

Density

- Density is a **characteristic property** which helps us identify substances
- Amount of matter (stuff) in a given volume of a substance.
- Every substance has a UNIQUE density depending on what it is made of.

Ex: aluminum has a density of 2.7g/cm^3 or 2.7 g/mL

Water has a density of 1g/ml

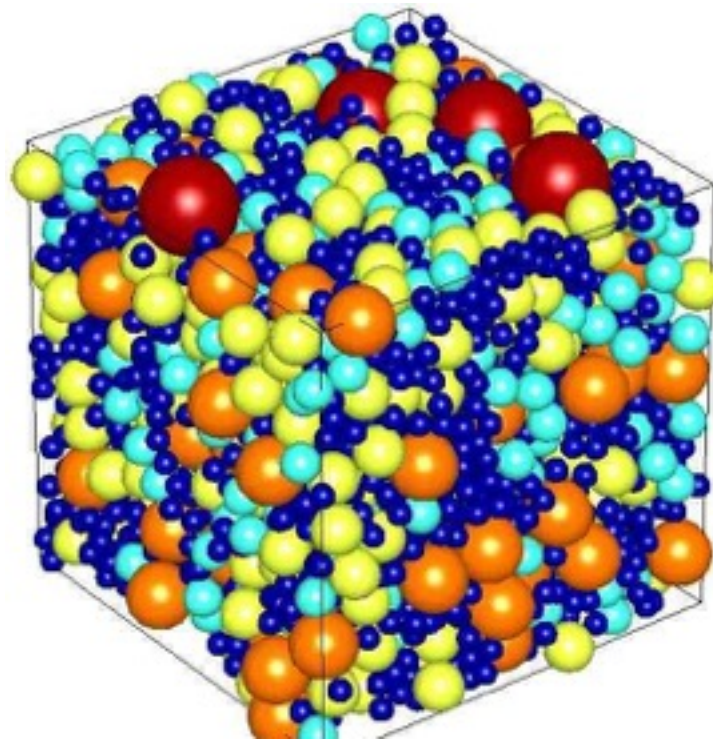
****NOTE: $1\text{mL} = 1\text{cm}^3$**

Formula for Density

Density is defined as mass per unit volume:

$$D = \frac{m}{V}$$

Density → D = $\frac{\text{mass}}{V}$ ← volume



Density is a Physical characteristic property because it can be measured!

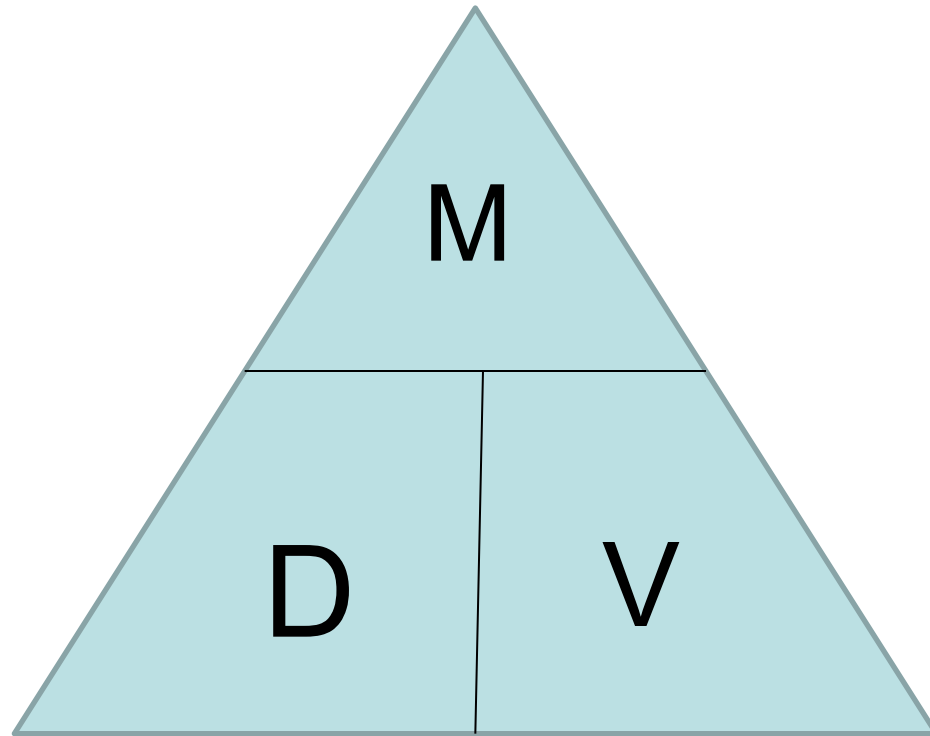
- Solids usually have a bigger density than liquids. Gases have the smallest density.
- Gas particles are more spread out, therefore they are lighter, liquids are closer together , and solids are the closest.

Finding Density

- To find density, you must first find the mass of an object and measure its volume. Then you divide mass by volume to get its density.
- Units for density: g/ml (liquid) or g/cm³ (solid)
- Ex: Calculate the density of 75 mL of a substance which has a mass of 94.5g at 20°C.

$$d = \frac{m}{v} = \frac{94.5 \text{ g}}{75 \text{ mL}} = 1.26 \text{ g/mL}$$

Density Triangle



Example

- A recipe calls for 13.8g of olive oil. If oil has a density of 0.92 g/mL, how many mL does a mass of 13.8 g correspond to?

$$d = \frac{m}{v}$$

$$\frac{0.92 \text{ g}}{1 \text{ mL}} = \frac{13.8 \text{ g}}{y \text{ mL}}$$

$$\frac{13.8 \text{ g} \times 1 \text{ mL}}{0.92 \text{ g}} = 15 \text{ mL}$$

A mass of 13.8 g corresponds to 15 ml of olive oil.

| D=M/V | Regular Solid | Irregular Solid | Liquid | Units |
|---------|--|---|--|---|
| Mass | Weigh solid on electronic balance | Weigh irregular solid on electronic balance (may need to use a weighing boat) | Weight liquid in a container (weigh empty container, put liquid in container, weigh it again) Final weight –weight of container= weight of liquid | g or kg |
| Volume | Length x width x height (use a ruler) | Water displacement. Fill graduated cylinder with enough water to cover object. Place object in cylinder. Final volume –initial volume = volume of object. | Measure liquid in a graduated cylinder or beaker (check meniscus) | Solid cm ³ m ³ Liquid mL L |
| Density | Divide mass by volume g/cm ³ | Divide mass by volume g/cm ³ or g/ml | Divide mass by volume g/ml | |