4. WEEK

DENSITY

- Density is universally defined as the weight per unit.
- That is, the ratio of the weight of the material to the volume of that material.
- It is expressed as "gram/cm^3" as a unit.

- Three types of densities can be mentioned for solid forms:

1) **True Density (Absolu Density):**

   It is the ratio of the weight of the solid part of the powder particles to the volume. Particle pores and voids represent the density of the next part after being removed.

2) **Bulk Dansite:** The density of the dry powder weight in a graduated cylinder is determined by the ratio of the volume of the powder to the volume of the cluster.

3) **Granule Density:** The densities that can be detected through the pores smaller than 50 μm by mercury, with no pressure applied by external pressure. Contains intraparticle pores and pores smaller than 10 μm.

- When a solid has non-porous structure, the True and Granular densities are identical to each other and can be determined by a gas such as mercury, benzene, alcohol or water or a gas such as helium.
- If the material is porous, ie the solid has an inner surface, helium gas should be used to determine the true density..

- Because helium gas has the ability to penetrate even the smallest pores without being absorbed by the material.
- When liquid materials are used, the results are almost equal to or close to true density.
- However, if the liquid is not well penetrated into the pores of the material, a difference can be observed.

Determination of Density

- Density determination has a great importance in determining the densities, especially during the passage of processes such as the transport, mixing and packaging of the powders and in determining the required equipment dimensions.

- The main purpose of the determination of the density is to find true density.
- The true density is the ratio of the mass of the powder to the volume of dust found by removing pores and interstitial spaces.
- It is important to note here that the choice of liquid medium in which the density of the powder material to be determined is insoluble.

- For this purpose, a liquid that does not dissolve the material must be and heavier than the powder must be used.

- In the measurements of density, clean and dry pycnometers made of glass are used as equipment.

- First, empty and dry pycnometer is weighed (a: Empty pycnometer weight)
- Then the pycnometer is filled with the specified liquid and weighed again (b: the weight of the pycnometer and the liquid)
- The pycnometer is evacuated and dried, the density is once again filled with the solid to be determined and reweighed (c: the weight of the pycnometer and float)

- In the final step, liquid substance is also added to the pycnometer containing powder and re-weighed (d: Pycnometer, powder and liquid pain)
- From here, the weight of the liquid displaced by the solid powder is determined, and the true density is calculated by placing it in the corresponding equality.

$$\text{True density} = \frac{(c-a)}{\left[\dfrac{\text{Weight of liquid displaced by powder}}{\text{Liquid density}}\right]}$$