

Complex Units

1. A plastic block measures 15.5 cm by 4.6 cm by 1.75 cm, and its mass is 98.456 g. Compute the density of the plastic.

$$V = 15.5\text{cm} \times 4.6\text{cm} \times 1.75\text{cm} = 124.78 \text{ cm}^3 (\pm 0.1\text{cm}^3)$$

$$d = \frac{98.456 \text{ g}}{124.78 \text{ cm}^3} = 0.7891 \frac{\text{g}}{\text{cm}^3}$$

2. A penny has a diameter of 1.8 cm and a thickness of 0.15 cm, and its mass is 2.50 g. Compute the density of the penny (cylinder volume, $V = \pi r^2 h$).

$$\text{dia} = 1.8 \text{ cm, so radius, } r = 0.9 \text{ cm } (\pm 0.1 \text{ cm since dividing by 2 just changes scale)}$$

$$V = \pi(0.9 \text{ cm})^2(0.15 \text{ cm}) = 0.3817 \text{ cm}^3 \text{ (1 significant figure)}$$

$$d = \frac{2.50 \text{ g}}{0.3817 \text{ cm}^3} = 6.549 \frac{\text{g}}{\text{cm}^3} = 7 \frac{\text{g}}{\text{cm}^3}$$

3. Calculate the volume of an aluminum spoon whose mass is 15.4 g.

You need to look up the aluminum's density: $d_{\text{Al}} = 2.71 \text{ g/cm}^3$ (*CRC Handbook of Chemistry and Physics*)

$$V_{\text{Al}} = 15.4 \text{ g} \times \frac{1 \text{ cm}^3}{2.71 \text{ g}} = 5.68 \text{ cm}^3$$

4. Calculate the volume of a quartz crystal of mass 0.246 g. (You may need to look up the density of quartz.)

$d = 2.65 \text{ g/cm}^3$ (www.a-m.de/englisch/lexikon/quartz.htm)

$$V_{\text{quartz}} = \frac{0.246 \text{ g}}{2.65 \frac{\text{g}}{\text{cm}^3}} = 0.0928 \text{ cm}^3$$