A short review of
PHYSICS AND UNITS

SI-UNITS

To describe quantities (such as the density of a piece of ice or the length of a glacier) scientists use units that conform with the SI-Units; which is based on the kilogram (kg), the meter (m), the second (s), and a number of other units. The table shown below provides information on how to transform a quantity measured in a given unit into SI-units:

Units of length:

1 cm = 0.39 in; 1 in = 2.54 cm
100 cm = 1 m =1.09 yd =3.3 ft; 1 ft = 0.31 m
1 km = 0.62 mi; 1 mi =1.61 km

Units of volume;

1 l = 1000 cm^3 = 1000 ml = 0.264 gal; 1 gal = 3.79 gal
1 m^3 = 1000 l = 264 gal

Units of weight:

1 kg = 1000 g = 2.205 lbs = 35.3 oz
1 t = 1000 kg = 2205 lbs

Units of temperature:

Relative:	1 ˚C = 1 K (Kelvin) = 1.8 ˚F
Absolute:	T in ˚C = 5/9 x (˚F – 32)
	T in ˚F = 9/5 x ˚C +32
	T in K = x˚C + 273.15

ENERGY AND OTHER USEFUL QUANTITIES

Energy is the capacity to do work.
Work is equal to the product of the net force exerted and the distance, through which the force moves,

$$W = F\,D,$$

where,

W is work $[M\,L^2\,T^{-2}] = (N \cdot m) = (J)$
F is force $[M\,L\,T^{-2}] = (N)$
D is distance $[L] = (m)$.

Density,	$\rho = m/V$,	V is volume, m mass, $[M\,L^{-3}] = (kg\ m^{-3})$.
Force,	$F = m\,a$,	$[M\,L\,T^{-2}] = (N)$.
Pressure,	$P = F/A$,	$[M\,L^{-1}\,T^{-2}] = (N\ m^{-2}) = (Pa)$.
Power,	dW/dt,	$[M\,L^2\,T^{-3}] = (N \cdot m\ s^{-1}) = (J\ s^{-1}) = (W)$.

CHANGING UNITS

Given that a glacier moves at 5 m per hour, what is the velocity in meters per second and kilometers per year?

Meters per second:

$$u = 5\frac{m}{hour}\cdot\frac{1}{3600\frac{s}{hour}} = \frac{1}{720}\frac{m}{s} \approx 1.4\cdot10^{-3}\frac{m}{s}$$

Kilometers per year:

$$u = 5\frac{m}{hour}\cdot\frac{\frac{1}{1000}\frac{km}{m}}{\frac{1}{24}\frac{day}{hour}\cdot\frac{1}{365}\frac{year}{day}} = \frac{5\cdot24\cdot365}{1000}\frac{km}{year} = 43.8\frac{km}{year}$$

DIMENSIONAL ANALYSIS

Dimensional analysis is an important and easy to use "tool". It refers to making sure that the dimensions of your variable(s) are correct. The dimensions are: M – for mass, L – for length, and T – for time.

An example would be making sure that the dimensions are correct when finding an area from a known pressure and force. By solving $A = F/P$, and we know that the dimension for A is $[\mathrm{L}^2]$,

$$A\,[\mathrm{L}^2] = \frac{F}{P}\frac{[\mathrm{MLT}^{-2}]}{[\mathrm{ML}^{-1}\mathrm{T}^{-2}]} = \frac{F}{P}[\mathrm{L}^2]\,.$$

This is very useful when length, area, and volume are used interchangeably in the formulation; which can cause confusion at times.