Appendix 5: formulae and relationships

The Advanced Subsidiary (AS) and Advanced (A) GCE Specifications Subject Criteria for physics issued by QCA specify that certain relationships and formulae should not be provided to students in examinations. This is mandatory for all awarding bodies.

The relationships listed below will *not* be provided for Advanced Subsidiary and Advanced GCE students.

(i) the relationship between speed, distance and time:

$$speed = \frac{distance}{time\ taken}$$

(ii) the relationship between force, mass and acceleration:

$force = mass \times acceleration \qquad F = ma$

$$acceleration = \frac{change\ in\ velocity}{time\ taken}$$

(iii) the relationship between density, mass and volume:

$$density = \frac{mass}{volume}$$

(iv) the concept of momentum and its conservation:

$momentum = mass \times velocity \qquad p = mv$

(v) the relationships between force, distance, work, power and time:

$work\ done = force \times distance\ moved\ in\ direction\ of\ force$

$$power = \frac{energy\ transferred}{time\ taken} = \frac{work\ done}{time\ taken}$$

(vi) the relationships between mass, weight, potential energy and kinetic energy:

$weight = mass \times gravitational\ field\ strength$

$kinetic\ energy = ½ \times mass \times speed^2$

$change\ in\ potential\ energy = mass \times gravitational\ field\ strength \times change\ in\ height$

(vii) the relationship between an applied force, the area over which it acts and the resulting pressure:

$$pressure = \frac{force}{area}$$

(viii) the Gas Law:

$pressure \times volume = number\ of\ moles \times molar\ gas\ constant \times absolute\ temperature$

$pV = nRT$

(ix) the relationships between charge, current, potential difference, resistance and electrical power:

$charge = current \times time$ $\Delta q = I\Delta t$

$potential\ difference = current \times resistance$ $V = IR$

$electrical\ power = potential\ difference \times current$ $P = VI$

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

$$potential\ difference = \frac{energy\ transferred}{charge} \qquad V = W/q$$

(xi) the relationship between resistance and resistivity:

$$resistance = \frac{resitivity \times length}{cross\text{-}sectional\ area} \qquad R = \rho l/A$$

(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:

$wave\ speed = frequency \times wavelength$ $v = f\lambda$

(xiv) the relationship between centripetal force, mass, speed and radius:

$$centripetal\ force = \frac{mass \times speed^2}{radius} \qquad F = mv^2/r$$

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

$F = kq_1q_2/r^2$ $F = Gm_1m_2/r^2$

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

$$capacitance = \frac{charge\ stored}{potential\ difference}$$

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

$$\frac{potential\ difference\ across\ coil\ 1}{potential\ difference\ across\ coil\ 2} = \frac{number\ of\ turns\ in\ coil\ 1}{number\ of\ turns\ in\ coil\ 2} \qquad \frac{V_1}{N_1} = \frac{V_2}{N_2}$$