

Oscillations

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.

17.1 Simple harmonic oscillations

A LEVEL Defining equation of s.h.m.

$$a = -\omega^2 x$$

a — acceleration (m s^{-2})

ω — angular frequency (rad s^{-1})

x — displacement from equilibrium (m)

A LEVEL Displacement in s.h.m.

$$x = x_0 \sin \omega t$$

x_0 — amplitude (m)

t — time (s)

A solution of $a = -\omega^2 x$.

A LEVEL Velocity in s.h.m.

$$v = v_0 \cos \omega t \quad \cdot \quad v = \pm \omega \sqrt{x_0^2 - x^2}$$

v_0 — maximum speed, $= \omega x_0$ (m s^{-1})

x_0 — amplitude (m)

17.2 Energy in simple harmonic motion

A LEVEL Total energy of an oscillator

$$E = \frac{1}{2} m \omega^2 x_0^2$$

E — total energy (J)

m — mass (kg)

ω — angular frequency (rad s^{-1})

x_0 — amplitude (m)