Waves

Revised AH Physics 2013

9. 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.

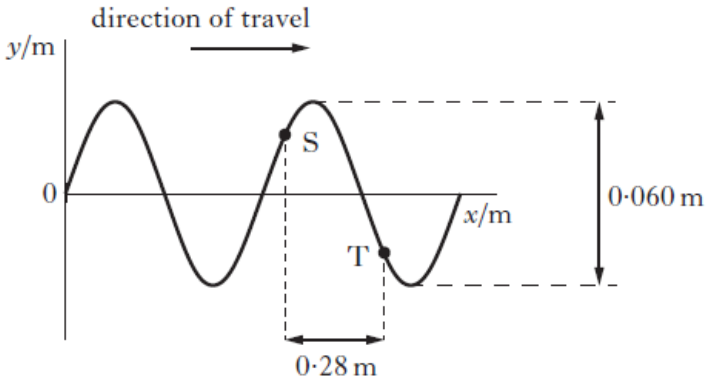


Figure 9

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:

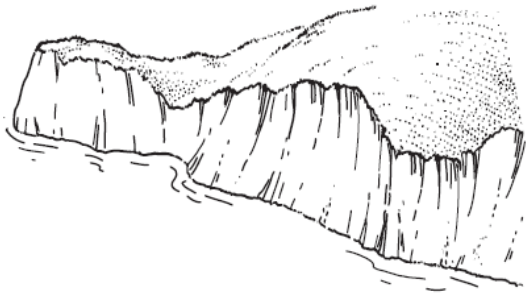
(i) the speed of this wave; **1**

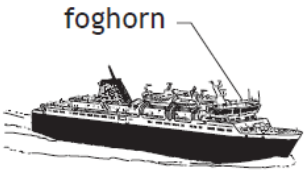
(ii) the amplitude of this wave. **2**

(5)

CfE AH Physics 2016

11.





A ship emits a blast of sound from its foghorn. The sound wave is described by the equation

$$y = 0 \cdot 250 \sin 2\pi (118t - 0 \cdot 357x)$$

where the symbols have their usual meaning.

(a) Determine the speed of the sound wave. 4

(b) The sound from the ship's foghorn reflects from a cliff. When it reaches the ship this reflected sound has half the energy of the original sound.

Write an equation describing the reflected sound wave at this point. 4

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9. A wave travelling along a string is represented by the relationship

$$y = 9 \cdot 50 \times 10^{-4} \sin (922t - 4 \cdot 50x)$$

(a) (i) Show that the frequency of the wave is 147 Hz. 1

(ii) Determine the speed of the wave. 4

(iii) The wave loses energy as it travels along the string.

At one point, the energy of the wave has decreased to one eighth of its original value.

Calculate the amplitude of the wave at this point. 3

9. (continued)

(b) The speed of a wave on a string can also be described by the relationship

$$v = \sqrt{\frac{T}{\mu}}$$

where v is the speed of the wave,

T is the tension in the string, and

μ is the mass per unit length of the string.

A string of length 0·69 m has a mass of $9{\cdot}0 \times 10^{-3}$ kg.

A wave is travelling along the string with a speed of 203 m s^{-1}.

Calculate the tension in the string. 3