provides abrasive action. Essential oils, if present in small quantity, are easily absorbed by calcium carbonate and pumice. This makes the uniform distribution of the oil difficult.

**Insufflation:** They are a class of powders meant for application to body cavities, e.g. ear, nose, vagina, etc. The powder has to be extremely fine and must find an entry to the cavity deep enough to bring about its action at the site. It is delivered to the effected part in a stream with the help of the device called an insufflators, which blow the powder to the site. Some of the insufflations contain volatile liquid ingredients which may require uniform distribution in the powder. Active volatile liquid present in small portion should not be removed by evaporation but only incorporated by trituration in the powder. The pharmaceutical industry packages the insufflations in pressurized form, i.e. aerosols. Aerosols contain the medication in a stout container with a suitable valve, the delivery of the powder being accomplished by a liquefied or compressed gas propellant of a very low boiling point. On pressing the actuator of the valve the propellant delivers the medication in a stream.

## 2. Bulk Powder for Internal Use

Bulk powders contain many doses in a wide-mouth container that is suitable to remove the powder by teaspoon. The non-potent substances are used in bulk powder form, such as antacids, laxative, purgative, etc.

Rx	
Rhubarb powder	250 g
Light magnesium carbonate	325 g
Heavy magnesium carbonates	325 g
Ginger powder	100 g
Make a powder	

bicarbonate and citric acid are taken in equimolecular proportion and mixed to make granules, the quantity of water of crystallization liberated from the citric acid is large enough to make the mass wet and carbon dioxide may be liberated during the preparation itself. If one tries to substitute citric acid by tartaric acid, which contains no water of crystallization; it may not be possible to form a mass necessary to granulation. Therefore, both citric and tartaric acid are taken in suitable proportion leaving a little acid in surplus than the quantity required to neutralize sodium bicarbonate. This surplus is necessary to give the final preparation an acidic taste that is more palatable. There is a certain loss in weight of such a preparation due to loss of water in drying the granules and partial loss of carbon dioxide due to its release during preparation. Heating is done on a water bath keeping all the ingredients mixed in a porcelain dish. Gentle application of heat liberates the water of crystallization from citric acid and the mass tends to be coherent. The coherent mass is transferred from the porcelain dish and the granules are dried in an oven taking care to regulate the temperature which should be generally kept below 253 K. If necessary, the dry granules are passed through a sieve of appropriate size to break larger granules, which result due to sticking of the sieved wet granules.

### 5. Cachets

Cachet as a unit dosage form was very popular sometime back. Presently cachets are seldom used and have been replaced by capsules. Cachets like capsules, can be easily filled and sealed at the dispensing counter. This dosage form holds larger quantity of the medication as compared to capsules. Since the cachets are made of flour and water they are easily damaged in handling. Further this dosage form offers little protection against light and moisture. Due to its size and shape a cachet is difficult to swallow. The process of filling is similar to that of capsules. The drug is placed in one of the two halves of the cachets; the upper half is then placed over it and pressed with the help of a suitable device.

## LIQUID DOSAGE FORM

Liquid dosage forms commonly used in pharmaceutical practice are either monophasic or biphasic. Monophasic systems are characterized by the presence of a single homogeneous phase, e.g. solution, mixtures, elixirs, tinctures, syrups, ear drop, nasal drops, etc. whereas biphasic liquid dosage forms consist of two distinct phases, e.g. emulsions and suspensions. Liquid preparations may be broadly classified under two categories (Flowchart 8.2).

### 1. Internal liquid preparation

#### A. Monophasic liquid preparations

- |            |              |
|------------|--------------|
| a. Syrups  | c. Solutions |
| b. Elixirs | d. Linctuses |

#### B. Biphasic liquid preparations

- |                         |             |
|-------------------------|-------------|
| a. Suspension (mixture) | b. Emulsion |
|-------------------------|-------------|

### 2. External liquid preparations

#### A. Topical (Applied on the skin)

- |              |                  |
|--------------|------------------|
| a. Lotions   | c. Throat paints |
| b. Liniments | d. Collodions    |

#### B. Instilled into body cavities

- |              |                 |
|--------------|-----------------|
| a. Douches   | d. Nasal drops  |
| b. Enemas    | e. Nasal sprays |
| c. Ear drops | f. Inhalations  |

#### C. Used in mouth

- |            |                |
|------------|----------------|
| a. Gargles | b. Mouthwashes |
|------------|----------------|

## Solutions

A solution is a homogeneous one-phase system consisting of two or more components. Solvent is the phase in which the dispersion occur and solute is that components which is dispersed is small ions or molecules in the solvent. In general, solvent part is grater than solute in the solution except a few preparations, e.g., Syrup it contains 66.7% w/w of sucrose as solute and 33.3% of water as the solvent.

