Waves

Cambridge IGCSE Physics

> *The syllabus introduces every one with the words "recall and use", and 0625 provides no formula sheet in any paper. Compiled by GioPhysics from the published syllabus. This is an independent study aid, not a Cambridge document; the official syllabus is the authority.*

3.1 General properties of waves

CORE

Wave speed

$$v = f\lambda$$

`f = v / λ` · `λ = v / f`

- v — wave speed (m/s)
- f — frequency (Hz, kHz)
- λ — wavelength (m, cm)

3.2.1 Reflection of light

CORE

Law of reflection

$$\text{angle of incidence} = \text{angle of reflection}$$

- i — angle of incidence, from the normal (degree (°))
- r — angle of reflection, from the normal (degree (°))

3.2.2 Refraction of light

SUPP.

Refractive index from angles

$$n = \frac{\sin i}{\sin r}$$

`sin r = sin i / n`

- n — refractive index
- i — angle of incidence (degree (°))
- r — angle of refraction (degree (°))

SUPP.

Refractive index from the critical angle

$$n = \frac{1}{\sin c}$$

`sin c = 1 / n`

- n — refractive index
- c — critical angle (degree (°))

SUPP.

Refractive index as a ratio of speeds

$$n = \text{speed in region 1} / \text{speed in region 2}$$

- n — refractive index

The syllabus defines refractive index as the ratio of the speeds of a wave in two different regions.

3.2.3 Thin lenses

No equations. 0625 examines lenses through ray diagrams and image characteristics — the lens equation is not required.

3.3 Electromagnetic spectrum

SUPP.

Speed of electromagnetic waves

$$c = 3.0 \times 10^8 \text{ m/s}$$

c — speed in a vacuum (m/s)

Approximately the same in air. All electromagnetic waves travel at this speed in a vacuum, which Core candidates must know qualitatively.

3.4 Sound

CORE
DERIVED

Speed of sound by an echo

$$v = 2d / t$$

v — speed of sound (m/s)
d — distance to the reflecting surface (m)
t — time for the echo to return (s)

Not printed in the syllabus: it is v = s/t with the pulse counted there and back. The syllabus asks for a method involving a measurement of distance and time.

SUPP.
DERIVED

Depth or distance from an ultrasound pulse

$$d = vt / 2$$

d — depth or distance (m)
v — wave speed in the medium (m/s)
t — time for the pulse to return (s)

Not printed in the syllabus: it is v = s/t with the pulse counted there and back. The syllabus requires depth or distance to be calculated from time and wave speed for sonar, medical scanning and non-destructive testing.