

Exercise 1.36

(a) A cube of osmium metal 1.500 cm on a side has a mass of 76.31 g at 25 °C. What is its density in g/cm³ at this temperature? (b) The density of titanium metal is 4.51 g/cm³ at 25 °C. What mass of titanium displaces 125.0 mL of water at 25 °C? (c) The density of benzene at 15 °C is 0.8787 g/mL. Calculate the mass of 0.1500 L of benzene at this temperature.

Solution**Part (a)**

The density of osmium is

$$\text{density} = \frac{\text{mass}}{\text{volume}} = \frac{76.31 \text{ g}}{(1.500 \text{ cm})^3} \approx 22.61 \frac{\text{g}}{\text{cm}^3}.$$

Part (b)

Since 1 mL = 1 cm³, the mass of titanium is

$$\text{mass} = \text{density} \times \text{volume} = 4.51 \frac{\text{g}}{\text{cm}^3} \times 125.0 \text{ cm}^3 \approx 564 \text{ g}.$$

Part (c)

Since 1 L = 1000 mL, 0.1500 L = 150.0 mL.

$$\text{mass} = \text{density} \times \text{volume} = 0.8787 \frac{\text{g}}{\text{mL}} \times 150.0 \text{ mL} \approx 131.8 \text{ g}$$