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 yds → m → cm

$$1.00\times10^2\,\text{yd}\left(\frac{0.9144\,\text{m}}{1\,\text{yd}}\right)\left(\frac{100\,\text{cm}}{1\,\text{m}}\right)=9144\,\text{cm}=\boxed{9.14\times10^2\,\text{cm}}$$

2. Determine the number of meters in 1.00 miles. mi → km → m

$$1.00\,\text{mi}\left(\frac{1\,\text{km}}{0.6214\,\text{mi}}\right)\left(\frac{1000\,\text{m}}{1\,\text{km}}\right)=1609.27\,\text{m}=\boxed{1.61\times10^3\,\text{m}}$$

3. The speed of light is 1.86×10^5 miles per second. How many meters will light travel in 1.0 seconds? (rate) $1.0\,\text{sec}=?\,\text{m}$ $\frac{1.86\times10^5\,\text{mi}}{1\,\text{sec}}$ sec → mi → km → m

$$1.0\,\text{sec}\left(\frac{1.86\times10^5\,\text{mi}}{1\,\text{sec}}\right)\left(\frac{1\,\text{km}}{0.6214\,\text{mi}}\right)\left(\frac{1000\,\text{m}}{1\,\text{km}}\right)=\boxed{3.0\times10^8\,\text{m}}$$

4. Calculate the number of seconds in a year. $1\,\text{yr}=?\,\text{sec}$ yr → day → hrs → min → sec.

$$1\,\text{yr}\left(\frac{365\,\text{days}}{1\,\text{yr}}\right)\left(\frac{24\,\text{hr}}{1\,\text{day}}\right)\left(\frac{60\,\text{min}}{1\,\text{hr}}\right)\left(\frac{60\,\text{sec}}{1\,\text{min}}\right)=31536000\,\text{sec}=\boxed{3\times10^7\,\text{sec}}$$

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? g → kg, mL → L

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

   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. $V = 5.15 - 5.00\,\text{mL} = 0.15\,\text{mL}$ $D=\frac{m}{V}$

$$D=\frac{2.8315\,\text{g}}{0.15\,\text{mL}}=18.87666667\,\text{g/mL}=\boxed{19\,\text{g/mL}}$$