

KEY

Dimensional Analysis Practice

Use dimensional analysis to answer each question. Record your solutions and notes in the spaces provided.

1. Find the number of centimeters in 1.00×10^2 yards

$$1.00 \times 10^2 \text{ yds} \left(\frac{3 \text{ ft}}{1 \text{ yd}} \right) \left(\frac{0.3048 \text{ m}}{1 \text{ ft}} \right) \left(\frac{100 \text{ cm}}{1 \text{ m}} \right) = \boxed{9140 \text{ cm} \text{ or } 9.14 \times 10^3 \text{ cm}}$$

2. Determine the number of meters in 1.00 miles.

$$1.00 \text{ miles} \left(\frac{1.609 \text{ km}}{1 \text{ mile}} \right) \left(\frac{1000 \text{ m}}{1 \text{ km}} \right) = \boxed{1610 \text{ m} \text{ or } 1.61 \times 10^3 \text{ m}}$$

3. The speed of light is 1.86×10^5 miles per second. How many meters will light travel in 1.0 seconds?

$$1.0 \text{ sec} \left(\frac{1.86 \times 10^5 \text{ miles}}{1 \text{ sec}} \right) \left(\frac{1.609 \text{ km}}{1 \text{ mile}} \right) \left(\frac{1000 \text{ m}}{1 \text{ km}} \right) = \boxed{3.0 \times 10^8 \text{ m}}$$

4. Calculate the number of seconds in a year.

$$1 \text{ yr} \left(\frac{365 \text{ days}}{1 \text{ yr}} \right) \left(\frac{24 \text{ hr}}{1 \text{ day}} \right) \left(\frac{60 \text{ min}}{1 \text{ hr}} \right) \left(\frac{60 \text{ sec}}{1 \text{ min}} \right) = \boxed{3.15 \times 10^7 \text{ sec}}$$

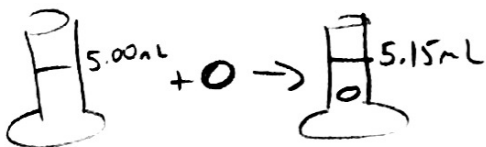
6. The density of mercury is 13.55 g/ml, and the density of gold is 19.32 g/ml.

- a) What is the density of mercury in kg/L?

$$13.55 \frac{\text{g}}{\text{mL}} \left(\frac{1 \text{ kg}}{1000 \text{ g}} \right) \left(\frac{1000 \text{ mL}}{1 \text{ L}} \right) = \boxed{13.55 \frac{\text{kg}}{\text{L}}}$$

- b) A 10.0 mL graduated cylinder is filled to 5.00 mL. A ring is placed in the graduated cylinder, and the water level rises to 5.15 mL. The ring is then dried and placed on a balance, and its mass is 2.8315g. Find the density of the ring.

$$\text{Vol}_{\text{ring}} = 5.15 \text{ mL} - 5.00 \text{ mL} = 0.15 \text{ mL}$$



$$D = \frac{M}{V}$$

$$D = \frac{2.8315 \text{ g}}{0.15 \text{ mL}} = 19 \text{ g/mL}$$

c) Is the ring pure gold? Explain how you arrived at your conclusion.

No, Gold has density = 19.32 g/mL
the ring is only 19 g/mL

8. The units of the chain system of measure, used by surveyors, are as follows:

7.92 inches = 1 link

100 links = 1 chain

10 chains = 1 furlong

80 chains = 1 mile

The distance of the Kentucky Derby, a classic horse race, is 1.25 miles. How is this distance expressed in furlongs?

$$1.25 \text{ miles} \left(\frac{80 \text{ chains}}{1 \text{ mile}} \right) \left(\frac{1 \text{ furlong}}{10 \text{ chains}} \right) = \boxed{10 \text{ furlongs}}$$

9. The displacement (total volume of the cylinders of the engine in a Ford Mustang) is 5.0 L. Convert this to cubic inches.

$$5.0 \text{ L} \left(\frac{1000 \text{ mL}}{1 \text{ L}} \right) \left(\frac{1 \text{ cm}^3}{1 \text{ mL}} \right) \left(\frac{1 \text{ in}}{2.54 \text{ cm}} \right)^3 = \boxed{3.0 \times 10^2 \text{ in}^3}$$

10. A cube that has a length of 1 cm on each side has a volume of 1 cm^3 . How many cubic centimeters are in 1 cubic meter?

$$1 \text{ m}^3 \left(\frac{100 \text{ cm}}{1 \text{ m}} \right)^3 = \boxed{1 \times 10^6 \text{ cm}^3}$$