HOW TO MAKE UNIT CONVERSIONS

Many calculations involve unit conversions. Not need to know all the conversion factors. Using conversion factors for basic units and for some common derived units the conversion factors can be found for the other derived units

e.g.

Q=mc($T_2 - T_1$) [kg][kJ/(kgK)][K]

Q: Thermal energy, [kJ]

c: Specific heat, [kJ/(kgK)]

Determine the conversion coefficient for c to have its value in [Btu/(lb_mR)]

- c= $\frac{Q}{m\Delta T}$

1 [Btu]=1.055 [kJ] → 1[kJ]=0.9479 [Btu]

1[kg]=2.2046 [lb_m]

1[K]= 1.8[R]

Factor to multiply c in [kJ/(kgK)] to obtain the value in [Btu/(lb_mR)]

$$\frac{0.9479\ [Btu]}{2.2046[lb_m]\ 1.8[R]} = \ 0.2389$$

Specific heat of wax , c=3.43 [kJ/(kgK)] → c= 0.2389*3.43=0.819 [Btu/(lb_mR)]

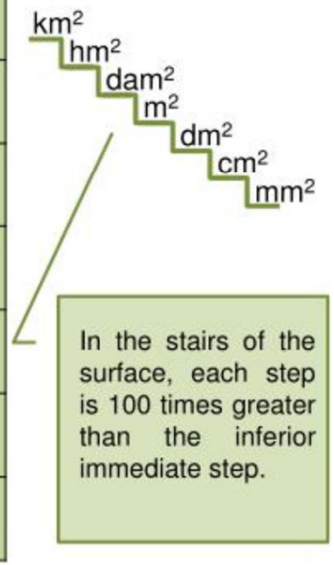
- Convert 1 [yr] to seconds

1[yr]$\frac{365[days]}{[yr]} * \frac{24[hr]}{[day]} * \frac{60[min]}{[hr]} * \frac{60[s]}{[min]}$ =31 536 000 =3.1536*10^7 [s]

$5[m^3] = ?\,[dm^3], \quad 1[m] = 10[dm] \rightarrow 1[m^3] = 10[dm] * 10[dm] * 10[dm] = 1000[dm^3]$

Multiples and submultiples of square metre

UNIT	SYMBOL	EQUIVALENT
Square kilometre	km^2	1 km^2 = 1 000 000 m^2
Square hectometre	hm^2	1 hm^2 = 10 000 m^2
Square decametre	dam^2	1 dam^2 = 100 m^2
Square metre	m^2	1 m^2
Square decimetre	dm^2	1 dm^2 = 0,01 m^2
Square centimetre	cm^2	1 cm^2 = 0, 000 1 m^2
Square millimetre	mm^2	1 mm^2 = 0,000 001 m^2



- $5[m^2] = ?\,[dm^2], \quad 1[m] = 10[dm] \rightarrow 1[m^2] = 10[dm] * 10[dm] = 100[dm^2]$
- $5[m^3] = ?\,[dm^3], \quad 1[m] = 10[dm] \rightarrow 1[m^3] = 10[dm] * 10[dm] * 10[dm] = 1000[dm^3]$

Consistency of Units

- If the objects are the same kind of thing they can be added or substracted!
- This is the fundamental ``apples and oranges'' rule

7[apples]+5[oranges]=????!!!!!!!

7[fruits]+5[fruits]=12[fruits]

$$t + x + m$$

(the sum of a time, a length, a mass) are *completely meaningless!*.

Physical laws are always dimensionally consistent.

The following equation is proposed for determining the magnitude of the resultant force needed. Is it a scientific equation?

- How could you understand? Explain

- $F = \frac{2mx^2}{D\Delta t^2} + \int_{t1}^{t2} a\, dt$
- Where;
- m: mass, a: acceleration D: path diameter x: distance

  t: time F: Force

$[\text{kgm}/s^2] = \frac{[kg][m^2]}{[m][s^2]} + \left[\frac{m}{s^2}\right][s]$ $since\ the\ unit\ of\ the\ terms\ to\ add\ are\ not\ the\ same$ $the\ equation\ can\ not\ be\ a\ scientific\ eqn.$