

Density and Specific Gravity

Density:

- Density is a physical characteristic, or property, of matter.
- Density is defined as the ratio of mass (grams) to a unit volume (cm^3) of matter.
- The formula for density is:
 - $d = m/v$
 - d is the *density*, in g/cm^3
 - m is the *mass*, in *grams*
 - v is the *volume*, in cm^3
 - As in any ratio formula where a value is equal to something divided by something else, the left value can be interchanged with the bottom number (denominator).
So, we get $v = m/d$.
 - Also, the top value (numerator) is equal to the product of the other two values.
So, we get $m = dv$.
 - NOTE: The volumes of liquids and gasses are often given in **mL**. A cm^3 is the same volume as an **mL**.
- Examples:
 - The mass of 11 mL of water (H_2O) is 11 g. What is the density of the sample?
 - $d = m/v = 11 \text{ g} \div 11 \text{ cm}^3 = 1.0 \text{ g/cm}^3$
 - Notice
 - Unit is g/cm^3
 - Answer is to *correct significant digits*
 - The density of copper (Cu) is 8.94 g/cm^3 . What is the mass of 12 cm^3 of Cu?
 - $m = dv = 8.94 \text{ g/cm}^3 \times 12 \text{ cm}^3 = 110 \text{ g}$
 - The density of potassium (K) is 0.862 g/cm^3 . What is the volume of 26.72 g of K?
 - $v = m/d = 26.72 \text{ g} \div 0.862 \text{ g/cm}^3 = 31.0 \text{ cm}^3$

Specific gravity:

- Specific gravity is the ratio of a substance's density to the density of water.
 - Because the density unit, g/cm^3 , for the substance and water is the same, those cancel.
 - E.g., the density of potassium (K) is 0.862 g/cm^3 . What is the specific gravity of K?
 - $0.862 \text{ g/cm}^3 \div 1.000 \text{ g/cm}^3 = 0.862$
 - I.e., the *number* for specific gravity is the same as the *number* for density, **but** specific gravity *has no units*.
 - 31 cm^3 of a metal has a mass of 26.7 g. What is the specific gravity? **0.86**