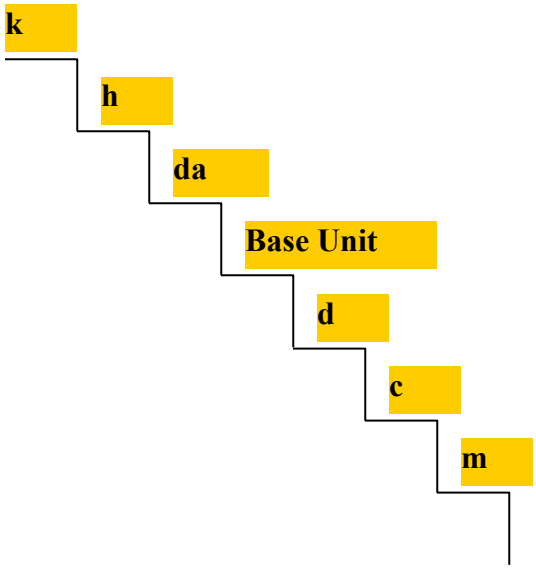
5.1.7 Metric Conversion, Temperature scales and GRASS Method

- To easily remember metric conversion remember "down right easy"
  - Always go right and down, or the conversions will not work
- You will always use the same prefixes, and change the suffix depending on the measurement

- Suffixes
  - L – litre
  - g – gram
  - m – metre
- Prefixes
  - k – kilo (1000)
  - h – hecto (100)
  - da – deca (10)
  - Base unit, l, g, m
  - d – deci (0.1)
  - c – centi (0.01)
  - m – milli (0.001)

- To convert from one prefix to the next, use the staircase

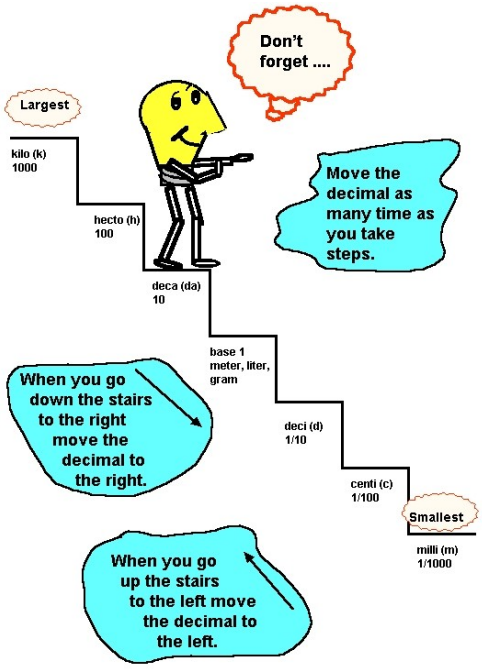


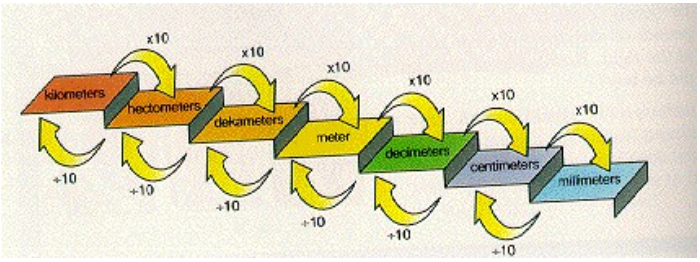
When converting from one prefix to another, simply follow the staircase. When you go down the staircase, each step represents one decimal place to the right, when you go up the staircase, each step represents one step to the left.
Example:
Convert 73.1 cm to Kilometres
You must walk 5 steps up the staircase to get from cm to km, thus move the decimal place 5 to the left
0.000731 km = 73.1 cm

Use pages 574-5 to help you fill in this table if required.

