W/S Measurement

1. a) meter  b) m³  c) kg
d) sec  e) Joule  f) Kelvin

2. a) $10^4$  b) $10^3$  c) $10^{-1}$  d) $10^{-2}$
e) $10^{-3}$  f) $10^{-6}$  g) $10^{-9}$  h) $10^{-12}$

3. Liquid: g/ml  Solid: g/cm³  Gas: g/L
   the diff is in how volume is calc.

4. \( V = L \times W \times h \)
   \[ V = 8.53 \text{ cm} \times 2.4 \text{ cm} \times 1.0 \text{ cm} = 20.5 \text{ cm}^3 \]
   \[ \rho = \frac{m}{V} = \frac{52.7064 \text{ g}}{20.5 \text{ cm}^3} = 2.60 \text{ g/cm}^3 \]

5. a. mass = density \times volume
   \[ (19.3 \text{ g/cm}^3) \left( \frac{4}{3} \pi (10.0 \text{ cm})^3 \right) = 8.08 \times 10^4 \text{ g} \]
   b. (21.4 g/cm³) \( \left( \frac{0.040 \text{ mm} \times 1 \text{ cm}}{10 \text{ mm}} \right)^3 \)
   \[ = 1.4 \times 10^{-6} \text{ g} \]
   c. (0.798 g/ml) (50.0 ml) = 39.9 g
\[ 1 \text{ mL} = 1 \text{ cm}^3 \]

(6) \[ V_{\text{cylinder}} = \pi r^2 h \]

Volume of oil filling bottle = \( \frac{\text{mass of oil}}{\text{density of oil}} \)

\[ = \frac{1360 \text{ g}}{0.9539 \text{ g/mL}} = 1.43 \times 10^3 \text{ mL} = 1.43 \times 10^3 \text{ cm}^3 \]

\[ r = \sqrt{\frac{\text{Volume}}{\pi \times h}} = \sqrt{\frac{1.43 \times 10^3 \text{ cm}^3}{\pi \times 21.5 \text{ cm}}} = 4.60 \text{ cm} \]

inner diameter = \( 2r = 2(4.60 \text{ cm}) = 9.20 \text{ cm} \)

(7) Volume that the water occupies equals the volume of the flask

mass of \( H_2O \) = 87.39 g - 56.12 g = 31.27 g

\[ V = \frac{m}{\rho} = \frac{31.27 \text{ g}}{0.9971 \text{ g/cm}^3} = 31.35 \text{ cm}^3 \]

(8) Volume of silver = volume of water displaced

Volume of Ag = 260.5 - 242.0 mL = 18.5 mL or 18.5 cm\(^3\)

\[ \rho = \frac{194.39}{18.5 \text{ cm}^3} = 10.59 \text{ g/cm}^3 \]
9) The liquid must be less dense than the ice in order for the ice to sink. The temp of the experiment must be maintained at or below 0°C to prevent the ice from melting.

10) a) \( 77\, \text{K} - 273 = -196\, ^\circ\text{C} \)

\( 4.2\, \text{K} - 273 = -269\, ^\circ\text{C} \)

\( 601\, \text{K} - 273 = 328\, ^\circ\text{C} \)

11) a