$mg = 10^{-3} g$ $\quad$ $Kg = 10^{3} g$

Convert 14500 mg to kg

$$14500\, mg \times \frac{10^{-3}\, g}{mg} \times \frac{Kg}{10^{3}\, g} = 0.0145\, Kg$$

Tip: Don't put units with their own exponents (like square meters or cubic meters) into your factors.

$cm = 10^{-2}\, m$

Convert 0.147 cm^2 to m^2

$$0.147\, cm^2 \times \frac{10^{-2}\, m}{cm} \times \frac{10^{-2}\, m}{cm} = 1.47 \times 10^{-5}\, m^2$$

$(0.0000147\, m^2)$

When converting squared or cubedn units, remember to use each factor two (squared) or three (cubed) times, because

$cm^2 = cm \times cm$ $\qquad$ $cm^3 = cm \times cm \times cm$

... and all the prefixes need to be converted.

8.45 kg to μg

$Kg = 10^{3} g \quad \mu g = 10^{-6} g$

$$8.45\,Kg \times \frac{10^{3} g}{Kg} \times \frac{\mu g}{10^{-6} g} = 8450000000\,\mu g$$

$(8.45 \times 10^{9}\,\mu g)$

88100 kHz to MHz

$Hz = s^{-1}$ (frequency)

$KHz = 10^{3} Hz \quad MHz = 10^{6} Hz$

$$88100\,KHz \times \frac{10^{3} Hz}{KHz} \times \frac{MHz}{10^{6} Hz} = 88.1\,MHz$$

Convert 38.47 in to m, assuming 2.54 cm = 1 in

$2.54\ cm = in \qquad cm = 10^{-2} m$

$$38.47\ in \times \frac{2.54\ cm}{in} \times \frac{10^{-2}\ m}{cm} = \boxed{0.9771\ m}$$

Convert 12.48 km to in

$2.54\ cm = in \qquad cm = 10^{-2} m \qquad Km = 10^{3} m$

$$12.48\ Km \times \frac{10^{3}\ m}{Km} \times \frac{cm}{10^{-2}\ m} \times \frac{in}{2.54\ cm} = \boxed{491300\ in}$$

Accuracy and Precision

- two related concepts that you must understand when working with measured numbers!

Accuracy

- how close a measured number is to the CORRECT (or "true") value of what you are measuring

- "Is it right?"

- checked by comparing measurements against a STANDARD (a substance or object with known properties)

Precision

- how close a SET of measured numbers are to EACH OTHER

- "Can I reproduce this?"

- checked by repeated measurements

More on precison

Every measurement contains some amount of ERROR, or some amount of deviation from the true value of what is being measured.

RANDOM ERROR is the variability in a measurement that cannot be traced back to a single cause. Random errors cause measurements to fluctuate around the true value, but can be averaged out given enough measurements.

When reporting measurements, we want to indicate how much random error we think is present. How?

We'll go to the lab and measure the mass of a metal ring using an ANALYTICAL BALANCE: