

Question 25 (Answer: **B**)

- Count the wavelengths between P and Q: they are $1\frac{1}{4}$ wavelengths apart.
- Each whole wavelength is 360° , so $1.25 \times 360 = 450^\circ$.
- A phase difference above 360° is perfectly normal for points more than one wavelength apart.

Question 26 (Answer: **D**)

- Read the amplitudes off the graph: X is 0.40 cm and Y is 0.75 cm.
- Intensity is proportional to the *square* of the amplitude.
- $(0.75/0.40)^2 = 1.875^2 = 3.5$, so wave Y has intensity $3.5I$; C is the ratio without squaring.

Question 24 (Answer: **D**)

- The wave moves to the right, so P next takes on the displacement of the string just to its left – which is below the axis.
- P is therefore moving downwards at $t = 0$, and since it sits at zero displacement it is at maximum speed.
- So the velocity starts at its largest *negative* value; C has the right shape but starts at zero.

Question 26 (Answer: **A**)

- A phase difference of 270° is three quarters of a wavelength along the string.
- One wavelength is the distance between successive crests, so measure $\frac{3}{4}$ of that from X.
- For comparison, a whole wavelength apart is in phase and half a wavelength apart is antiphase.

Question 24 (Answer: **D**)

- In a transverse wave a particle moves fastest as it passes through zero displacement.
- At a crest or a trough it is momentarily at rest before reversing.
- So the fastest particle is the one sitting on the axis, not the one at the largest displacement.

Question 26 (Answer: **B**)

- Measure one whole cycle crest to crest: it spans 3.5 divisions.
- With the time-base at $300 \mu\text{s}$ per division, $T = 3.5 \times 300 = 1050 \mu\text{s}$.
- $f = 1/(1.05 \times 10^{-3}) = 950 \text{ Hz}$; the y-gain plays no part in a frequency.

Question 20 (Answer: **B**)

- Amplitude is measured from the centre line to a peak: 3 divisions at 1 V per division is 3 V.
- One complete cycle spans 2 divisions, so $T = 2 \times 2.0 = 4.0 \text{ ms}$.
- $f = 1/(4.0 \times 10^{-3}) = 250 \text{ Hz}$; C and D take the peak-to-peak height as the amplitude.

5(a)	wavelength: - wavelength = distance between successive / adjacent in phase points / wavefronts / crests / troughs $\lambda = d / (\text{number of oscillations})$ frequency: - frequency = (number of) oscillations / cycles crests / troughs / wavefronts (passing a point) per unit time $f = (\text{number of oscillations}) / t$ One correct point from either list One correct point from both lists and speed = distance / time and one of: - wavelength $\times$ frequency (= distance per unit time) = speed $[(\text{number of oscillations}) / t] \times [d / (\text{number of oscillations})] = f\lambda$ $v (= d / t) = \lambda / (1/f) = f\lambda$ or $v (= d / t) = \lambda / T = f\lambda$
5(b)(i)	$T = 4 \times 10^{-3}$ $f = 1/T = 1/0.004$ $f = 250 \text{ Hz}$
5(b)(ii)	$f_0 = f_s v / (v - v_s)$ $250 = 236 \times v / (v - 20)$ $v = (250 \times 20) / (250 - 236)$ $= 360 \text{ m s}^{-1}$

3(a)	10.0 cm
3(b)(i)	$v = f\lambda$ $= 16 \times 0.40$ $= 6.4 \text{ m s}^{-1}$
3(b)(ii)	(X and Y have a) <u>constant</u> phase difference (of 180°) so (they are) coherent
3(c)	A single wave of amplitude 10.0 cm A single negative sine wave of wavelength 0.40 m
3(d)	$I \propto A^2$ $\frac{I_X}{I_Y} = 10^2 / 20^2$ ratio = 0.25

Question 25 (Answer: **B**)

- First the wavelength: $\lambda = v/f = 600/300 = 2.0 \text{ m}$.
- The two points are 0.50 m apart, which is a quarter of a wavelength.
- A whole wavelength is 360° , so a quarter is 90° .