

Exercise walk-through

General properties of waves ■ 3.1

eXercise

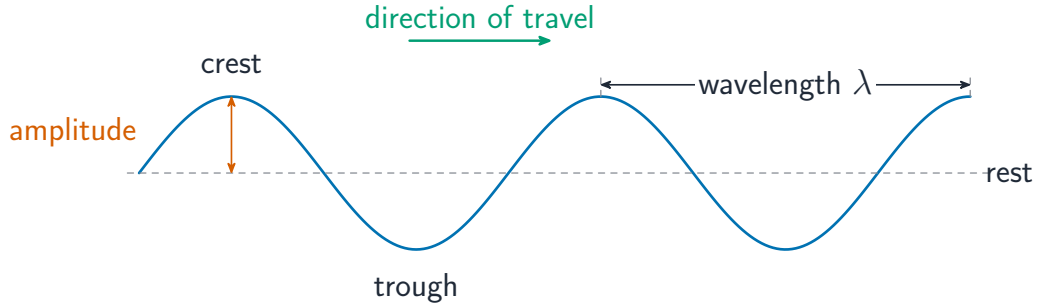
You must be able to

- use $v = f\lambda$ and define wavelength, frequency, amplitude
- distinguish transverse and longitudinal waves
- describe reflection, refraction and diffraction

Method — The wave equation

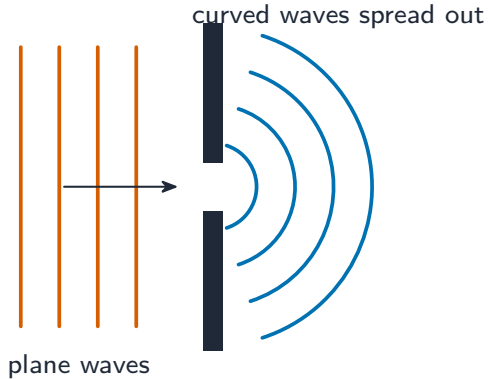
Sound $v = 340 \text{ m/s}$, $f = 170 \text{ Hz}$: $\lambda = \frac{v}{f} = \frac{340}{170} = 2.0 \text{ m}.$

Method — The wave equation



A transverse wave with wavelength, amplitude, crest and trough labelled

Method — The wave equation



Plane waves spreading out through a narrow gap

Practice 2.1 ■ 2 marks

A wave has frequency 50 Hz and wavelength 0.40 m. Find its speed.

Solution 2.1

Method: The wave equation

Worked steps

$$v = f\lambda = 50 \times 0.40 = 20 \text{ m/s} \quad \text{M1} \quad \text{A1}.$$

Practice 2.2 ■ 1 mark

State the difference between a transverse and a longitudinal wave.

Solution 2.2

Method: The wave equation

Worked steps

in a transverse wave the particles vibrate at right angles to the travel direction; in a longitudinal wave they vibrate along it **B1**.

Exam-style 3.1 ■ 1 mark

The number of complete waves passing a point each second is the:

A wavelength

B amplitude

C frequency

D wave speed

Solution 3.1

A wavelength

B amplitude

C frequency



D wave speed

Worked steps

C. Frequency is the number of waves per second.

Exam-style 3.2 ■ 2 marks

Water waves of wavelength 0.020 m travel at 0.30 m/s .

- (a) Find their frequency.
- (b) State and explain what happens to the waves as they pass through a gap about 0.02 m wide.

Solution 3.2

Method: The wave equation

Worked steps

(a) $f = \frac{v}{\lambda} = \frac{0.30}{0.020} = 15 \text{ Hz}$ **M1** **A1**.

(b) the waves spread out (diffract) **M1**; because the gap is about the same size as the wavelength **A1**.

Exam-style 3.3 ■ 2 marks

A radio wave has a speed of 3.0×10^8 m/s and a frequency of 1.0×10^8 Hz. Find its wavelength.

Solution 3.3

Method: The wave equation

Worked steps

$$\lambda = \frac{v}{f} = \frac{3.0 \times 10^8}{1.0 \times 10^8} = 3.0 \text{ m} \quad \text{M1} \quad \text{A1}.$$