2025 Sec 4 Physics Assignment Answers
Assignment 12a General Properties of Waves

***Note**: Show all formulae & working steps!*

1(a)

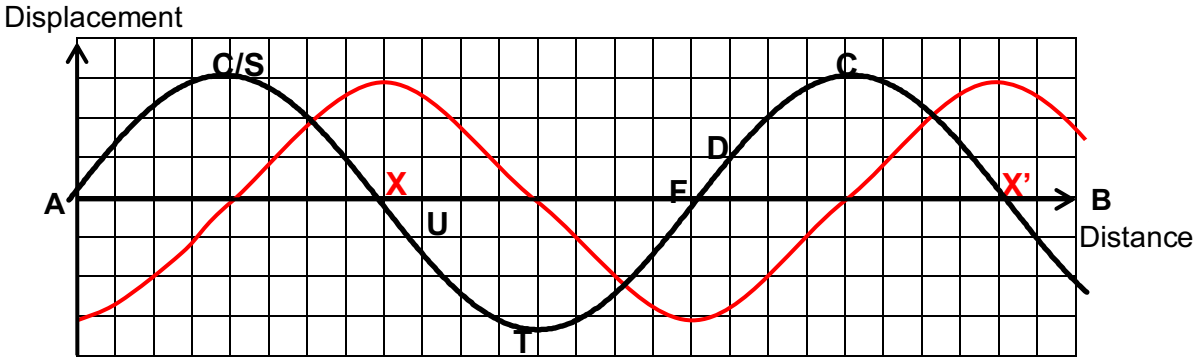


Fig. 1

(i) the crest **C** and the trough **T**.

(ii) Amplitude = 3×0.5 = 1.5 cm

(iii) Wavelength = 16×0.5 = 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 = 16×0.10 = 1.60 s

(ii) $f = 1/T$ = 0.625 Hz

(c) $v = f\lambda$
= (0.625)(8.0)
= $\underline{5.0\ cm\ s^{-1}}$.

(d) see Fig. 1 above
Distance travelled by wave to the right = v x t = 5.0 x 0.40 = 2.0 cm

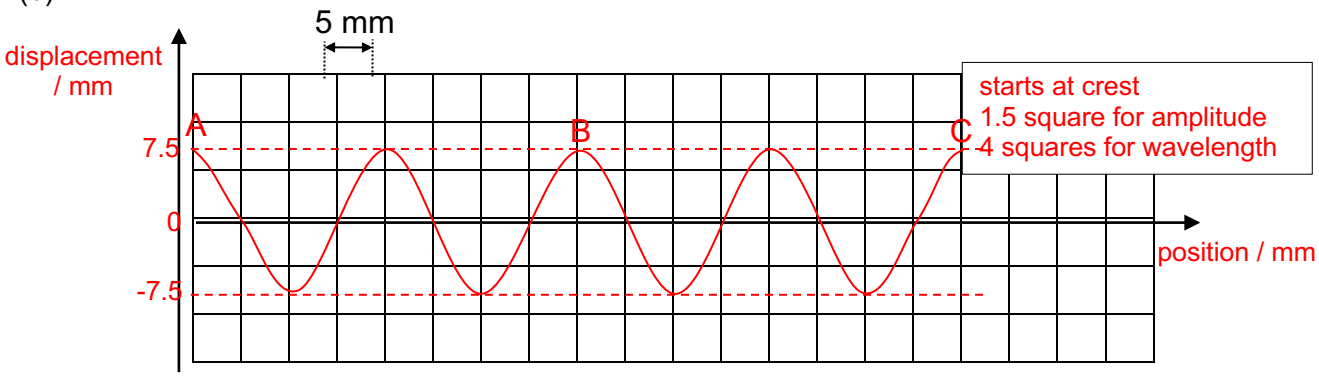
2

(a)

(i) the wavelength = 10.0 cm ÷ 5 = <u>2.00 cm</u>

(ii) the wave speed $v = f\lambda$ = 4.0 x 2.00 = <u>8.0 cm s^{-1}</u>

(b)



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

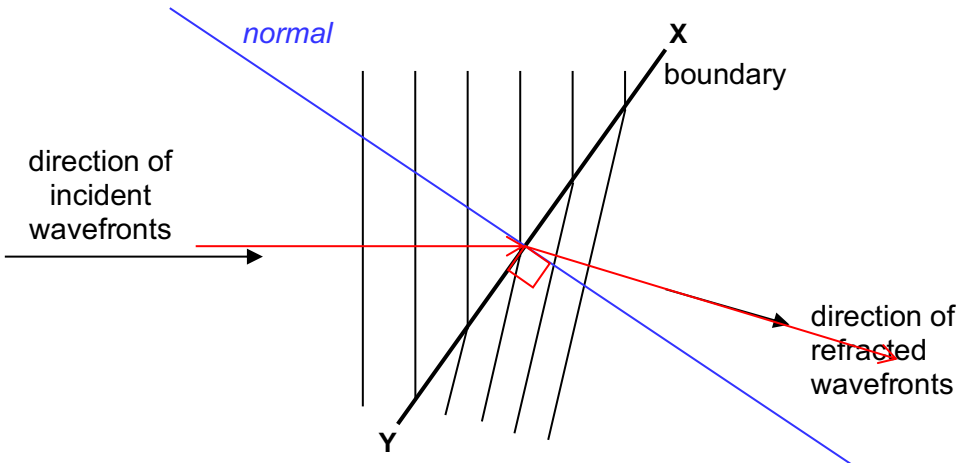
<u>The water particle at C oscillates vertically as the wave travels past it.</u>

***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,

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

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