

Advanced Higher Physics Unit 2 Homework

Homework exercise 4 – Waves

Total = 29 marks

Question 1:

- | | <i>Marks</i> |
|---|--------------|
| (a) A travelling wave is represented by the expression | |
| $y = 2.0 \times 10^{-4} \sin(1570t - 4.6x)$ | |
| where x and y are in metres and t is in seconds. | |
| (i) Calculate the frequency of the wave. | 2 |
| (ii) A wave with the same frequency and four times the intensity travels in the opposite direction. | |
| Write down the equation which represents this wave. | 2 |

Advanced Higher Physics Unit 2 Homework

Question 2:

Marks

A transverse wave travels along a string as shown in Figure 9A.

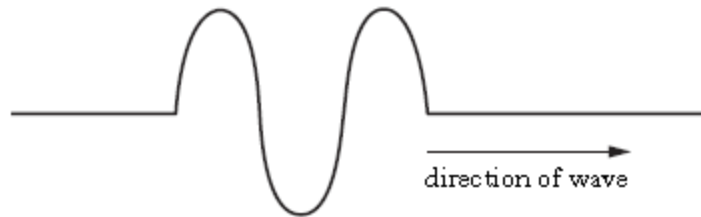


Figure 9A

The equation representing the travelling wave on the string is

$$y = 8.6 \times 10^{-2} \sin 2\pi(2.4t - 2.0x)$$

where x and y are in metres and t is in seconds.

- (a) State the frequency of the wave. 1
- (b) Calculate the velocity of the wave. 2
- (c) Attached to the end of the string is a very light ring. The ring is free to move up and down a fixed vertical rod.

Figure 9B shows the string after the wave reflects from the vertical rod.

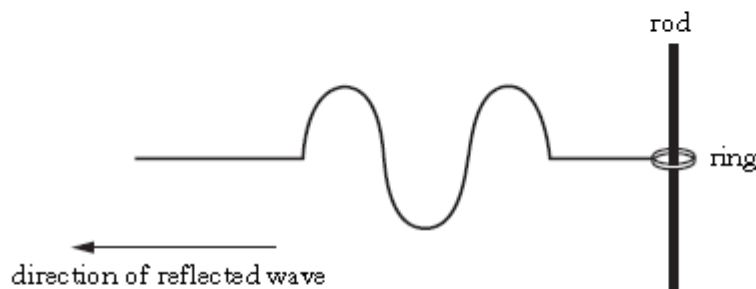


Figure 9B

When the wave reflects, its intensity falls to one quarter of its original value. The frequency and wavelength are constant.

Write the equation that represents this reflected wave.

2
(5)

Advanced Higher Physics Unit 2 Homework

Question 3:

Marks

A water wave of frequency 2.5 Hz travels from left to right.

Figure 9 represents the displacement y of the water at one instant in time.

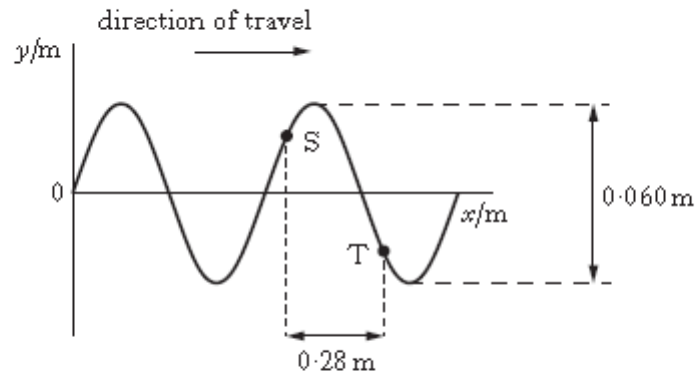


Figure 9

Points S and T are separated by a horizontal distance of 0.28 m.

The phase difference between these two points is 3.5 radians.

- (a) Calculate the wavelength of this wave. 2
- (b) A second wave with double the frequency travels in the same direction through the water. This wave transfers five times the energy of the wave in part (a).
Calculate:
- (i) the speed of this wave; 1
- (ii) the amplitude of this wave. 2

(5)

Advanced Higher Physics Unit 2 Homework

Question 4:

Marks

- . A wave travelling along a horizontal string is represented by the equation

$$y = 25 \sin 2\pi\left(55t - \frac{x}{16}\right)$$

where x and y are in millimetres and t in seconds.

- (a) State the amplitude of the wave. 1
- (b) Calculate the speed of the wave. 3
- (c) Two points on the string are separated by a horizontal distance of 24 mm. Calculate the phase difference between these points. 2
- (d) Another two points on the wave are described as being in phase. State a possible value for the horizontal distance between these points. 1
- (7)**

Question 5:

Marks

- . A transverse wave is described by the expression

$$y = 8.0 \sin (12t - 0.50x)$$

where t is in seconds and x and y are in metres.

- (a) For this wave, calculate the:
- (i) frequency;
- (ii) wavelength. 2
- (b) (i) Calculate the phase difference, in radians, between the point at $x = 3.0$ m and the point at $x = 4.0$ m.
- ~~(ii)~~ Calculate the time for the wave to travel between these two points. 4
- (c) The wave is reflected and loses some energy. State a possible equation for the reflected wave. 2
- (8)**