## Advantages

- ✦ Easy to swallow than solid dosage form like tablet and capsules.

- ✦ Drug in solution form is immediately available for absorption.
- ✦ A solution is a homogeneous system and therefore the drug remains uniformly distributed throughout the preparation.
- ✦ Suitable for drugs that can irritate and damage the gastric mucosa, if localized in a specific area. The irritation is reduced by administration in solution form.

### ***Disadvantages***

- ✦ Inconvenient to transport and store because they are bulky.
- ✦ Whole product is lost immediately if any breakage in the container.
- ✦ The stability of most of substances in aqueous solution is less than solid dosage form .
- ✦ Self life of solution is shorter than solid preparation
- ✦ Suitable media for the microbial contamination and may therefore require suitable preservatives.
- ✦ Dose inaccuracy compared to solid dosage form .
- ✦ Bitter unpleasant substance are not suitable for solutions and need sweetening and flavoring agent to make them more palatable.

### ***Method of Preparation***

Following additives are generally required for preparation of solution.

- ✦ **Solvents:** (a) Aqueous (b) Non-aqueous (fixed oil, alcohol, polyhydric alcohol, dimethyl-sulfoxide, ethyl ether, liquid paraffin, etc.
- ✦ **Buffers:** Carbonates, citrates, gluconates, lactates, phosphate, tartrate, borates, etc.
- ✦ **Colors:** water soluble dye amaranth.
- ✦ Density modifiers.
- ✦ Flavors and perfumes.
- ✦ **Taste enhancer.**
  - a. Salty: Apricot, butterscotch, liquorice, peach, vanilla.
  - b. Bitter: Anise, chocolate, mint, wild cherry.
  - c. Sweet: Vanilla fruits.
  - d. Sour: Citrus fruits, raspberry.
- ✦ Preservatives.
- ✦ Antioxidants and reducing agents.



**Container**

Narrow mouth, screw capped, colorless plain bottle and amber colored bottle for heat sensitive drugs.

**Example:** Prepare and dispense cresol with soap solution

Rx	
Cresol	500 mL
Vegetable oil	180 g
Potassium hydroxide	42 g
Purified water, sufficient to produce	1000 mL

*Method of dispensing:* Dissolve potassium hydroxide in purified water (50%), add vegetable oil and heat on a water-bath and mix thoroughly. Continue heating until a small portion dissolved in water without separation of oily drops. Add cresol and mix thoroughly with sufficient purified water.

**Example:** Prepare and dispense aqueous iodine solution (Lugol's solution)

Rx	
Iodine	50 g
Potassium iodide	100 g
Purified water	1000 mL

*Method of dispensing:* Dissolve potassium iodide and iodine in purified water and mix thoroughly. Finally make up the volume with the help of purified water.

**Example:** Prepare and dispense strong iodine solution

Rx	
Iodine	100 g
Potassium iodide	60 g
Purified water	100 mL
Ethanol, sufficient to produce	1000 mL

*Method of dispensing:* Dissolve potassium iodide and iodine in purified water and add sufficient ethanol to make up the volume.

### Classification

Mixtures are classified into:

1. Simple mixture containing soluble substances
2. Mixtures containing diffusible solids
3. Mixtures containing indiffusible solids
4. Mixtures containing precipitates forming liquids
5. Mixtures containing slightly soluble liquids

1. **Simple mixtures containing soluble substances:** Simple mixtures contains only soluble ingredients, e.g., carminative mixture, diarrhea mixture and expectorant mixture.

*Example:* Dispense 900 mL of the mixture.

