# UNITS

**units** **units** **units** **units** **units** **units**

- SI equivalent units
- Orders of magnitude
- Units and homogeneity

A useful revision technique is to check all the equations given in the formula sheet for the unit in question, making sure that you learn them as words and not as symbols that you know the units of every term in the equations and that you can demonstrate the homogeneity of each one.

**Key units:**

| | | | |
|---|---|---|---|
| newton | N | $kg\ m\ s^{-2}$ | |
| joule | J | $N\ m$ | $kg\ m^2\ s^{-2}$ |
| watt | W | $J\ s^{-1}$ | $kg\ m^2\ s^{-3}$ |
| coulomb | C | $A\ s$ | |
| volt | V | $J\ C^{-1}$ | $kg\ m^2\ s^{-3}\ A^{-1}$ |
| ohm | Ω | $V\ A^{-1}$ | $kg\ m^2\ s^{-3}\ A^{-2}$ |
| frequency | Hz | $s^{-1}$ | |
| farad | F | $C\ V^{-1}$ | $kg^{-1}\ m^{-2}\ s^4\ A^2$ |
| tesla | T | $N\ A^{-1}\ m^{-1}$ | $kg\ s^{-2}\ A^{-1}$ |
| weber | Wb | $T\ m^2$ | $kg\ m^2\ s^{-2}\ A^{-1}$ |
| bequerel | Bq | $s^{-1}$ | |
| pascal | Pa | $N\ m^{-2}$ | $kg\ m^{-1}\ s^{-2}$ |

**Useful equivalences:**

$$N\ kg^{-1} \equiv m\ s^{-2}$$

$$N\ m^{-1} \equiv kg\ s^{-2}$$

$$N\ C^{-1} \equiv V\ m^{-1}$$

$$N\ s \equiv kg\ m\ s^{-2}$$

And many more that I can't think of at the moment!

**Physicists know how big things are!**

| Prefix | Symbol | Multiplier |
|---|---|---|
| giga | G | $10^{9}$ |
| mega | M | $10^{6}$ |
| kilo | k | $10^{3}$ |
| centi | c | $10^{-2}$ |
| milli | m | $10^{-3}$ |
| micro | μ | $10^{-6}$ |
| nano | n | $10^{-9}$ |
| pico | p | $10^{-12}$ |

And using some of the above, they can tell you that, approximately:

| | |
|---|---|
| Mass of an adult | 75 kg |
| Density of liquids | 1000 kg $m^{-3}$ |
| Density of gases | 1 kg $m^{-3}$ |
| A year consists of | $3 \times 10^{7}$ s |
| Mains frequency | 50 Hz |
| 50 miles per hour | 80 kph |
| 80 kilometres per hour | 22 m $s^{-1}$ |
| 1 horse power | 750 W |
| Diameter of an atom | $10^{-10}$ m |
| Diameter of a nucleus | $10^{-14}$ m |
| Earth's magnetic field | $5 \times 10^{-6}$ T |
| Earth's electric field | 100 V $m^{-1}$ |
| 1 square millimetre | $1 \times 10^{-6}$ $m^{2}$ |
| 1 electron volt | $1.6 \times 10^{-19}$ J |