Powder

Can be defined as subdivided solids (drug and /or chemicals) intended for internal or external use.

- **Notes:**
  - ❖ Powder present in various dosage forms as : vials, suspension, dusting powder.
  - ❖ The term powder used to describe a formulation in which a drug has been mixed with other powdered excipient to produce the final product the function of added excipients depends upon the intended use of the products: diluting, coloring, flavoring and sweetening agent for example may be added to the powders for oral use.

Particle size of powders:

The particles of pharmaceutical powders may range from extremely coarse (about 10 mm in diameter) to extremely fine (approaching colloidal dimensions of 1µm or less)

- **Notes:**
  - ❖ The USP classify the particle size of powders into the following terms: very coarse, coarse, moderately coarse, fine and very fine.
  - ❖ Particle size of powder can influence a variety of important factors, such as:

1- Dissolution rate of particles intended to dissolve; drug micronization can increase the rate of drug dissolution and its bioavailability.

2- Suspendability of particles intended to remain undissolved but uniformly dispersed in liquid vehicle.

3- Uniform distribution of a drug substance in a powder mixture or solid dosage form to ensure dose - to – dose content uniformity.

4- Penetrateability of particles intended to be inhaled for deposition deep in the respiratory tract.
5- Non-grittiness of solid particles in dermal ointment, creams, and ophthalmic preparations.

Methods for determination of particles size:

1- Sieving: in which particles are passed by mechanical shaking through a series of known size sieves.
2- Microscopy: in which the particles sized through the use of calibrated grid back ground or other measuring device.
3- Sedimentation: in which the particles size is determined by measuring the terminal settling velocity of particles through a liquid medium in gravitational or centrifugal environment.
4- Light energy diffraction or light scattering in which particle size is determined by reduction in light reaching the sensor as the particle (dispersed in liquid or gas) passes through the sensing zone.
5- Laser holography: in which pulsed laser is fired through an aerosolized particle spray and photographed in three dimensions with holographic camera.
6- Cascade impaction: is based on the principle that particle, driven by an air stream will impact on a surface in its path, provided that its inertia is sufficient to overcome the drug force that tends to keep it in the air stream.

Advantages of powder:

1. Improve stability of the drug such as antibiotics.
2. Easily taken by children or infant.
3. Convenient for dispensing drugs with large dose.
4. Oral powder capsules have a faster dissolution rate than tablets and capsules.
5. Economical (don't need a solvent).

Disadvantages of powder:

1. It is not suitable for administration of unpleasant taste drugs.
2. Unsuitable for drugs that deteriorate by oxygen or atmosphere.

3. It is not suitable for administration of potent drug.
4. Unsuitable for administration of drugs inactivated in the stomach.

Methods of mixing powder:

Depending upon the nature of the ingredients, the amount of powder to prepare, and the equipment available, powders may be blended by:-

1. Spatulation.
2. Trituration.
3. Sifting.
4. Tumbling.

1- Spatulation:

Is a method by which a small amount of powder may be blended by the movement of a spatula through the powders on a sheet of paper or an ointment tile.

- **Notes:**
  - ❖ Spatulation is not suitable for large quantities of powder containing potent substances, because homogenous blending is not as certain as through other methods.
  - ❖ Very little compression or compacting of the powder results from Spatulation.
  - ❖ Spatulation is especially suited to the mixing of solid substances that form eutectic mixtures (or liquefy) when close and prolonged contact with one another (ex: phenol, camphor, menthol, aspirin ……)

2- Trituration:

This method employed both to decrease the particle size and to mix the powder.

- **Notes:**
  - ❖ In trituration method if simple admixture is desired without special need to decrease particle size, the glass mortar is usually preffered.

- ❖ In trituration method when a small amount of potent substance is to be mixed with large amount of diluent, the geometric dilution method is used to ensure the uniform distribution of potent drug.

3- Sifting:

In this method powders mixing by passing them through sifters like those used in kitchen to sift flour.

- **Notes:**
  - ❖ Sifting result in light fluffy product.
  - ❖ Sifting is not acceptable for the incorporation potent drugs into diluent powder.

4- Tumbling:

By this method the powders are mixed by tumbling in rotating container.

Dispensing of powder :

Medicated powder may be provided to the patient as

a- Bulk powders: for non-potent drug as antacid laxative, douche powders.

b- Divided powder: for potent drug as antibiotics.

Methods of divided powder:

1. Weighing method: by this method each portion of powder is weighed separately before enfolding in paper.
2. Block and divide method: by this method the pharmacist places the entire amount of prepared powder on a flat surface such as a porcelain or glass plate, pill tile, or large sheet of paper, and with large spatula forms a rectangular or square – shaped block of powder having a uniform depth. Then, using the spatula, the pharmacist cuts into the powder vertically and horizontally to delineate the appropriate number of smaller, uniform blocks, each representing a dose or unit of medication. Each of block with the spatula and transferred to the powder paper and wrapped.
3. Measure in special form (estimation method).
4. The smaller block is than separated from the main

- **Notes:**

Block and divide method and estimation method are non – accurate therefore, used for non – potent drugs. While weighing method is an accurate method, so used for potent drugs.

