IGCSE PHYSICS • EXERCISE SHEET

3.1 General properties of waves

Name: _____ Class: _____ Date: _____ **Total: 10 marks**

Objective

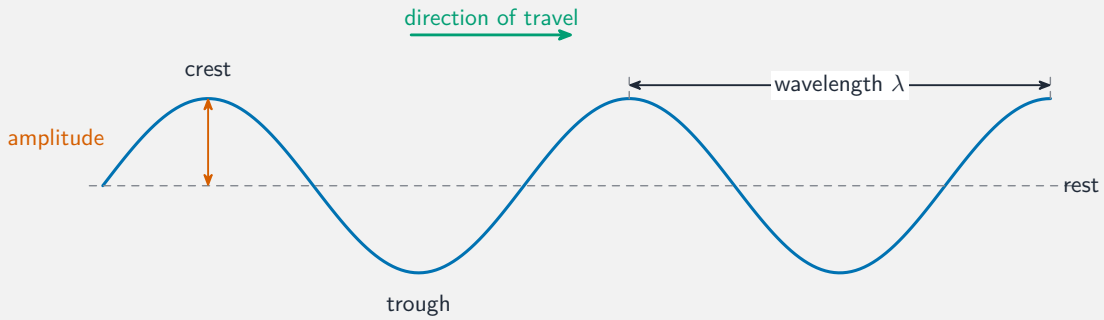
Build the skills to answer exam questions on the **general properties of waves** 波的性质—the wave terms, the **wave equation** $v = f\lambda$, transverse vs longitudinal, and reflection/refraction/**diffraction** 衍射.

You must be able to:

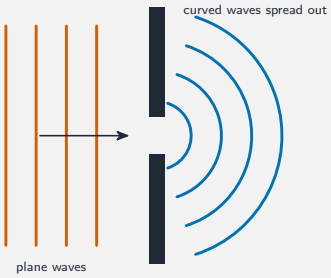
- use $v = f\lambda$ and define wavelength, frequency, amplitude
- distinguish transverse and longitudinal waves
- describe reflection, refraction and diffraction

1 Worked examples

The wave equation



Wavelength = crest-to-crest distance; amplitude = rest-to-crest height; $v = f\lambda$



Diffraction is strongest when the gap is about one wavelength wide

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

2 Practice

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]

3 Exam-style questions

3.1 The number of complete waves passing a point each second is the: [1]

- **A** wavelength
- **B** amplitude
- **C** frequency
- **D** wave speed

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

(a) Find their frequency. [2]

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

3.3 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. [2]

4 Go further

You are now ready for the real exam questions on this subtopic. Open the **3.1 General properties of waves** past-paper sheet in the Library, or try these in **Practice mode**:

- 0625/21 N25 —Q18 (waves / diffraction)
- 0625/22 N25 —Q17 (wave properties)
- 0625/21 J25 —Q17 (waves)

Solutions

2.1 $v = f\lambda = 50 \times 0.40 = 20$ m/s.

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

3.1 C. Frequency is the number of waves per second.

3.2 (a) $f = \dfrac{v}{\lambda} = \dfrac{0.30}{0.020} = 15$ Hz.
(b) the waves spread out (diffract); because the gap is about the same size as the wavelength.

3.3 $\lambda = \dfrac{v}{f} = \dfrac{3.0 \times 10^8}{1.0 \times 10^8} = 3.0$ m.