Rx	
Potassium bromide	40 g
Tincture nux vomica	40 mL
Chloroform water	900 mL (qs)
Prepare a mixture	

2. **Mixtures containing diffusible solids:** Diffusible solids are those which do not dissolve in water, but may be mixed there with so that, upon shaking, the powder drug is evenly diffused throughout the liquid for sufficient time to ensure uniform distribution in each dose. The commonly used diffusible drugs are bismuth carbonate, bismuth subnitrate, magnesium carbonate (heavy or light), magnesium oxide (heavy or light), quinine sulfate, light kaolin, etc.

*Example:* Dispense the following mixture.

Rx	
Magnesium sulfate	150 g
Magnesium carbonate	20 g
Peppermint water	900 mL (qs)
Prepare a mixture	

3. **Mixtures containing indiffusible solids:** Indiffusible solids are those solids which are not soluble in water and do not remain uniformly distributed in the vehicle for sufficiently long time. Therefore, to suspend the drug, suspending agents are added. The commonly used indiffusible drugs in mixtures form are acetyl salicylic

acid, quinine salicylate, calomel, phenacetin, benzoic acid, phenobarbitone prepared chalk, etc.

The suspending agents which are commonly used in mixtures containing indiffusible solids are:

- a. Compound tragacanth powder: In the proportion of 2 g/100 mL (10 grains-ounce) of the mixture.
- b. Tragacanth mucilage: In the proportion of 1/4th or the volume of the mixture.

**Mixture containing precipitate forming liquids:** Certain liquid preparation 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 rediffuse upon shaking. To prevent this compound tragacanth powder or tragacanth mucilage are used (Tables 8.2 and 8.3).

**Table 8.2:** Comparison between mixture and pure compound

<i>Mixtures</i>	<i>Pure compounds</i>
A mixture can be physically separated into pure compounds or elements.	A pure compound has a constant composition with fixed ratios of elements.
Mixtures exhibit physical properties which are not fixed. For example, mixture of alcohol and water boils over a range of temperatures	Physical properties, such as boiling point or melting point of pure substances are fixed. For example, pure water boils at 100°C

## SYRUPS

Syrups are concentrated oral solutions of sugar or nearly saturated solutions of sucrose in water or other aqueous liquids. Syrups containing 85% w/v or 66.7% w/w sucrose will retard the growth of microorganisms. Dilute solution of sucrose provides an excellent nutritional media for the growth of yeast, moulds and other microorganisms. When heat is employed for the preparation of syrups, a small portion of sucrose changes to dextrose and levulose. This phenomenon is called as inversion. Sucrose solution is optically active and rotates polarized light to right while on heating optical activity decreases rotated the light to left due to formation of other compounds (dextrose ad

### Methods of Preparation

Preparation of syrup depends on the physical and chemical characteristics of the substance employed for its preparation of syrups.

1. **Agitation without heat:** This method is used for the preparation of syrups containing volatile substances. In this process active medicament is added in solution and mixed in a glass-stopper bottle. For preparing large quantities, glass lined tank with mechanical agitators is employed. This method is used for the preparation of wide variety of syrups. Cough syrups are commonly prepared by this process, e.g. codeine syrup, ephedrine sulfate syrup, etc.
2. **Solution with heat:** This process is generally preferred as it is simple and less time consuming method, particularly if the constituents are not affected by heat and are non-volatile in nature. In this process sucrose is added in the aqueous solution and heated till the sucrose is dissolved completely. Adding remaining amount of distilled water makes up volume of the solution. If the syrups containing any substances which are coagulated, it can be separated subsequently by straining. Excessive heating of syrup is not suitable because more inversion of sucrose occurs with the increase in temperature. Syrups cannot be sterilized in autoclave without caramelization. This solution is converted in yellowish to brown color due to formation of caramel by the effect of heat on sucrose.
3. **Addition of a medicated liquid:** This method is used when other medicated substances in liquid form are added to syrup to medicate it. In this process, sometimes precipitation takes place due to the presence of resinous and oily substances. It is necessary to take care that medicated substance should not get precipitated in this process.
4. **Percolation:** In this process, purified water or an aqueous solution is allowed to pass through a bed of crystalline sucrose. A plug of cotton is put in the neck of the percolator and purified water or aqueous solution is added in the percolator containing sucrose. The flow rate is controlled by the stopcock and maintained such that drops appear in rapid succession. If required, a small portion of liquid is re-passed

through the percolator to dissolve the sugar completely in the liquid or aqueous solvent.

