# LAB 2 INDUSTRIAL PHARMACY 2023-2024 POWDER DENSITY

#### **CONTINUE TO LAB 1**

# SEMI SOLID DOSAGE FORM EQUIPMENT

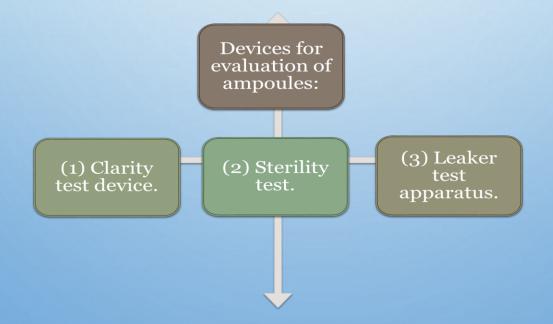
- Three Roller Mill.
- Filling Tube
- Collapsible Closer (To Close The Tubes).





#### **AMPOULES EQUIPMENT**

- Ampoule filling machine (consists of manual tool fills the ampoule in every push is 1 ml)
- 2. Ampoule filling and sealing machine
- 3. Ampoule sealing machine (utilize high temperature heat to seal the tip of the ampoule).
- 4. Millipore filter (sterilization of liquid because of small pores).



# Powder density

## **POWDER**

- Solid, dry substance made up of finely divided drugs, with. Or without excipients and intended for internal or external administration is referred to pharm. Powder
- The particles of pharmaceutical powders and granules may range from being extremely coarse, about 10 mm (1 cm) in diameter, to extremely fine, approaching colloidal dimensions of 1  $\mu$ m or less.
- Powders are composed of: particles and voids., They are available as crystalline and amorphous
- The packing of particles depends on: shape & size- cohesiveness- short range motion and external forces.

# Powder bulk density

bulk density is used to describe the density of the powder and its value must be smaller than the true density of the particles. It important in knowing the dose and formulation density to determine the appropriate size for a capsule formulation as well as the homogeneity of a low dose formulation in which there are large differences in drug and excipient densities.

Simply, it expresses the amount (usually weight or mass) [100 g] of untapped powder in a specified interparticulate void volume (150-250 ml).

$$\rho o = \frac{\text{mass}}{\text{volume}}$$
 (unit in g/ml = 1000 kg/m<sup>3</sup>)



As an international unit (because the measurements are made using cylinders. It may also be expressed in grams per cubic centimeter (g/cm<sup>3</sup>).



# Tapped density

Describe the bulk-density of a powder (or granules) after compression ("tapping") the container (100 or 250 ml) of powder (1 min) a measured number of times (either 300 or 250 tap), usually from a predetermined height [14 or 3 mm].

Tapped density = mass of powder/ tapped volume

# Tapped density and powder flowability

- The change in tapped powder volume (related to flow properties of powders)
- It can be determined by compressibility which is computed from powder density using the following equation:

% compressibility (carr's index) = 
$$(\rho t - \rho o/\rho t) \times 100$$
  
Hausner ratio =  $\rho t/\rho o$ 

 $\rho$ t- tapped density  $\rho$ o- bulk density

% compressibility (Carr's index)	Flowability	Hausner ratio
≤10	Excellent	1-1.11
11-15	Good	1.12-1.18
16-20	Fair	1.19-1.25
21-25	passable	1.26-1.34
26-31	Poor	1.35-1.45
32-37	Very poor	1.46-1.59
More than 38	Extremely poor	> 1.6

### **MEASURING BULK DENSITY**

Is determined by pouring **pre-sieved** (≥1 mm) bulk drug into a graduated cylinder (250 ml) via a large funnel and measuring the volume and weight.

# Measuring tapped density

• Measured by tapping graduated glass measuring cylinder manually or by mechanical device.

Note: devices that rotate the cylinder or vessel during tapping may be preferred to minimize any possible separation of the mass.

# Types of tapping: Manual tapping and Mechanical tapping

#### 1. Manual tapping:

The raising and lowering of the cylinder by hand is done without reference to the height traversed and arbitrary acceleration in both upward and downward directions; the hand remaining in contact with the cylinder at all times (hand tapping).

(The cylinder containing the powder is tapped by repeatedly striking its base down onto a hard surface).

## 2. MECHANICAL TAPPING

-Tap density analyzers (tap density testers) use an electric motor to turn a cam under a specially constructed cylinder holder. The holder secures the cylinder to a vertical shaft which runs in a low friction bearing.

The tapping rate is expressed in taps per minute; the rate being typically a few hundred.





**-Digital or electromechanical counters** are usually incorporated in the device to automatically stop the cam rotation after a predetermined (yet adjustable) number of taps.

(Carry out 10, 500, and 1250 taps on the same powder sample and read the corresponding volumes v10, v500, and v1250 to the nearest graduated unit. If the difference between V500 and V1250 is  $\leq 2$  ml, V1250 is the tapped volume. If the difference between V500 and V1250 > 2 ml, repeat in increments such as 1250 taps, until the difference between measurements  $\leq 2$  ml).

• The **height through which the container falls** is (drop height or stroke). It is set by the distance between the highest point on the cam and the striking surface.

#### HOW TO CORRECT THE DENSITY PROBLEM:

- 1. MILLING
- 2. SLUGGING
- 3. FORMULATION

