Topic 1 Physical quantities and units

Summary

- All physical quantities have a magnitude (size) and a unit.
- The SI base units of mass, length, time, electric current, thermodynamic temperature and amount of substance are the kilogram, metre, second, ampere, kelvin and mole respectively.
- Units of all mechanical, electrical, magnetic and thermal quantities may be derived in terms of these base units.
- Physical equations must be homogeneous (balanced). Each term in an equation must have the same base units.
- The convention for printing headings in tables of data, and for labelling graph axes, is the symbol for the physical quantity (in *italic*), followed by a forward slash, followed by the abbreviation for the unit (in roman). In handwriting, one cannot distinguish between italic and roman type.
- The order of magnitude of a number is the power of ten to which the number is raised. The order of magnitude can be used to make a check on whether a calculation gives a sensible answer.
- A scalar quantity has magnitude only.
- A vector quantity has magnitude and direction.
- A vector quantity may be represented by an arrow, with the length of the arrow drawn to scale to give the magnitude.
- The combined effect of two (or more) vectors is called the resultant.
- Coplanar vectors may be added (or subtracted) using a vector diagram.
- The resultant may be found using a scale drawing of the vector diagram, or by calculation.
- A single vector may be divided into two separate components.
- The dividing of a vector into components is known as the resolution of the vector.
- In general, a vector is resolved into two components at right angles to each other.

Definitions and formulae

- SI base quantities and their units: mass (kg), length (m), time (s), current (A), temperature (K), amount of substance (mol).
- Prefixes:

Prefix	Symbol	Multiplying factor
tera	T	10^{12}
giga	G	10^{9}
mega	M	10^{6}
kilo	k	10^{3}
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}

- A scalar only has magnitude; a vector has magnitude and direction.
- The resolved components of a vector of magnitude V acting at an angle θ to the horizontal are $V \cos \theta$ horizontally and $V \sin \theta$ vertically.