

Exercise walk-through

3.1

Wave properties and the EM spectrum

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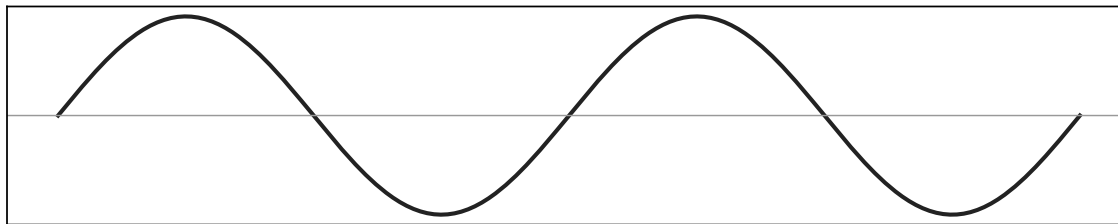
1

The method

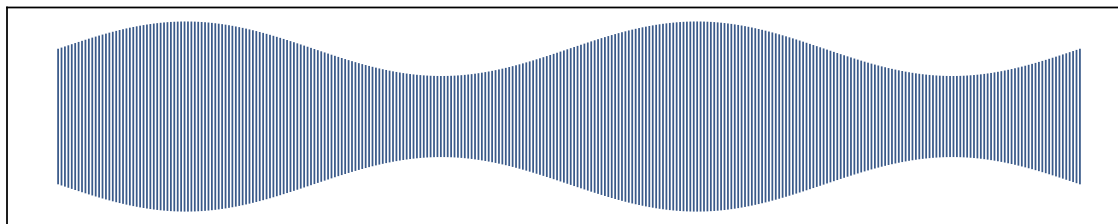
Method — The model

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

transverse: oscillations perpendicular to travel (EM, water)



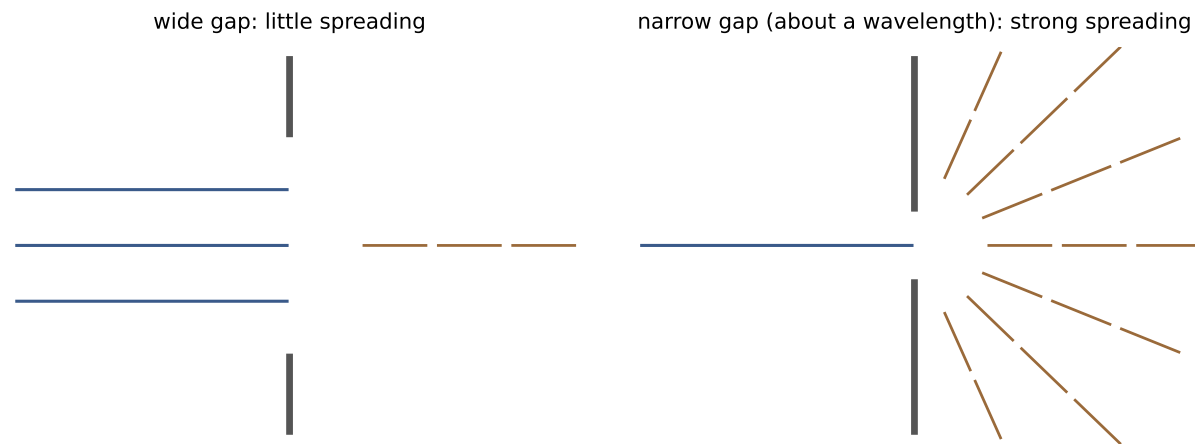
longitudinal: compressions and rarefactions along the travel (sound)



Transverse oscillates across the travel; longitudinal compresses along it.

Method — The model

at boundaries waves reflect, transmit or absorb



Wide gap: little spreading; gap near the wavelength: strong spreading.

Exercises 2.1·2.3

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]

Exercises 2.1·2.3

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

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

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

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

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

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

Exercises 2.4·3.1

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

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

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

Exercises 2.4·3.1

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

2.4 When the gap width is comparable to the wavelength.

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

2.5 Microwaves.

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

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

Exercises 3.2-3.3

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]

Exercises 3.2-3.3

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

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

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

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