### PRESERVATIVES

Syrup should be kept at low temperature, about 25°C is suitable for preservation. Preservatives are used to prevent bacterial and mould growth viz. methyl paraben, propyl paraben, sodium benzoate, benzoic acid, etc.

### Label and Storage

Syrup should be kept in well-closed containers and stored at temperature below 30°C. Bottle should be completely filled, carefully stoppered and stored in cool dark place.

*Example:* Prepare and dispense simple syrup

Rx	
Sucrose	667 g
Purified water, sufficient to produce	1000 g
	Or

Rx	
Sucrose	850 g
Purified water, sufficient to produce	1000 mL

*Example:* Prepare and dispense invert syrup

Rx	
Sucrose	66.7 g
Purified water, sufficient to produce	100.0 g
Hydrochloric acid	qs
Sodium carbonate as neutralizing agent.	

*Method of dispensing:* Prepare syrup of sucrose 66.6% w/w in purified water and add hydrochloric acid slowly with continuous stirring neutralize the solution using sodium carbonate solution

*Example:* Prepare and dispense tolu syrup (1000 mL)

Rx	
Tolu balsam	12.5 g
Sucrose	660 g
Purified water	1000 mL (qs)

**Example:** Prepare and dispense high alcohol elixir

Rx	
Compound orange spirit	4 mL
Saccharin	3 mL
Glycerin	200 mL
Alcohol	1000 mL (qs)

*Method of dispensing:* Dissolve the compound orange spirit and the saccharin in 70.0 mL of alcohol and glycerin. Add sufficient amount of alcohol to produce 100.0 mL and mix properly. Filter the mixture and preserve in suitable container.

**Example:** Prepare and dispense simple elixir

Rx	
Orange tincture	75 mL
Syrup	400 mL
Chloroform water	1000 mL (qs)

*Method of dispensing:* Mix orange tincture with the syrup and add sufficient chloroform water to produce 100.0 mL. Add 5% of purified talc and shake vigorously. Filter the elixir and preserve in a suitable container.

**Example:** Prepare and dispense pediatric paracetamol elixir

Rx	
Paracetamol	24 mL
Ethanol (96%)	100 mL
Propylene glycol	100 mL
Concentrated raspberry juice	25 mL
Choloroform spirit	20 mL
Inverrt syrup	275 mL
Amaranth solution	2 mL
Glycerin	1000 mL (qs)

*Method of dispensing:* Mix ethanol (96%), propylene glycol and choloroform spirit and make a mixture. Dissolve paracetamol and shake it, add other additives. Finally, sufficient amount of glycerin to produce 1000 mL.

*Example:* Prepare terpin hydrate elixir

Rx	
Terpin hydrate	50 g
Orange oil	0.2 mL
Glycerin	400 mL
Alcohol	425 mL
Syrup	100 mL
Purified water	1000 mL (qs)

*Method of dispensing:* Dissolve terpin hydrate in alcohol and add other additives. Add sufficient purified water to produce 100 mL and mix if necessary, filter the elixir and preserve in a suitable container.

### MOUTHWASHES

A mouthwash is an aqueous solution which is most often used for its deodorant, refreshing or antiseptic effect. It may contain alcohol, glycerin, synthetic sweeteners, surface-active agent, flavoring and coloring agents. Mouthwashes generally contain following substances:

1. **Antibacterial agents:** Alkaline phenol, hydrogen peroxide, buffered sodium perborate, thymol glycerin.
2. **Astringents:** Zinc sulfate, zinc chloride, etc.

*Container:* Narrow mouthed screw capped colored fluted bottle.

*Label:* The label on the container should state – “Not to be swallowed in larges amount” and “Store in cool place and Dark place away from Sunlight”.

*Example:* Prepare and dispense compound sodium chloride mouthwash.