Quantity	Unit	Symbol
length width height	millimetre centimetre metre kilometre	mm cm _____ _____
mass	gram _____ _____	g kg t
_____	cubic centimetre cubic metre millimetre litre	_____ _____ _____ _____
density	grams per _____ _____ per _____ kilograms per _____	g/cm^3 ___ /mL kg/L

Staircase Method of Conversion
Draw a set of stairs. Each step has 1 prefix for the metric system with the base unit (metre, litre, gram) on the halfway step. Each step down the steps represents <u>multiplying</u> by 10. Each step up represents <u>dividing</u> by 10.





<u>Remember:</u>
1. Move the decimal as many times as you take steps.
2. When you go down the stairs to the right, move the decimal to the _____.
3. When you go up the stairs to the left, move the decimal to the _____.

<u>EXAMPLE:</u>
4.7 km = <u>?</u> m
a. move down 3 steps from k step to base step for metres
b. 3 steps means move 3 decimal places
c. down means move decimal to the right

4.7 km = <u>4700.</u> m
Most of the time we leave out the decimal if it is after a number

4.7 km = <u>4700</u> m

Complete the following metric conversions using the *Staircase Method*.

Going down!

1. 3 km = _____ hm
2. 42 km = _____ dam
3. 22 km = _____ m
4. 67 km = _____ cm
5. 45 m = _____ mm
6. 8.4 dam = _____ dm
7. 23.45 cm = _____ mm

Going up!

1. 234 mm = _____ cm
2. 67 mm = _____ dm
3. 3.3 mm = _____ m
4. 234.56 mm = _____ km
5. 4.6 cm = _____ m
6. 3.5 dm = _____ hm
7. 345.1 m = _____ km

Both up the steps and down the steps!

1. 0.64 m = _____ cm
2. 34 mm = _____ dam
3. 3.4 m = _____ dm
4. 5.5 m = _____ mm

Volume and Mass Units too!

1. 125 mL = _____ L
2. 45 cL = _____ L
3. 2.1 mg = _____ g
4. 68 L = _____ mL
5. 3.4 kL = _____ L
6. 4356 mg = _____ kg

Note: The above 1.5 page of note was borrowed from SNC1D1 Ms. M. Booth

Temperature Conversions

Now, not all measurements will be in an SI unit. A good example is temperature. It is crucial to always use SI units in any formula in chemistry because most formulas relate to measurements taken in SI units, and use of another type of unit in these formulas would result in an incorrect answer. Often times temperature will be made in fahrenheit or celsius. If you have the former, there is a long process in obtaining the kelvin equivalents. Here are the formulas to convert from any type of temperature to another type:

To convert a Celsius temperature into degrees Fahrenheit:

$$T_f = (9/5) \times (T_c + 32^oC)$$

To convert a Fahrenheit temperature into Celsius:

$$T_c = (5/9) \times (T_f - 32^oF)$$

The Kelvin Scale

Scientists use the Kelvin scale, which is based on the Celsius scale, but has no negative numbers. Zero on the Kelvin scale is considered the be absolute zero; that is, the point at which all molecular motion stops.

To convert a temperature reading into degrees Kelvin, simply add 273.15 to the Celsius temperature. This explains why in scientific temperatures you'll see references to temperatures on Earth in the 300-degree range.

Let's try converting 20.0° Fahrenheit to Kelvin.

1. First, convert the Fahrenheit into Celsius. This yields -6.67° C.
2. Convert the Celsius to Kelvin by adding 273.15.
3. Answer is: 266.63° K is your final answer!

G.R.A.S.S. Method for organization of Mathematical Problems

G – Given
R – Required
A – Analysis
S – Substitute
S - Solve

Example Problem
Eg. Using the G.R.A.S.S. method, calculate the density of an unknown material given that the mass is 4.8 kg and the volume is 3 litres

Given
– what is given to you?
Mass ⇒ 4.8 kg
Volume ⇒3 litres

Required
- what do we need to find?
We need to find the density

Analysis
- What formulas will you need to solve for the required?
formula is D = m/V

Substitute
- Insert the given into the formula
D = m/V
D = 4.8kg/3L

Solve
- Solve the equation
D = 4.8 kg/3L
D = 1.6 kg/L

http://library.thinkquest.org/3310/nographics/textbook/index.html