Formulae for relationships between physical quantities

The relationships listed below should not be provided for AS and A level candidates.

- (i) the relationship between speed, distance and time: $v = \frac{s}{t}$
- (ii) the relationship between force, mass and acceleration:

force = mass x acceleration
$$F = m a$$

- (iii) the relationship between density, mass and volume: $D = \frac{m}{V}$
- (iv) the concept of momentum and its conservation:

momentum = mass x velocity
$$p = m v$$

- (v) the relationships between force, distance, work, power and time: work done = force x distance moved in direction of force
- (vi) the relationships between mass, weight, potential energy and kinetic energy: weight = mass x gravitational field strength kinetic energy = $\frac{1}{2} m v^2$ change in potential energy = mass × gravitational field strength × change in height
- (vii) the relationship between an applied force, the area over which it acts and the resulting pressure:

$$P = \frac{F}{A}$$

- (viii) the Gas Law: pressure \times volume = number of moles \times molar gas constant \times absolute temperature $p \ V = n \ R \ T$
- (ix) the relationships between charge, current, potential difference, resistance and electrical power: charge = current × time

$$\Delta Q = I \Delta t$$
potential difference = current × resistance
 $V = I R$
electrical power = potential difference × current
 $P = V I$

(x) the relationship between potential difference, energy and charge:

$$V = \frac{E}{Q}$$

(xi) the relationship between resistance and resistivity:

$$R = \frac{\rho l}{A}$$

- (xii) the relationship between charge flow and energy transfer in a circuit: energy = potential difference \times current \times time E = VIt
- (xiii) the relationship between speed, frequency and wavelength: wave speed = frequency x wavelength $v = f \lambda$
- (xiv) the relationship between centripetal force, mass, speed and radius:

$$F = \frac{mv^2}{r}$$

(xv) the inverse square laws for force in radial electric and gravitational fields:

$$F = \frac{kQ_1Q_2}{r^2}$$
$$F = \frac{Gm_1m_2}{r^2}$$

(xvi) the relationship between capacitance, charge and potential difference:

$$C = \frac{Q}{V}$$

(xvii) the relationship between the potential difference across the coils in a transformer and the number of turns in them:

 $\frac{\text{pd across primary coil}}{\text{pd across secondary coil}} = \frac{\text{number of turns on primary coil}}{\text{number of turns on secondary coil}}$