Rx	
Sodium bicarbonate	10 g
Sodium chloride	15 g
Concentrated peppermint emulsion	25 mL
Double strength chloroform water	500 mL
Purified water qs	1000 mL

saliva which relieves dryness, e.g. phenol gargles, potassium chloride and phenol gargles.

*Storage:* Store at room temperature. Keep out of the reach of children. Store away from direct sunlight, heat and moisture.

*Labeling:* The containers should be labeled "For external use only". The direction for proper dilution should be stated on the label.

*Example:* Prepare and dispense 100 mL of potassium chlorate and phenol gargle BPC.

Potassium chlorate and phenol gargles BPC.	
Potassium chlorate	30.0 g
Patent blue V	0.009 g
Liquefied phenol	15.0 mL
Water sufficient to make 1000 mL	

*Method:* Dissolve the potassium chlorate in warm water. Cool and add liquefied phenol. Add the dye solution, filter and make up volume. Transfer to a container, cork, label and dispense.

## LINIMENTS

Liniments are solution or mixture of various substances in oil, alcoholic solution of soap or emulsions or occasionally semisolid preparations intended for external application and should be labeled "For external use only". They are applied with rubbing or massaged into the skin as counter irritating or stimulating agents to the affected area.

Liniments are usually applied with friction and rubbing of the skin. The oil or soap base proving base of application and message. Alcoholic liniments are used generally for their rubifacient, counter irritant, mildly astringents and show penetrating effects. These types of liniments easily penetrate to the skin.

The oily liniments are slow in their action but are more useful when massaged. The function of liniment depends on the additives but most of liniments may function solely as protective coating on the affected area. Liniment should not be applied to the broken skin because they would be very irritating especially if alcohol is used as solvent.



*They may contain following substances:*

- a. Analgesic
- b. Antimicrobial
- c. Rubifacient
- d. Counter irritant
- e. Stimulants
- f. Soothing agents.

Although alcohol is primarily used as solvent, it enhances the penetration of the medicaments into the skin and has counter irritant or rubifacient action. Counter irritants are used to mask pain from fibrositis, sciatica, neuralgia and similar complaints by producing warmth, tingling and numbness. When rubbed onto the skin, they also cause redness and hence are called as rubifacient. Cotton oil and arachis oil are less irritant than alcohol and spread more easily on the skin.

Two types of vehicle are used for the preparation of liniments (i) alcohol, e.g. soap liniments and aconite liniments, and (ii) oils e.g. camphor liniment and methyl salicylate liniment.

*Labeling:* It should be comply with the general requirements for labeling. In addition the labeling on the container should indicate—for external use only, shake well before use ,not to be applied to wounds or broken skin, store in cool place.

*Container:* Narrow mouthed screw capped bottles can be used for dispensing liniments.

**Example:** Prepare and dispense white liniment

Rx	
Oleic acid	85 mL
Turpentine oil	250 mL
Dilute ammonia solution	45 mL
Ammonium chloride	125 g
Purified water	1000 mL

*Method of dispensing:* Mix the oleic acid with measured quantity of turpentine oil. Mix dilute ammonia solution with 45 mL of purified water and warm it. Add warm diluted ammonia solution to the oily solution and shake to form an emulsion. Finally, make up the volume with purified water.

*Example:* Prepare and dispense calamine liniment.

Rx	
Calamine	50 g
Wool fat	10 g
Oleic acid	5 mL
Arachis oil	500 mL
Calcium hydroxide solution	1000 mL (qs)

*Method of dispensing:* Melt weighted amount of wool fat, oleic acid and arachis oil. Triturate calamine with melted oil. Add calcium hydroxide solution and shake it, transfer it to a suitable container and shake vigorously and finally make up the volume with calcium hydroxide solution.

### SEMISOLID DOSAGE FORMS

Various semisolid dosage forms are shown in Flowchart 8.3

### MUCILAGES

**Mucilage** is a polar glycoprotein, an exopolysaccharide, a polymer produced by most plants and some microorganisms. The official mucilage's are thick, viscid, adhesive liquids, produced by dispersing gum in water, or by extracting the mucilaginous principles from vegetable substances with water. The mucilage's all are prone to decomposition, showing appreciable decrease in viscosity on storage; they should never be prepared in quantities larger than can be used immediately, unless a preservative is added. Acacia mucilage NFXII contains benzoic acid and Tragacanth mucilage BPC (1973) contains alcohol and chloroform water.

