

DIMENSIONAL ANALYSIS PRACTICE – Applied Density KEY

- A 3.60 g sample of pure Aluminum (Al) occupies a volume of 9.72 cm³. A 500.0 cm³ block of Al sells for \$ 1.28. How much should you get for 850.0 g of Al?
\$5.88
 $3.60\text{g}/9.72\text{cm}^3 = 850.00\text{g}/X \text{ \$}1.28/500.0 \text{ cm}^3$
or $\text{\$}1.28/500.00 \text{ cm}^3 \times 9.72\text{cm}^3/3.60 \text{ g} \times 850.00 \text{ g}$
- Gold (Au) has a density of 19.3 g/cm³. What volume in cm³ would be occupied by 1.5 kg of Au? **78 cm³**
 $1.5\text{kg} \times 1000\text{g}/1\text{kg} \times 1\text{cm}^3/19.3 \text{ g}$
- The density mercury (Hg) is 13.6 g cm⁻³. What would be the weight of 2.0 L of Hg in pounds? 1.00 pound = 454 g **60. lb**
 $2.0\text{L Hg} \times 1000 \text{ mL/L} \times 1\text{cm}^3/1 \text{ mL} \times 13.6\text{g}/\text{cm}^3 \times 1.00 \text{ lb}/454 \text{ g}$
- unit conversion 2: A sample of drinking water was found to have a concentration of 10.0 mg/mL of toxic substance X. What was the concentration of X in g/L?
 $10.0\text{mg}/\text{mL} \times 1\text{g}/1000 \text{ mg} \times 1000 \text{ mL/L} = \textbf{10.0 g/L}$
- The density of Gold (Au) is 19.3 g cm⁻³. What is the thickness of a Au wire which is 22.3 cm long and has a mass of 1.56 g? **0.068 cm**
thickness = diameter = 2r $D = m/V$ $V = m/D$ $V = \pi r^2 h$ $r^2 = \text{mass}/\pi h D$
 $r^2 = 1.56 \text{ g}/\pi (22.3\text{cm}) 19.3\text{g}/\text{cm}^3$ $r^2 = 1.154 \times 10^{-3}$ $r = 3.40 \times 10^{-2}$ $d = 2r = 6.80 \times 10^{-2} \text{cm}$
- The density of aluminum (Al) is 2.70 g cm⁻³. A rectangular sheet of (Al) foil is 25.0 cm long, 15.0 cm wide, and has a mass of 8.78 g. What is the thickness of the Al foil in cm? **0.00867 cm**
 $D = m/V$ $V = m/D$ $V = l \times w \times \text{thickness}$ thickness = mass/(l x w) Density
thickness = $8.78 \text{ g}/(25.0\text{cm} \times 15.0 \text{ cm} \times 2.70 \text{ g}/\text{cm}^3) = 8.67 \times 10^{-3} \text{ cm}$
- How many mm³ are in a cm³? **10³ mm**
- A SCUBA diver after seeing a 10. m Great White Shark obtains an underwater velocity of 2.0 m s⁻¹, what is the diver's velocity in km/hr? **7.2 km/hr**
 $2.0 \text{ m/s} \times 1 \text{ km}/1000 \text{ m} \times 60 \text{ sec}/1 \text{ min.} \times 60 \text{ min.}/1 \text{ hr.} = 7.2 \text{ km/hr}$
- How many liters are in a m³? **10³ L**
 $1 \text{ m}^3 \times (100 \text{ cm}/1 \text{ m})^3 \times 1 \text{ mL}/1\text{cm}^3 \times 1 \text{ liter}/1000 \text{ mL} = 1000 \text{ L}$
- How many mm are in 1000 cm? **1.00 x 10⁴mm**
 $1000\text{cm} \times 10 \text{ mm}/1\text{cm} = 10,000 = 1 \times 10^4 \text{ mm}$