

Waves

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.

7.1 Progressive waves

AS The wave equation

$$v = f\lambda$$

$$f = v / \lambda \quad \cdot \quad \lambda = v / f$$

v — wave speed (m s^{-1})

f — frequency (Hz)

λ — wavelength (m)

The syllabus asks you to derive it from the definitions of speed, frequency and wavelength.

AS Intensity

$$\text{intensity} = \text{power} / \text{area}$$

I — intensity (W m^{-2})

P — power (W)

A — area (m^2)

AS Intensity and amplitude

$$\text{intensity} \propto (\text{amplitude})^2$$

$I \propto A^2$ — for a progressive wave

7.3 Doppler effect for sound waves

AS Observed frequency from a moving source

$$f_o = f_s v / (v \pm v_s)$$

f_o — observed frequency (Hz)

f_s — source frequency (Hz)

v — speed of sound (m s^{-1})

v_s — speed of the source (m s^{-1})

Minus when the source approaches, plus when it recedes.

7.5 Polarisation

AS Malus's law

$$I = I_0 \cos^2 \theta$$

I — transmitted intensity (W m^{-2})

I_0 — intensity of the plane-polarised wave (W m^{-2})

θ — angle between the polariser axes ($^\circ$)