



2024 Sec 4 Physics Assignment Answers Assignment 12 General Wave Properties

Note: Show all formulae & working steps!

1(a)

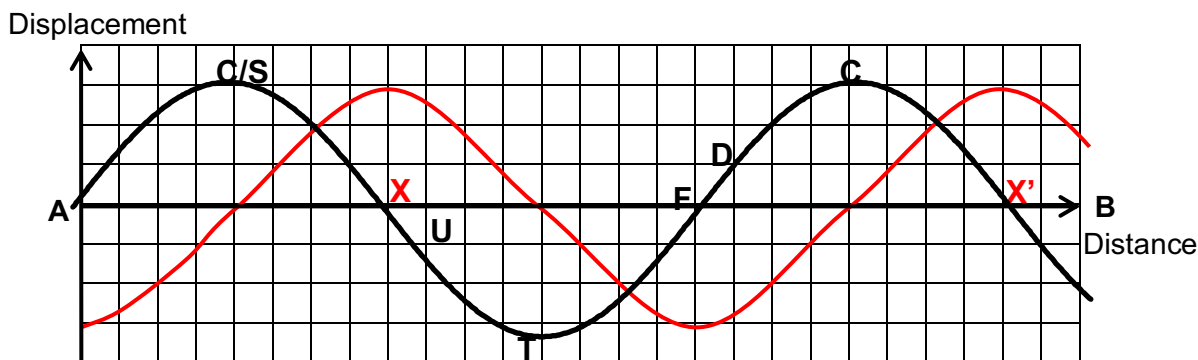


Fig. 1

- (i) the crest **C** and the trough **T**.
- (ii) Amplitude = $3 \times 0.5 = 1.5$ cm
- (iii) Wavelength = $16 \times 0.5 = 8.0$ cm
- (iv) points **X** and **X'** along **AB** that are in phase with each other.
(**XX'** are one wavelength apart)
- (v) **D** a particle which is on its way down.
- (vi) **U** a particle which is on its way up.
- (vii) **S** a particle which is momentarily at rest.
- (viii) **F** a particle which is travelling fastest.

(b)

- (i) $T = 16 \times 0.10 = 1.60$ s
- (ii) $f = 1/T = 0.625$ Hz

(c)

$$\begin{aligned}
 v &= f\lambda \\
 &= (0.625)(8.0) \\
 &= \underline{5.0 \text{ cm s}^{-1}}.
 \end{aligned}$$

(d)

see Fig. 1 above

$$\text{Distance travelled by wave to the right} = v \times t = 5.0 \times 0.40 = 2.0 \text{ cm}$$

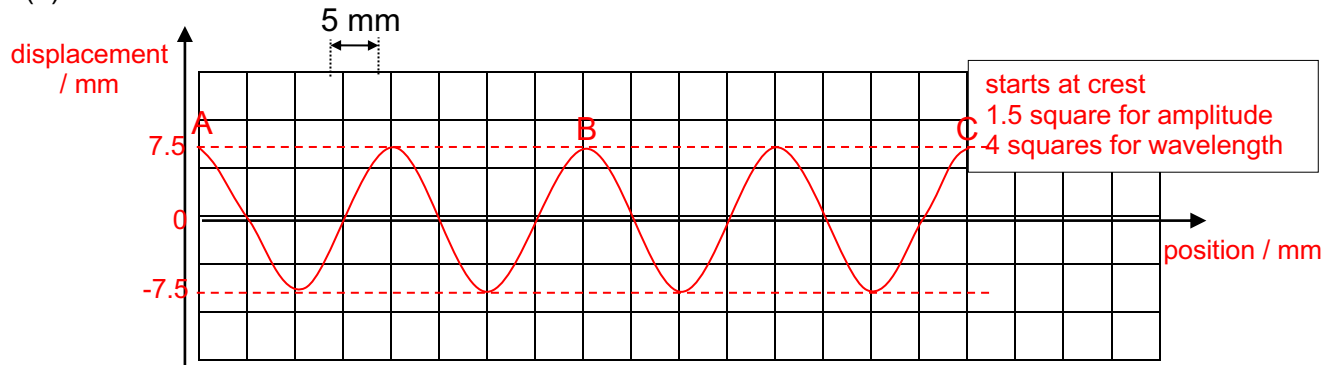
2

(a)

