

The Metric System



Science involves collecting data and much of that data is measurements. But every country, city or university seem to have their own measuring system, which proved to be very confusing. Scientists realized they needed a standard of measurement for all scientists. An agreed upon standard would allow scientists to make **accurate** and **precise** measurements that are **reproducible** and **unchanging**.

The original standard of scientific measurement was the **metric system** introduced in 1790 in France during the French Revolution. The metric system is based on the decimal system or powers of 10 just like our number system. This makes the metric system very natural and easy to use. Then, in 1960, the **SI system** was introduced as the new scientific standard. The SI system is still based on the metric system, but it is defined as having only seven **fundamental units** and all the other units are derived from these seven fundamental units.

Metric Units

Property	Unit	Symbol
length	meter	m
mass	gram	g
volume	liter	l
time	second	s
temperature	Celsius	°C

Note: 1 cubic centimeter (cm^3) = 1 milliliter 1 cubic centimeter of water = 1 gram

Metric Prefixes

The metric system is based on the decimal system and makes use of prefixes to indicate **fractions** and **multiples of ten**. The same prefixes are used with all the base units.

prefix + base unit → new unit
milli + meter → millimeter

Prefixes for LARGE Measurements			
Prefix	Symbol	Meaning	Value
giga-	G	one billion	10^9
mega-	M	one million	10^6
kilo-	k	one thousand	10^3

Prefixes for small Measurements			
Prefix	Symbol	Meaning	Value
deci-	d	one-tenth	10^{-1}
centi-	c	one hundredth	10^{-2}
milli-	m	one thousandth	10^{-3}
micro-	μ	one millionth	10^{-6}
nano-	n	one billionth	10^{-9}

Metric conversions are easy because all you need to do is **move the decimal** according to the conversion rule. Anytime you change from a large unit to a smaller unit you get more pieces and anytime you change a small unit to a larger unit you get fewer pieces.

Conversion Rule

Large to small = **small to large** =

move the decimal **right**

move the decimal **left**

Practice

Directions: Convert the following units. Remember move the decimal point.

2500 g = _____ kg 10 m = _____ km 2 km = _____ cm
 250 mL = _____ L 2000 g = _____ kg 10 kg = _____ mg
 1500 cc = _____ L 1357 g = _____ kg 791 g = _____ kg

"If you cannot measure it, you cannot improve it." - Lord Kelvin

Think About It

- Why do scientists need a standard of measurement?
- List the benefits of having a standard system of measurement?
- Describe the metric system.
- What makes the metric system easy to use?
- List the prefixes for 10^3 , 10^{-2} , 10^{-3} , 10^{-6} , 10^{-9} , and 10^{-12} .

“Great souls have wills; feeble ones have only wishes.” - Chinese Proverb