

Question 25 (Answer: **A**)

- 5.0×10^{-6} m is 5000 nm, well beyond the red end of the visible range.
- That is infrared, so the eye cannot detect it.
- B and C are false for all electromagnetic waves, and D describes a mechanical wave.

Question 27 (Answer: **C**)

- Visible light runs from about 400 nm to 700 nm, that is 4×10^{-7} to 7×10^{-7} m.
- Green sits near the middle, around 550 nm = 5.5×10^{-7} m.
- A and B are X-ray wavelengths; D is just past the red end, in the infrared.

Question 5 (Answer: **A**)

- The pulse travels there and back, so the one-way time is $3960/2 = 1980$ s.
- $d = ct = 3.0 \times 10^8 \times 1980 = 5.94 \times 10^{11}$ m.
- The options are in kilometres, so that is 5.94×10^8 km – C is the same figure left in metres.

Question 27 (Answer: **C**)

- Convert every option to metres first – that is the whole question.
- A is 4.5×10^{-7} m, B is 6.2×10^{-7} m and D is 4.2×10^{-7} m, all inside the visible 400–700 nm band.
- C is 5.4×10^{-8} m = 54 nm, which is ultraviolet and so invisible.

Question 23 (Answer: **D**)

- Electromagnetic waves are transverse.
- In free space they all travel at the same speed, $c = 3.0 \times 10^8$ m s⁻¹, whatever the wavelength.
- Only inside a medium does the speed start to depend on wavelength.

Question 22 (Answer: **A**)

- All electromagnetic waves are transverse – electric and magnetic fields oscillating at right angles to the travel direction.
- None of them is longitudinal.
- They all travel through free space, at 3.0×10^8 m s⁻¹.

Question 23 (Answer: **D**)

- Infrared lies just beyond the red end of the visible spectrum, so it begins around 700–800 nm.
- It extends to about 1 mm, where the microwave region takes over.
- A is ultraviolet, B is radio, and C is the visible range itself.