Acacia mucilage may be prepared by placing 350 g of acacia in a graduated bottle, washing the drug with cold purified water, allowing it to drain, and adding enough warm purified water, in which 2 g of benzoic acid has been dissolved, to make the product measure 1000 mL. The bottle then is stoppered, placed on its side, rotated occasionally and the product strained when the acacia has dissolved and labeled it.

Tragacanth mucilage BPC (1973) is prepared by mixing 12.5 g of tragacanth with 25 mL alcohol (90%) in a bottle and then

quickly adding sufficient chloroform water to 1000 mL and shaking vigorously. The alcohol used to disperse the gum to prevent agglomeration on addition of water.

Mucilages are used primarily to aid in suspending insoluble substance in liquids, their colloidal character and viscosity helps prevent immediate sedimentation.

*Examples:* Including sulfur in lotions, resin in mixtures, and oils in emulsions. Both tragacanth and acacia either are partially or completely insoluble in alcohol.

Tragacanth is precipitated from solution by alcohol, but acacia, on the other hand is soluble in diluted alcoholic solutions. A 60% solution of acacia may be prepared with 20% alcohol, and a 4% solution of acacia may be prepared even with 50% alcohol. The viscosity of tragacanth mucilage is reduced by acid, alkalis or sodium chloride, particularly if the mucilage is heated. It shows maximum viscosity at pH 5.

Recent research on mucilages includes the preparation of mucilage from plantain and the identification of its sugars, the preparation and suspending properties of cocoagum, the preparation of glycerin ointments using flex seed mucilage, and the consideration of various gums and mucilage obtained from several Indian plants for pharmaceutical purposes.

Several synthetic mucilage-like substances, such as polyvinyl alcohol methylcellulose, carboxymethyl cellulose and related substances are used at the appropriate concentration as mucilage substitutes and emulsifying and suspending agents. Methylcellulose is used widely as a bulk laxative because it absorbs water and swell to a hydrogel in the intestine, in much the same manner as psyllium or karaya gum. Methylcellulose oral solution UPS is a flavored solution of the agent. It may be prepared by adding slowly the methylcellulose to about one third the amount of boiling waters, with stirring, until it is thoroughly wetted. Cold water then should be added and the wetted material allowed to dissolve while stirring. The viscosity of the solution will depend upon the concentration and the specifications of the methylcellulose. The synthetic gums are nonglycogenetic and may be used in the preparation of diabetic syrups. Sodium carboxymethyl cellulose 0.25–1% of a medium grade in water is generally suitable for preparing a suspending

vehicle. Several formulas for such syrups, based on sodium carboxymethylcellulose, have been proposed. Uniformly smooth mucilages sometimes are difficult to prepare because of the uneven wetting of the gums. In general, it is best to use fine gum particles and disperse them with good agitation in a little 95% alcohol or in cold water (except for methylcellulose). The appropriate amount of water then are be added with constant stirring.

### CREAMS

Creams are semisolid dosage forms containing one or more drug substances dissolved or dispersed in a suitable base. This term has traditionally been applied to semisolids that possess a relatively fluid consistency formulated as either water-in-oil (e.g. cold cream) or oil-in-water (e.g. fluocinolone acetonide cream) emulsions. However, more recently the term has been restricted to products consisting of oil-in-water emulsions or aqueous microcrystalline dispersions of long-chain fatty acids or alcohols that are water washable and more cosmetically and aesthetically acceptable. Creams can be used for administering drugs via the vaginal route (e.g. triple sulfa vaginal cream).

Pharmaceutical preparations for treatment of conditions, such as rashes, skin irritation, stings, fungal infections, etc. are normally supplied in the form of a cream or ointment as this provides an effective means of delivering the active ingredient directly to the required area. Active ingredients are dispersed in either phase or added when the emulsion has been formed and allowed to cool. Ingredients, formulation and product viscosity differ widely, however, a typical manufacturing process breaks down into four individual operations:

- ✦ Preparation of the oil phase: Flake/powder ingredients, sometimes dry blended in advance, are dispersed into mineral oil or silicone oil. Heating may be required to melt some ingredients.
- ✦ Hydration of aqueous phase ingredients: Emulsifiers, thickeners and stabilizers are dispersed into water in a separate vessel. Heating may be required to accelerate hydration.