(i) the wavelength = $10.0 \text{ cm} \div 5 = \underline{2.00 \text{ cm}}$

(ii) the wave speed $v = f\lambda = 4.0 \times 2.00 = \underline{8.0 \text{ cm s}^{-1}}$

(b)



(c) Briefly describe the movement of the water particle at point C as the wave travels past.

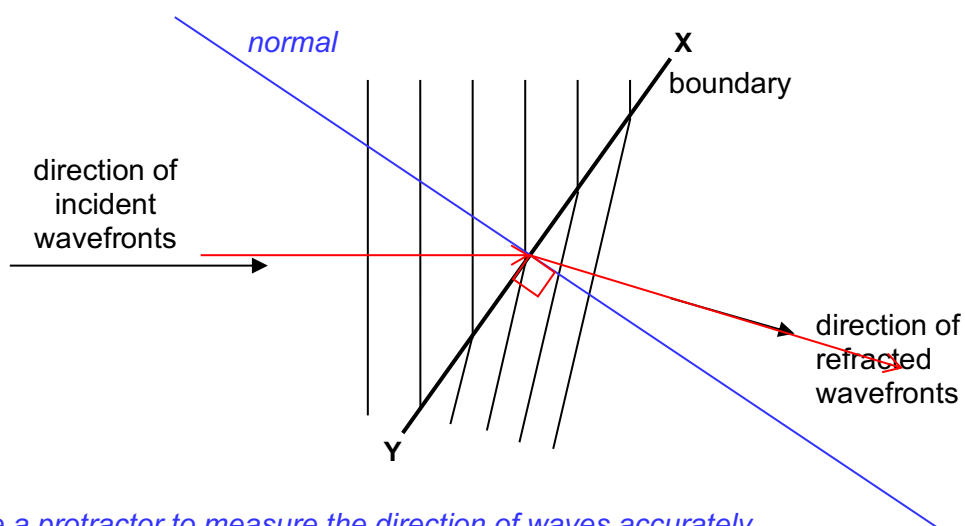
The water particle at C oscillates vertically as the wave travels past it.

Note: If > 1 mark: The water particle at C (crest) will accelerate vertically downwards then decelerate to a momentary stop at the trough. It will then accelerate upwards then decelerate to a stop at the crest. This oscillation of the particle is then repeated as the wave travels past.

(d) For the same frequency f ,

$$\frac{v_2}{v_1} = \frac{\lambda_2}{\lambda_1} \quad \rightarrow \quad \frac{\lambda_2}{\lambda_1} = 1.5 \quad \rightarrow \quad \lambda_2 = 1.5 \times 2.0 \text{ cm} = 3.0 \text{ cm}$$

3



Note: Use a protractor to measure the direction of waves accurately.
Direction of waves are at 90° to the wavefronts.

- (a) Describe how the initial incident wavefronts could be produced in a ripple tank.

A plane dipper (or horizontal wooden bar) just touching the surface of the water is attached to a motor vibrating with a frequency of 5.0 Hz.

- (b) Describe how you would arrange to bring about the refraction at XY.

A transparent Perspex block (or glass block) is submerged in the water to the right of XY to form a shallow region above the block.

- (c) Determine the following characteristics of the wave. Show all formulae and necessary working clearly.

speed of incident waves	$v = f \times \lambda = 5.0 \times 0.7 = 3.5 \text{ cm s}^{-1}$
frequency of refracted waves	$f = v / \lambda = 3.5 / 0.7 = 5.0 \text{ Hz}$ (same as incident waves)
speed of refracted waves	$v = f \times \lambda = 5.0 \times 0.4 = 2.0 \text{ cm s}^{-1}$