

Work, energy and power

Cambridge International AS & A Level Physics

Unlike IGCSE, 9702 gives you a data sheet: it is page 2 of Papers 1, 2 and 4, with more formulae on page 3 of Paper 4. Everything marked GIVEN is printed for you; everything else you must recall. Compiled by GioPhysics from the published syllabus. This is an independent study aid, not a Cambridge document; the official syllabus is the authority.

5.1 Energy conservation

AS Work done by a force

$$W = Fs \cos \theta$$

W — work done (J)

F — force (N)

s — displacement (m)

θ — angle between force and displacement ($^\circ$)

Work is force $\times$ displacement in the direction of the force.

AS Power

$$P = W / t$$

P — power (W)

W — work done (J)

t — time (s)

AS Power of a force moving at constant velocity

$$P = Fv$$

P — power (W)

F — force (N)

v — velocity (m s^{-1})

The syllabus asks you to derive this one.

AS Efficiency

$$\text{efficiency} = \text{useful energy output} / \text{total energy input}$$

energy — or power, in the same unit top and bottom

5.2 Gravitational potential energy and kinetic energy

AS Change in gravitational potential energy

$$EP = mgh$$

EP — change in g.p.e. (J)

m — mass (kg)

g — gravitational field strength (N kg^{-1})

h — change in height (m)

For a uniform field. Derived from $W = Fs$.

AS Kinetic energy

$$EK = \frac{1}{2}mv^2$$

EK — kinetic energy (J)

m — mass (kg)

v — speed (m s^{-1})

The syllabus asks you to derive this from the equations of motion.