

Density Problems

Solve the following problems using the GRASSS method.

1. Calculate the mass of a liquid with a density of 3.2 g/mL and a volume of 25.0 mL.

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

$$(25) 3.2 = \frac{m}{25} (25)$$

$$m = (25)(3.2)$$

$$= 80$$

$$D = 3.2 \text{ g/mL}$$

$$V = 25.0 \text{ mL}$$

$$m = ?$$

\therefore the mass of the liquid is $8.0 \times 10^1 \text{ g}$

2. Calculate the density of a 500.0 g rectangular block with the following dimensions: length=8.0 cm, width=6.0 cm, height=5.0 cm.

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

$$= \frac{500}{240}$$

$$= 2.1$$

$$m = 500.0 \text{ g}$$

$$V = l \times w \times h$$

$$= 8 \times 6 \times 5$$

$$= 240 \text{ cm}^3$$

\therefore the density of the block is 2 g/cm^3 $D = ?$

3. Calculate the mass of a solid metal cylinder with a density of 2.6 g/cm³, a diameter of 1.8 cm, and a length of 4.0 cm.

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

$$(11.304) 2.6 = \frac{m}{11.304} (11.304)$$

$$m = (10.1736)(2.6) = 26.45$$

$$D = 2.6 \text{ g/cm}^3$$

$$V = \pi r^2 L$$

$$= (3.14) (.9)^2 (4)$$

$$= 10.1736 \text{ cm}^3$$

$$m = ?$$

\therefore the mass is 26 g

4. An irregular object with a mass of 18.0 kg displaces 2.5 L of water when placed in a large overflow container. Calculate the density of the object.

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

$$= \frac{18}{2.5} = 7.2$$

$$m = 18 \text{ kg}$$

$$V = 2.5 \text{ L}$$

$$D = ?$$

\therefore the density is 7.2 kg/L

5. A graduated cylinder has a mass of 80.0 g when empty. When 20.0 mL of water is added, the graduated cylinder has a mass of 100.0 g. If a stone is added to the graduated cylinder, the water level rises to 45.0 mL and the total mass is now 156.0 g. What is the density of the stone?

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

$$= \frac{56}{25}$$

$$= 2.24$$

$$V = 45 - 20$$

$$= 25 \text{ mL}$$

$$m = 156 - 80 - 20$$

$$= 56 \text{ g}$$

\therefore the density is 2.24 g/mL

$$D = ?$$