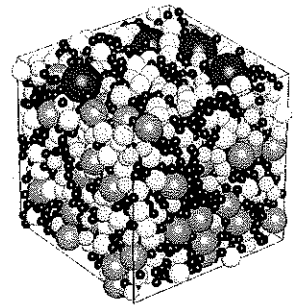


Mass = g  
 Volume = mL, cm<sup>3</sup>  
 Density = g/mL or g/cm<sup>3</sup>

### Density In-Class Assignment

$$D = \frac{M}{V} \quad V = \frac{M}{D} \quad m = D \times V$$



As long as a substance is homogeneous, the size or shape of the sample doesn't matter. The density will always be the same. This means that a steel paper clip has the same density as a steel girder used to build a bridge.

Density = Mass ÷ Volume       $D = \frac{m}{V}$

Use the density formula to solve the following problems. Show all work and the answer must have the correct units. Remember that volume can have different forms. A block of ice with a volume of 3 cm<sup>3</sup> would be 3 mL of liquid after being melted.

1. What is the density of CO gas if 0.196 g occupies a volume of 100 ml?

$$D = \frac{m}{V} = \frac{0.196 \text{ g}}{100 \text{ mL}} = 0.00196 \text{ g/mL} = 0.002 \text{ g/mL}$$

Answer 0.002 g/mL

2. A block of wood 3 cm on each side has a mass of 27 g. What is the density of the block? (Hint, don't forget to find the volume of the wood.)

$$\begin{aligned} V_{\text{wood}} &= L \times W \times H \\ &= 3 \text{ cm} \times 3 \text{ cm} \times 3 \text{ cm} \\ &= \underline{27 \text{ cm}^3} \rightarrow V \end{aligned}$$

$$D = \frac{m}{V} = \frac{27 \text{ g}}{27 \text{ cm}^3} = 1 \text{ g/cm}^3$$

Answer 1 g/cm<sup>3</sup>

3. An irregularly shaped stone was lowered into a graduated cylinder holding a volume of water equal to 2 ml. The height of the water rose to 7 ml. If the mass of the stone was 25 g, what was its density?

$$V_{\text{stone}} = V_2 - V_1$$

$$= 7\text{ml} - 2\text{ml}$$

$$= 5\text{ml}$$

$$D = \frac{m}{V} = \frac{25\text{g}}{5\text{ml}} = 5\text{g/ml}$$

4. A 10.0 cm<sup>3</sup> sample of copper has a mass of 89.6 g. What is the density of copper? Answer 8.96 g/ml

$$D = \frac{m}{V} = \frac{89.6\text{g}}{10.0\text{cm}^3} = 8.96\text{g/cm}^3$$

Answer 8.96 g/cm<sup>3</sup>

5. Silver has a density of 10.5 grams/cm<sup>3</sup> and gold has a density of 19.3 g/cm<sup>3</sup>. Which would have the greater mass, 5cm<sup>3</sup> of silver or 5cm<sup>3</sup> of gold?

Silver

$$D = 10.5\text{g/cm}^3$$

$$V = 5\text{cm}^3$$

$$M_s = D \times V = 10.5\text{g/cm}^3 \times 5\text{cm}^3 = 52.5\text{g silver}$$

gold

$$D = 19.3\text{g/cm}^3$$

$$V = 5\text{cm}^3$$

$$M_g = D \times V = 19.3\text{g/cm}^3 \times 5\text{cm}^3 = 96.5\text{g gold}$$

52.5g silver < 96.5g gold

Answer Gold

6. Five mL of ethanol has a mass of 3.9 g, and 5.0 mL of benzene has a mass of 44 g. Which liquid is denser?

Ethanol

$$m = 3.9\text{g}$$

$$V = 5.0\text{mL}$$

$$D_E = \frac{m}{V} = \frac{3.9\text{g}}{5.0\text{mL}} = 0.78\text{g/mL Ethanol}$$

Benzene

$$m = 44\text{g}$$

$$V = 5.0\text{mL}$$

$$D_B = \frac{m}{V} = \frac{44\text{g}}{5.0\text{mL}} = 8.8\text{g/mL Benzene}$$

Answer Benzene

8.8g/mL Benzene > 0.78g/mL ethanol

7. A sample of iron has the ~~same~~ dimensions of 2 cm x 3 cm x 2 cm. If the mass of this rectangular-shaped object is 94 g, what is the density of iron?

$$\begin{aligned} V_{\text{iron}} &= L \times W \times H \\ &= 2\text{ cm} \times 3\text{ cm} \times 2\text{ cm} \\ &= 12\text{ cm}^3 \quad -V \end{aligned}$$

Answer 7.8 g/cm<sup>3</sup>

$$D = \frac{m}{V} = \frac{94\text{ g}}{12\text{ cm}^3} = 7.8\text{ g/cm}^3$$