

Name: _____

key

Date: _____

Density Problems

1. A block of aluminum is found to have a mass of 54.6 g and a volume of 20.3 cm³. Calculate the density of the aluminum block.

$$d = \frac{m}{V} = \frac{54.6}{20.3} = 2.96 \text{ g/cm}^3$$

2. A piece of metal is known to have a density of 16.3 g/cm³. Once placed on the balance, it is found that the metal has a mass of 215.42 g. What is the volume of the metal?

$$d = \frac{m}{V} \quad d \cdot V = m \quad V = \frac{215.42}{16.3} = 13.2 \text{ cm}^3$$

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

3. The gas inside of a balloon is known to occupy a volume of 2.545 × 10³ mL. It is also known that the density of the balloon is 2.31 × 10⁻² g/cm³. What is the mass of the air in the balloon?

$$d = \frac{m}{V} \quad d \cdot V = m$$

$$(0.0231)(2545) = 58.7 \text{ g}$$

4. A chemistry student wants to find the density of a certain rock. The rock is placed in an overflow container that empties water into a graduated cylinder. The initial volume of water in the graduated cylinder is 33.5 mL. Once the rock is placed into the container, the water level rises to 39.6 mL. The mass of the rock is found to be 101.2 g. What is the density of the rock?

$$V = V_f - V_i$$

$$V = 39.6 - 33.5$$

$$= 6.1 \text{ mL}$$

$$d = \frac{m}{V} = \frac{101.2}{6.1} = 17 \text{ g/cm}^3$$

5. The mass of a copper block is 5740 g. The length of the block is 12.1 cm and the width of the block is 4.2 cm. What is the height of the block? The density of copper is 8.96 g/cm³.

$$d = \frac{m}{V} \quad V = \frac{5740}{8.96}$$

$$V = \frac{m}{d} \quad V = 640 \text{ cm}^3$$

$$V = lwh$$

$$640 = (12.1)(4.2)(h)$$

$$13 \text{ cm} = h$$

6. Aluminum has a density of 2700 kg/m³. 4.569 × 10⁵ kg of aluminum are brought to a warehouse for storage. Is it possible that a room with dimensions 9.00 m by 10.00 m by 25.00 m will be large enough to store the aluminum?

$$V = lwh$$

$$V = (25.00)(9.00)(10.00)$$

$$V_{\text{room}} = 2250 \text{ m}^3$$

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

Yes

$$V = \frac{m}{d} = \frac{456900}{2700} \quad V = 169 \text{ m}^3 \text{ block}$$

7. Ethanol, ($d = 0.89 \text{ g/mL}$), water, ($d = 1.00 \text{ g/mL}$), aluminum, ($d = 2.70 \text{ g/cm}^3$), and mercury ($d = 12.88 \text{ g/cm}^3$) are placed inside a container. Describe what will happen to each chemical (assume no reactions take place).



8. A metal bar is believed to be made of copper. The mass of the bar is 87.43 g , and the volume of the bar is 9.80 cm^3 . The density of copper is 8.92 g/cm^3 . Is the bar made of copper? Why?

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

$$= \frac{87.43}{9.80} = 8.92 \text{ g/cm}^3 \quad \text{Yes - density matches}$$

9. A graduate cylinder is filled with water to the 40.0 mL mark. A bolt placed in the cylinder raises the water level to the 46.0 mL mark. If the bolt has a density of 9.710 g/cm^3 , what is the mass of the bolt?

$$V = V_f - V_i$$

$$= 46.0 - 40.0$$

$$= 6.0 \text{ mL}$$

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

$$d \cdot V = m$$

$$(9.710)(6.0) = m$$

$$m = 58 \text{ g}$$

10. A wooden cube is found to have a mass of 87.95 g . Its density is 5.93 g/cm^3 . What is the volume of the cube? What is the length of each side?

$$d = \frac{m}{V} \quad V = \frac{m}{d} = \frac{87.95}{5.93} \quad V = 14.8 \text{ cm}^3 \quad V = lwh = l^3 \quad \text{cube}$$

$$\sqrt[3]{V} = l$$

$$l = 2.45 \text{ cm}$$

11. What is the density of a cork with a mass of 7.45 g , and a volume of 9.3 cm^3 ?

$$d = \frac{m}{V} = \frac{7.45}{9.3} = 0.80 \text{ g/cm}^3$$

12. A block has dimensions of 6.50 cm by 4.50 cm by 7.12 cm . What is the mass of the block if its density is 8.57 g/cm^3 ?

$$d = \frac{m}{V} \quad m = d \cdot V = (8.57)(208) = 1780 \text{ g}$$

$$V = lwh = (6.50)(4.50)(7.12) = 208 \text{ cm}^3$$