

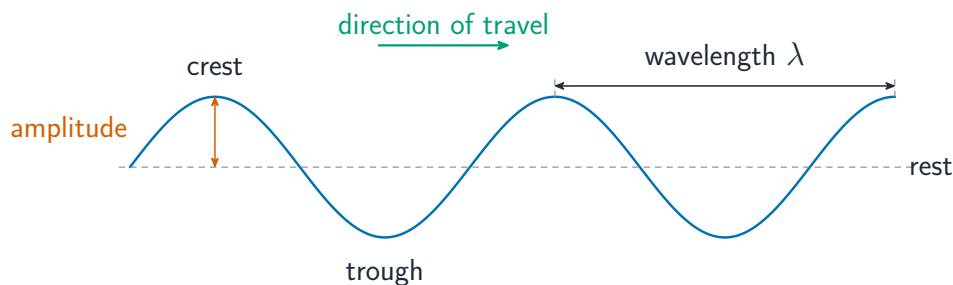
Exercise walk-through

3.1

General properties of waves

IGCSE Physics

Describing a wave



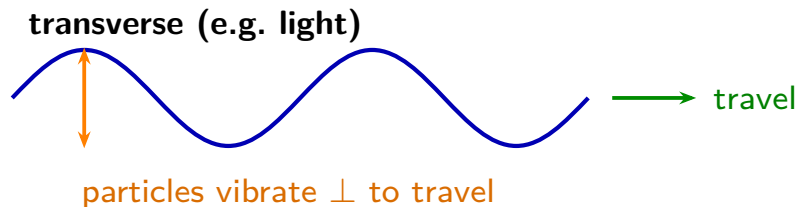
A **wave** carries **energy**, not **matter**.

$$v = f\lambda.$$

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

$$\lambda = \frac{340}{170} = 2.0 \text{ m}$$

Two types; three behaviours



longitudinal (e.g. sound)



transverse $\perp$, longitudinal $\parallel$

- **transverse** – particles $\perp$ travel (light, water)
- **longitudinal** – particles $\parallel$ travel (sound)

All waves **reflect**, **refract** and **diffract**. Speed $v = f\lambda$.

Exercises 2.1·2.2

2.1 A wave has frequency 50 Hz and wavelength 0.40 m. Find its speed. [2]

2.2 State the difference between a transverse and a longitudinal wave. [1]

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2.1 A wave has frequency 50 Hz and wavelength 0.40 m. Find its speed. [2]

2.1

- $v = f\lambda$

$$v = f\lambda = (50 \text{ Hz})(0.40 \text{ m}) = \mathbf{20} \frac{\text{m}}{\text{s}}$$

2.2 State the difference between a transverse and a longitudinal wave. [1]

2.2

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

Exercise 3.1

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

[1]

☐

A wavelength

B amplitude

C frequency

D wave speed

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[1]

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A wavelength

B amplitude

C frequency

D wave speed

3.1 C

- frequency is the number of waves per second

Exercise 3.2 (a)

3.2 Water waves of wavelength 0.020 m travel at $0.30 \frac{\text{m}}{\text{s}}$.

(a) Find their frequency.

[2]

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3.2 Water waves of wavelength 0.020 m travel at $0.30 \frac{\text{m}}{\text{s}}$.

(a) Find their frequency.

[2]

(a) $f = v/\lambda$

$$f = \frac{v}{\lambda} = \frac{0.30 \frac{\text{m}}{\text{s}}}{0.020 \text{ m}} = \mathbf{15 \text{ Hz}}$$

Exercise 3.2 (b)

3.2 Water waves of wavelength 0.020 m travel at $0.30 \frac{\text{m}}{\text{s}}$.

(b) State and explain what happens to the waves as they pass through a gap about 0.02 m wide. [2]

Exercise 3.2 (b)

3.2 Water waves of wavelength 0.020 m travel at $0.30 \frac{\text{m}}{\text{s}}$.

(b) State and explain what happens to the waves as they pass through a gap about 0.02 m wide. [2]

(b) the waves spread out (diffract)

- because the gap is about the same size as the wavelength

Exercise 3.3

3.3 A radio wave has a speed of $3.0 \times 10^8 \frac{\text{m}}{\text{s}}$ and a frequency of $1.0 \times 10^8 \text{ Hz}$. Find its wavelength. [2]

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3.3

- $\lambda = v/f$

$$\lambda = \frac{3.0 \times 10^8 \frac{\text{m}}{\text{s}}}{1.0 \times 10^8 \text{ Hz}} = \mathbf{3.0 \text{ m}}$$