### **C. Foundation Creams**

Foundation creams provide base make-up to hold the powder or other make-up above it. It vary in viscosity and available in the form of liquid to thicker creams. The liquid foundation make-up is much easier to apply than powder and a smooth appearance can be obtained. Night and massage cream are used to provide nourishment to the skin. To supplement foods for the skin and to treat the dry skin nutritive. Creams which are generally applied on skin and left for few or several hours mostly overnight, known as night creams. Creams which act by providing emollient action by rubbing the cream on the skin with massage like action are called as massage creams.

### **D. Hand and Body Creams**

Hand and body creams are used for hands and other body part's skin may be exposed to water, water soap, detergents causes removal of lipids and other secretions from the skin. Cold and dry winds take out moisture resulting in chapping of the skin. Skin dry, scaly, infection due to microbes can leads to dermatitis. So, to control all these hand and body creams are applied. The main functions of hand and body creams are to provide an oily film to protect the skin, keep the skin smooth but not greasy, and it is easy to apply.

### **E. All-purpose Creams**

The all-purpose creams are also known as 'sports cream' as they were used by sportsmen in skiing and outdoor activities. They are somewhat oily but not greasy type and can spread easily on the skin to give protective film. The composition of the cream is such that it can act: as a foundation cream to provide a foundation base for make-up; as a cleansing cream and liquefy easily; as a cream to smooth the rough surface of the skin. Hence, they are called as all-purpose cream.

## **LOTIONS**

Lotions are usually liquid or liquid suspension or semisolid preparations containing one or more medicaments, intended to be applied to the uniform skin without friction. They are lightly

**Example:** Prepare and dispense calamine lotion

Rx	
Calamine	150 g
Zinc oxide	60 g
Bentonite	30 g
Sodium citrate	5 mL
Liquefied phenol	5 mL
Glycerin	50 mL
Rose water, sufficient to produce	1000 mL

*Method of dispensing:* Prepare sodium citrate solution in 700 mL rose water. Triturate calamine, zinc oxide, and bentonite with citrate solution in a mortar and pestle and add other additives and make sufficient volume with rose water.

**Example:** Prepare and dispense boric acid lotion

Rx	
Chlorinated lime	12.5 g
Boric acid	12.5 g
Purified water, sufficient to produce	1000 mL

*Method of dispensing:* Mix chlorinated lime and boric acid and dissolve in purified water to produce 1000 mL.

**Example:** Prepare and dispense gentian violet lotion.

Rx	
Gentian violet	10 g
Ethanol (95%)	100 mL
Purified water, sufficient to produce	1000 mL

*Method of dispensing:* Dissolve gentian violet in ethanol (95%) and add sufficient purified water to produce 1000 mL.

*Containers:* Narrow mouthed, fluted bottle.

*Label:* "Store in a cool and dry place away from sunlight" The label on the container should contain—'Shake well before use' and 'For external use only'.

**PASTES**

Pastes are the semisolid preparations meant for external application to the skin. They contain large amounts of finely powdered solids like starch, zinc oxide, etc. Due to the presence of these substances they have viscosity and stiffness and are less attractive cosmetically. Since pastes are stiff they do not melt at ordinary temperature thus forming and holding a protective coating over the area they are applied. They soothe the inflamed and raw surfaces and minimize the damage done by itching conditions like chronic eczema.

**PREPARATION**

They are prepared by trituration and fusion methods. Trituration method is used when the base is liquid or semisolid while fusion method is used when the base is semisolid or solid in nature. Paste can be applied to the affected part with the help of a spatula or they may be spread on any of dressing material and then applied. They are not removed from the site of application for quite a long time, the pastes are not suitable for application to the scalp because they are very difficult to remove from the hair. Bases used for pastes are:

1. Hydrocarbon bases
2. Water miscible bases
3. Water-soluble bases

**1. Hydrocarbon Bases**

Soft paraffins and liquid paraffin are commonly used bases for the preparation of pastes.

