

Measurements

Measurements are comparisons of properties against accepted standards, called units.

ENGLISH / US SYSTEM OF UNITS:

$$1 \text{ foot} = 12 \text{ inches}$$

$$1 \text{ yard} = 3 \text{ ft}$$

$$1 \text{ mile} = 1760 \text{ yards}$$

$$5280 \text{ ft} \approx 1 \text{ mile}$$

So what's the problem? The English system of units is a big mess. Units do not relate to each other in a manner that is easily remembered and used.

English units are nonstandard and difficult to use. Solution?

THE METRIC SYSTEM

Metric Base Units:

Length	meter	m
Mass	*kilogram	kg
Temperature	Kelvin	K
Time	second	s

All metric units are made up of COMBINATIONS of BASE UNITS!

*we usually treat the gram as if it's the base unit for mass!

- One meter is approximately 3.3 feet.
- One kilogram is approximately 2.2 pounds.

What about SIZE?

Metric units may be made larger or smaller by adding PREFIXES.

A few common metric prefixes:

mega-	10^6	M
kilo-	10^3	k
centi-	10^{-2}	c
milli-	10^{-3}	m
micro-	10^{-6}	μ

Bigger units



smaller units

MEMORIZE the common metric prefixes on the study guide

Applying prefixes

$$1 \text{ m} = \text{m}$$

$$1 \text{ km} = 10^3 \text{ m} \quad (1000 \text{ m}) \quad 10 \times 10 \times 10$$

$$1 \text{ cm} = 10^{-2} \text{ m} \quad \left(\frac{1}{100} \text{ m} \right) \quad \frac{1}{10} \times \frac{1}{10}$$

Scaling units with metric prefixes ... examples

The distance between here and Columbia, SC is about 107,000 meters.
What metric unit would be best suited for a distance like this?

$$\text{km} = 10^3 (1000) \text{ m}$$

107 km

A piece of chalk is 0.080 meters long. What metric unit would be best suited for this length?

$$\text{cm} = 10^{-2} \left(\frac{1}{100}\right) \text{ m}$$

8.0 cm

Derived Units

- are units that are made up of combinations of metric base units with each other and/or with prefixes

Two derived units are particularly important in introductory chemistry:

1) VOLUME

2) DENSITY