

CHEMISTRY PS 2-2 DENSITY

NAME _____ PERIOD _____

1. An aluminum cylinder has a density of 2.98 g/cc. If its mass is 194.98 g and its height is 12.87 cm, solve for its diameter?

$$d = \frac{m}{V}, \quad V = \frac{m}{d} = \frac{194.98 \text{ g}}{2.98 \text{ g/cc}} = 65.42953 \text{ cc}$$

$$V = \pi r^2 h, \quad r^2 = \frac{V}{\pi h}, \quad r = \sqrt{\frac{V}{\pi h}} = \sqrt{\frac{65.42953 \text{ cm}^3}{\pi (12.87 \text{ cm})}} = 1.618 \dots \text{ cm} \times 2 = \boxed{2.54 \text{ cm}}$$

2. If 98.54 grams of a substance occupies 135.6 mL, what is its density?

$$d = \frac{m}{V} = \frac{98.54 \text{ g}}{135.6 \text{ mL}} = \boxed{0.7267 \frac{\text{g}}{\text{mL}}}$$

3. A beaker will hold 615 mL of water when full. If you place 550 mL of water into the beaker and then add a metal cylinder with a diameter of 2.66 cm and a height of 13.06 cm, will any water overflow?

$$V = \pi r^2 h = \pi (1.33 \text{ cm})^2 13.06 \text{ cm} = 72.576 \dots \text{ cm}^3$$

$$550 \text{ mL} + 72.576 \dots \text{ mL} = \boxed{623 \text{ mL} \therefore \text{Yes, } 8 \text{ mL will overflow}}$$

4. Solve for the density of a object whose mass in air is 129 g and whose mass in water is 92 grams.

$$129 \text{ g} - 92 \text{ g} = 37 \text{ g} = 37 \text{ mL water displaced}$$

$$d = \frac{m}{V} = \frac{129 \text{ g}}{37 \text{ cm}^3} = \boxed{3.5 \frac{\text{g}}{\text{cm}^3}}$$

5. A metal ball has a density of 9.11 g/cc and a mass of 0.499 kg. If it is placed into a graduate that already contains 23.9 mL of water, what will be the final reading on the graduate?

$$d = \frac{m}{V}, \quad V = \frac{m}{d} = \frac{499 \text{ g}}{9.11 \text{ g/cm}^3} = 54.8 \text{ cm}^3$$

$$54.8 \text{ mL}$$

$$+ 23.9 \text{ mL}$$

$$= \boxed{78.7 \text{ mL}}$$

6. An object with a mass in air of 4.5 grams has a mass in water of 2.7 grams. Solve for the density of the object.

$$4.5\text{g} - 2.7\text{g} = 1.8\text{g} = 1.8\text{ mL water displaced}$$

$$d = \frac{m}{V} = \frac{4.5\text{g}}{1.8\text{mL}} = 2.5\text{ g/cm}^3$$

7. A perfect cube has a density of 3.4 g/mL and a mass of 89 grams. Solve for the length of one of the sides of the cube.

$$V_{\text{cube}} = \text{side}^3$$

$$d = \frac{m}{V}, \quad V = \frac{m}{d} = \frac{89\text{g}}{3.4\text{g/mL}} = 26.176\text{ mL}$$

$$\text{side} = \sqrt[3]{V} = \sqrt[3]{26.176\text{ cm}^3} = 2.969\text{ cm} = 3.0\text{ cm}$$

8. A tiny metal electrode has a mass of 2.6×10^{-5} grams and a volume of 3.02×10^{-6} mL. Calculate the density of the electrode.

$$d = \frac{m}{V} = \frac{2.6 \times 10^{-5}\text{g}}{3.02 \times 10^{-6}\text{ mL}} = 8.6\text{ g/cm}^3$$

9. A cylinder with a diameter of 2.7 cm and a mass of 45 grams has a density of 1.34 g/cm^3 . What is the height of the cylinder?

$$d = \frac{m}{V}, \quad V = \frac{m}{d} = \frac{45\text{g}}{1.34\text{ g/cm}^3} = 33.58208\text{ cm}^3$$

$$V_{\text{cyl.}} = \pi r^2 h, \quad h = \frac{V}{\pi r^2} = \frac{33.58208\text{ cm}^3}{\pi (1.35\text{ cm})^2}$$

$$h = 5.9\text{ cm}$$