Rules of mixing and preparation of powders:

1. Calculate one packet more than the prescribed amount because of loss of weight.
2. Particle size of the powder should be reduced by mortar if any crystalline substance is present.
3. Mix the powder by geometrical diluent method.
4. Divide and package.

- **Notes:**
  - ❖ In preparation of powders, if the total amount of active ingredients is less than the minimum weighable quantity (0.1 g on 2 gr) dilution will be necessary.
  - ❖ Avoid any fraction present in grain.
  - ❖ Lactose is usually used as diluent. Because it is colorless, order less, soluble and generally harmless.

Types of paper used to enclose the powders:

1. Simple bond paper.
2. Vegetable parchment, a thin, semiopagne paper having limited moisture resistant qualities.
3. Glassine, glazed, transparent paper, having limited moisture – resistant qualities.
4. Waxed paper, a transparent, water proof paper.

Experimental work:

Rx 1 .

Aspirin	gr iv
Phenacetine	gr iv
Codeine phosphate	/8 gr
Ft. powder	
Mitt. 12 packets	

Calculation:

Calculate for (13) powders:

Aspirin	4 gr × 13 = 25 gr → 3.46
Phenacetine	4 gr × 13 = 25 gr → 3.46
Codeine phosphate	1/8 gr × 13 = 1.631 gr = 0.118 g
	The total weight = 7.03 g

Weight of each packet = 4 gr + 4 gr + 1/8 = 8.13 gr = 0.54 g

Rx 2 .

Phenacetine gr iv
Caffeine gr i
Ft. pulvis
Mitt. 10 packets

Calculation:

Calculate for (11) powders:

Phenacetine	4 gr × 11 = 44 gr → 2.93 g
Caffeine	1 gr × 11 = 11 gr → 0.73 g
	The total weight = 3.66 g

Weight of each packet = 3.66 /11 = 0.33 g

Rx 3 .

Bismuth carbonate grv
Sodium bicarbonate griii
Magnesium gr vii
Ft. pulvis
Mitt. 4 packets

Calculation:

Calculate for (5) powders:

Bismuth carbonate	5 gr × 5 = 25 gr → 1.67 g
Sodium bicarbonate	3 gr × 5 = 15 gr → 1 g
Magnesium	7 gr × 5 = 53 gr → 2.33 g
	The total weight = 5 g

Weight of each packet = 5/5 = 1 g

Dilution of powders

Experimental work:

Rx 1 .

Codeine phosphate 1/6 gr.

Ft. powder

Mitt. 11 packets

Calculations:

Calculate for (12) powders. Use lactose as the diluent

Codeine phosphate 1/6 gr × 12 = 2 gr. Codeine phosphate

The minimum weighable quantity is 100 mg or 2 gr.:

2 gr × 12 = 24 gr……The total weight

24 gr . - 2 gr. = 22 gr the amount of lactose needed.

Rx 2 .

Phenobarbitone 1/8 g

Caffeine 1/4 gr.

Ft. pulvis

Mitt. 9 packets

Calculations:

Calculate for (10) powders. Use lactose as the diluent

Phenobarbitone 1/8 gr × 10 = 1.25 gr.

Caffeine 1/4 gr × 10 = 2.5 gr.

The minimum weighable quantity is 100 mg or 2 gr.:

2 gr × 10 = 20 gr……The total weight

20 gr . – (1.25 gr. + 2.5 gr) = 16.25 the amount of lactose used.

Rx 3 .

Hyoscine hydrobromide 1/150 g

Ft. pulvis

Mitt. 12 packets

Calculations: (double – dilution method):

Calculate for (15) powders. Use lactose as the diluent

1/150 gr × 15 = 1/10 gr.

The minimum weighable quantity is 100 mg or 2 gr.:

2 gr × 15 = 30 gr……The total weight

30 gr. – 1gr. = 29 gr. the amount of lactose added.

Or 150 powders must contain:

1/150 gr. × 150 = 1 gr. Hyoscine hydrobromide
2 gr. × 150 = 300 gr. Total weight
300 gr. – 1gr. = 299 gr. the amount of lactose added.

Rx 4 .

Phenobarbitone 10 mg
Ft. pulvis
Mitt. 5 packets

Calculations:

Calculate for (6) powders. Use lactose as the diluent. Phenobarbitone tablet (15 mg) used

10 gr × 6 = 60 gr. Phenobarbitone
60 mg / 15 = 4 tablet required.
The minimum weighable quantity is 100 mg:
100 mg × 6 = 600 mg……The total weight

Crush the tablet in a mortar and pestle, then weight the powder to complete the weight to 600 mg.