*Example:* Prepare and dispense 1000 g of compound zinc paste BPC.

Rx	
Zinc oxide, finely sifted	250 g
Starch, finely sifted	250 g
White, soft paraffin	500 g (qs)
Make a paste	

*Method:* Triturate the zinc oxide, the resorcinol and precipitated sulfur with a portion of the emulsifying ointment until smooth and gradually incorporate the remaining part of the emulsifying ointment.

### 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. These bases are water soluble. Water-soluble dental paste containing neomycin sulfate is prepared with macrogol base.

#### Method of Preparation

Pastes are prepared by trituration and fusion methods just like ointments. The trituration method is used only in those cases where the base is liquid or semisolid. The fusion method is used when the base is semisolid or solid in nature. These two methods have already been explained in detail under the topic of preparation of ointments (Table 8.4).

**Table 8.4:** Differentiation between pastes and ointments

<i>Pastes</i>	<i>Ointments</i>
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 semisolid 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 a 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.



16. Discuss the general method of dispensing of:
  - a. Mixtures containing indiffusible solids
  - b. Mixtures containing precipitate forming liquids
  - c. Mixtures containing diffusible solids
17. What are mixtures? Classify different types of mixtures. Discuss in brief, the various vehicles and adjuncts used in the formulation of mixtures?
18. Define the following terms:
  - a. Syrup
  - b. Elixirs
  - c. Liniment
  - d. Mouthwash
  - e. Throat paint
  - f. Paste
  - g. Inhalation
  - h. Lotion
  - i. Aromatic Water
  - j. Solutions
  - k. Paints
  - l. Spirits
19. Differentiate between the following:
  - a. Syrup and elixir
  - b. Throat paint and mouthwash
  - c. Liniment and lotion
  - d. Paints and paste
  - e. Syrup IP and BP
20. Write short notes on:
  - a. Liniment
  - b. Gargles
  - c. Elixir
  - d. Inhalation
  - e. Throat paint
  - f. Paste
  - g. Syrup
  - h. Mixtures
21. Give the method of preparation of the following:
  - a. Tolu syrup
  - b. Iodine paint compound
  - c. Turpentine liniment
  - d. Calamine lotion
  - e. Compound sodium chloride mouthwash
22. Explain the reasons for the following statements:
  - a. Mixtures are not prepared to keep them for long period.
  - b. Syrups are not prepared in potable water.
  - c. Mouthwashes are to be taken in small doses without any dilution.
  - d. Soap is included as one of the ingredient in some of the liniment.
  - e. Liniment should not be applied to the broken skin.

- f. Preservatives are not added in syrups.
- g. Inhalation should not be disposed to fire.
- h. Before mixing powders they should be sieved to have uniform particle size.

### OBJECTIVE TYPE QUESTIONS

Fill in the blanks with suitable words

23. Simple syrup IP is \_\_\_\_\_ solution of \_\_\_\_\_ in water having sucrose \_\_\_\_\_ concentration.
24. Linctuses should be taken in small \_\_\_\_\_ and swallowed \_\_\_\_\_ in order to have \_\_\_\_\_ and \_\_\_\_\_ effect of medicaments.
25. Angle of repose should be between \_\_\_\_\_ for good flow properties and Carr's index should be \_\_\_\_\_.
26. Effervescent granules contains \_\_\_\_\_ due to which carbon dioxide gas is evolved.
27. Colloid is an example of \_\_\_\_\_ mixture while suspension is an example of \_\_\_\_\_ mixture.
28. Match the items of column I and with appropriate items in column II

Column I	Column II
A. Linctuses	i. are sweet aromatic preparations.
B. Liniments	ii. are liquid preparation meant for external application without friction.
C. Elixirs	iii. are viscous liquid preparation meant for the relief of cough.
D. Lotions	iv. are viscous liquid preparation used for mouth and throat infection.
E. Throat paint	v. are liquid and semi-liquid preparations meant for application to skin with friction.

29. Match the following:

1. Syrups	a. Topical Preparation
2. Suspension	b. Mouthwashes
3. Lotion	c. Biphasic
4. Mouthwashes	d. External liquid dosage form