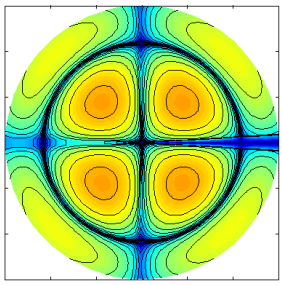

VISUAL PHYSICS ONLINE

CHANGING UNITS

A skill that you must master is to change one unit in to another.

For example, years into seconds, and km/h to m/s.

Example 1 Simple time conversions

$1\ ms = 1x10^{-3}\ s \quad 1\ \mu s = 1x10^{-6}\ s \quad 1\ ns = 1x10^{-9}\ s$

$34.5\ ms = 34.5x10^{-3}\ s \qquad 543.5\ ns = 543.5x10^{-9}\ s$

$43.5\ \mu s = 43.5x10^{-6}\ s$

multiple the number by the conversion factor

NO – don't move the decimal point about

34.5 ms = 0.0345 m

1 min = 60 s
1h = 60 min = (60) (60) s
1 day = 24 h = (24) (60) (60) s
1 year = 356 days = (365) (24) (60) (60) s

use ( ) not the multiplication sign x

It is often necessary to convert one set of units into another. This can be done by reducing the conversion to a simple algebraic problem. The following examples will illustrate how to do this.

Example 2

A car is travelling at a speed of 165 $km.h^{-1}$. What is the speed of the car in $m.s^{-1}$?

1 km = 10^3 m 1 h = (60)(60) s = 3.6×10^3 s

1 km. h^{-1} = $(10^3) / (3.6\times10^3)$ $m.s^{-1}$

165 $km.h^{-1}$ = $(165)\ (10^3) / (3.6\times10^3)$ $m.s^{-1}$ = 45.8 $m.s^{-1}$

Example 3

The density of a liquid was 1.8 $g.mL^{-1}$. What is the density in $kg.m^{-3}$?

1 g = 10^{-3} kg

1 mL = 1 cm^3

1 cm = 10^{-2} m

1 cm^3 = $(10^{-2})^3$ cm^3 = 10^{-6} m^3

1 $g.mL^{-1}$ = $(10^{-3}) / (10^{-6})$ $kg.m^{-3}$

1.8 $g.mL^{-1}$ = $(1.8)\ (10^{-3}) / (10^{-6})$ $kg.m^{-3}$ = 1.8×10^3 $kg.m^{-3}$

Note

The use of multiplication by powers of 10 ($x10^6$).

The use of superscripts:

use $m.s^{-1}$ not m/s

use $kg.m^{-3}$ not kg/m^3

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If you have any feedback, comments, suggestions or corrections please email:

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