3.1 Wave properties and the EM spectrum

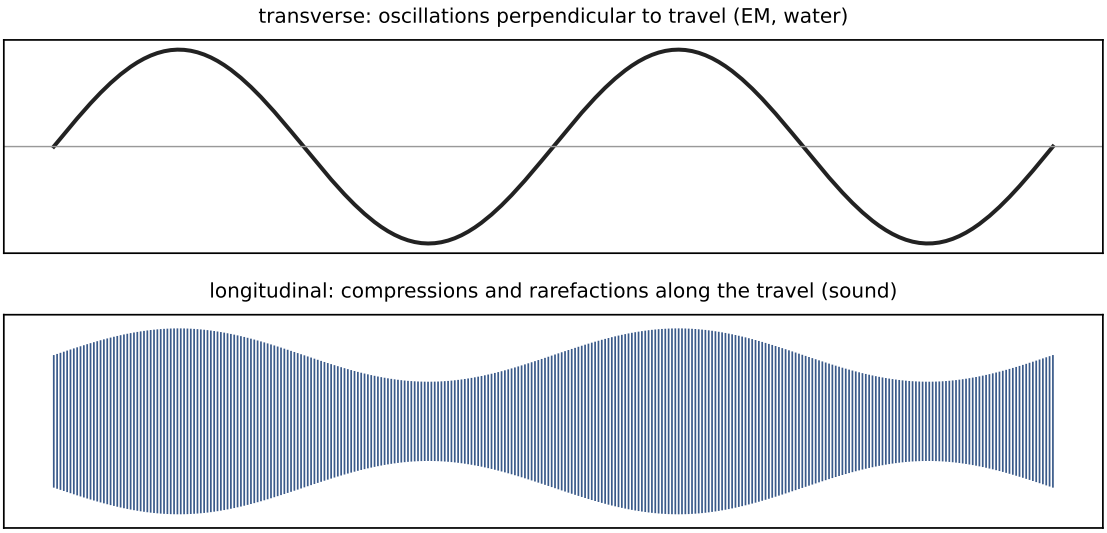
Name: _____ Class: _____ Date: _____ **Total: 17 marks**

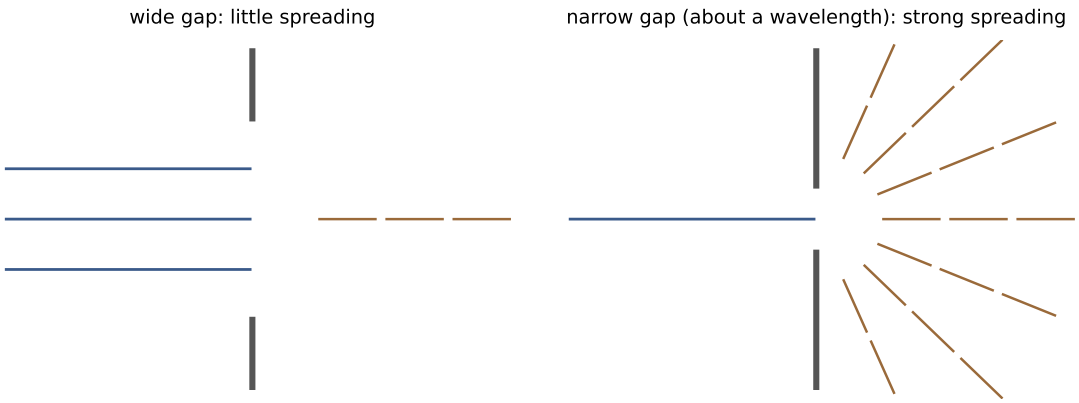
Objective

Cover wave properties and the EM spectrum (3.3.1–3.3.2): transverse and longitudinal waves, boundary behaviour, diffraction, v = fλ, the spectrum's order with uses and hazards, infrared emission and X-rays. Original OxfordAQA practice.

1 Key knowledge and worked examples

■ The model





$v = f\lambda$; at boundaries waves reflect, transmit or absorb.

Spectrum order and hazards

Radio → microwave → infrared → visible → UV → X-ray → gamma. Hazards climb with energy: heating (micro/IR), ionising (UV up).

2 Practice

2.1 Name one transverse and one longitudinal wave. [2]

2.2 A wave has wavelength 2.5 m and frequency 60 Hz. Calculate its speed. [2]

2.3 State what happens to a wave at a boundary between two materials. [2]

2.4 When does a gap diffract waves strongly? [1]

2.5 Name the EM family used for satellite TV. [1]

3 Exam-style questions

3.1 A radio station broadcasts at 200 MHz. Calculate the wavelength (speed 3×10^8 m/s). [3]

3.2 Explain why radio reception is often possible behind hills, using diffraction. [2]

3.3 Give one use and one hazard each of ultraviolet and X-rays. [4]

Solutions

2.1 Transverse – light/water waves; longitudinal – sound.

2.2 $v = 60 \times 2.5 = 150$ m/s.

2.3 Reflected, transmitted or absorbed (or a combination).

2.4 When the gap width is comparable to the wavelength.

2.5 Microwaves.

3.1 $\lambda = v/f = (3 \times 10^8)/(200 \times 10^6) = 1.5$ m.

3.2 Radio wavelengths are comparable to the hill's size, so the waves diffract around it and reach the far side.

3.3 UV: use – security marking; hazard – skin cancer/blindness. X-rays: use – medical imaging; hazard – high doses kill cells (ionising).