

# GENERAL CHEMISTRY

## STANDARD 1.18

**1.18: Calculate the density of a substance**

# TYPES OF PROPERTIES

- Extensive Properties
  - Do depend on the amount of matter present
  - Examples include mass, volume, weight, length
- Intensive Properties
  - Do NOT depend on the amount of matter present
  - Examples include color, luster, malleability, hardness
  - Density is an example of an intensive property
    - Density is the ratio of the mass to the volume of a substance
    - Density is a physical property of a substance
    - Density can be used to identify a substance
    - Density is represented by the greek letter “rho”  $\rho$

# DENSITY

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

Common units for density include  $\text{kg/m}^3$  or  $\text{g/cm}^3$

# FIVE STEP PROBLEM SOLVING METHOD

Used to keep the problem solving process organized. Use this for all algebraic-style problems.

1. Write down all known and unknown variables including correct units and significant figures.
2. Write down the correct parent equation in the exact form that it is provided.
3. Algebraically manipulate the parent equation to isolate the unknown variable of interest.
4. Substitute all known values, including significant figures and units, into the equation with the unknown variable isolated.
5. Evaluate the mathematical expression and determine the final answer. Write the final answer using the correct number of significant figures and the correct units.

# DENSITY CALCULATION EXAMPLE

Calculate the density of a 25 g piece of wood with a volume of 3.82 cm<sup>3</sup>.

Step 1

$$m = 25 \text{ g}$$
$$v = 3.82 \text{ cm}^3$$
$$\rho = ?$$

Step 2

$$\rho = m / V$$

Step 3

$$\rho = m / V$$

Step 4

$$\rho = 25 \text{ g} / 3.8 \text{ cm}^3$$

Step 5

$$\rho = 6.5445 = 6.5 \text{ g/cm}^3$$

# DENSITY CALCULATION EXAMPLE

Calculate the volume of a 25 g piece of wood with a density of 15.25 g/cm<sup>3</sup>

Step 1

$$m = 25 \text{ g}$$

$$v = ?$$

$$\rho = 15.25 \text{ g/cm}^3$$

Step 2

$$\rho = m / V$$

Step 3

$$V = m / \rho$$

Step 4

$$V = 25 \text{ g} / 15.25 \text{ g/cm}^3$$

Step 5

$$V = 1.639 = 1.6 \text{ cm}^3$$