

Wavelength, frequency and how waves behave

Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Test answers (mark scheme)

Mark as shown. Accept answers that are worded differently but scientifically equivalent. Apply follow-through where an earlier error is carried into a later calculation, and do not penalise sensible rounding to 2 or 3 significant figures.

Level: Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** HS-PS4-1, GCSE P6

Question 1 Two types of wave (2 marks)

- a. A wave in which the vibrations are at right angles to the direction of travel of the wave (energy).
- b. Sound, a compression wave on a slinky, or a P-wave in an earthquake.

Marking: 1 mark each part.

Question 2 Wave speed (3 marks)

$$v = f \lambda = 12 \times 0.35 = \mathbf{4.2 \text{ m/s.}}$$

Marking: equation (1), substitution (1), answer with unit (1).

Question 3 Wave on a spring (4 marks)

- a. 4 cm.
- b. 20 cm.
- c. $f = v / \lambda = 40 / 20 = \mathbf{2.0 \text{ Hz.}}$
- d. $T = 1 / f = 1 / 2.0 = \mathbf{0.50 \text{ s.}}$

Marking: 1 mark each part.

Question 4 Moving into shallow water (3 marks)

(a) The speed decreases. (b) The wavelength decreases. (c) The frequency does not change.

Marking: 1 mark each.

Question 5 Reflection angle (3 marks)

The wavefront is at 25° to the barrier, so the ray meets the normal at $90^\circ - 25^\circ = 65^\circ$.

Angle of incidence = $\mathbf{65^\circ}$. By the law of reflection, angle of reflection = $\mathbf{65^\circ}$. The law: angle of incidence = angle of reflection.

Marking: 65° (1); 65° (1); law stated (1).

Question 6 Diffraction (2 marks)

The waves spread out strongly (diffract) after a gap of about one wavelength. A gap ten times as wide gives little spreading because the gap is much larger than the wavelength.

Marking: strong spreading for 2 cm gap (1); little spreading for 20 cm gap because gap much greater than λ (1).

Question 7 Counting waves (2 marks)

$T = 1 / 0.20 = 5.0$ s. In 60 s the number of waves is $60 \times 0.20 = \mathbf{12 \text{ waves}}$.

Marking: period (1); number of waves (1).

Question 8 Unchanged quantity (1 mark)

The frequency.

Marking: 1 mark.