Physicsaholics

DPP – 1 (Waves)

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Q 1. A harmonic wave is travelling on a stretched string. At any particular instant, the smallest distance between two particles having same displacement equal to half of amplitude is 4 cm. Find smallest separation between two particles which have same values of displacement equal to amplitude

(a) 4 cm (b)12 cm (c) 24 cm (d)8 cm

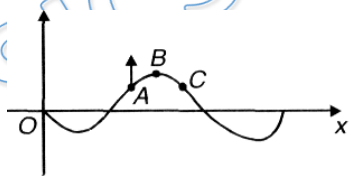
Q 2. Two corks are 10 m apart in a lake. Each goes up and down with period 5 s. And it is observed that when one is at its highest point, other one is at lowest point. The possible speed of wave is

(a) 2.5 m/s (b)5 m/s (c) 40 m/s (d)4 m/s

Q 3. If maximum speed of particle in a medium carrying a travelling wave is V_0, then find speed of particle when its displacement is half of maximum value

(a) $\frac{V_0}{2}$ (b) $\sqrt{3}\frac{V_0}{4}$ (c) $\sqrt{3}\frac{V_0}{2}$ (d) V_0

Q 4. At any instant, wave travelling along a string is shown in figure. Here point A is moving upwards. Which of following statement is true?



(a)Wave is travelling to right

(b)Displacement amplitude of wave is equal to displacement of B at this instant

(c)At this instant C also directed upward

(d)None of these

Q 5. The amplitude of wave disturbance propagating in positive x-axis is given by $y = \frac{1}{1+x^2}$ at t = 0 and $y = \frac{1}{1+(x-1)^2}$ at t = 2s, where x and y are in metres. The shape of the disturbance does not change during the propagation. The velocity of the wave is:

(a) 1 m/s (b) 0.5 m/s (c) 2 m/s (d) 4 m/s

Q 6. Which of the following functions of x and t represents a progressive wave

(a) y = sin (4t – 3x) (b) $y = \frac{1}{4+(4t+3x)^2}$

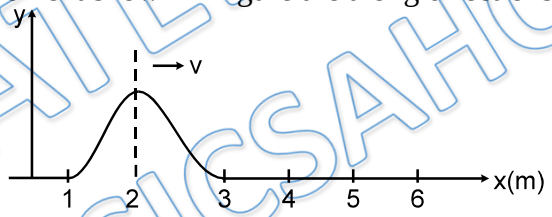
(c) $y = \frac{1}{4t+3x}$ (d) all of these

Q 7. $Y(x,t) = \frac{0.8}{[(4x-5t)^2+5]}$ represents a moving pulse where x and y are in metres and tin second. Then:
(a) pulse is moving in positive x-direction
(b) in 2 s it will travel a distance of 2.5 m
(c) its maximum displacement is 0.16 m
(d) it is a symmetric pulse

Q 8. A wave pulse moving in the positive x-direction along the x-axis is represented by the wavefunction y (x, t) = $\frac{2.0}{(x-3.0t)^2+1}$, where x and y are in centimeters and t is in seconds. Then
(a) The speed of particle at time t = 1 sec. and x = 3cm is zero.
(b) The speed of particle at time t = 1 sec. and x = 3cm is 2 cm/s.
(c) The speed of the pulse is 3.0 cm/s
(d) The speed of the pulse is 0.33 cm/s

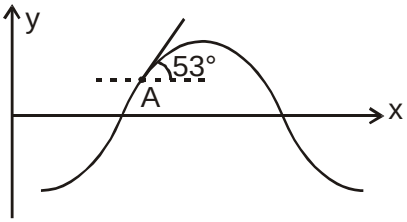
Q 9. The equation of a practical travelling wave is /are
(a) A tan (wt - kx)
(b) A $\sin^2$ (wt - kx)
(c) A sin(wt - kx) cos(wt - kx)
(d) none

Q 10. Wave pulse on a string shown in figure is moving to the right without changing shape. Consider two particles at positions x_1 = 1.5 m and x_2 = 2.5 m. Their transverse velocities at the moment shown in figure are along directions:



(a) positive y–axis and positive y–axis respectively
(b) negative y–axis and positive y–axis respectively
(c) positive y–axis and negative y–axis respectively
(d) negative y–axis and negative y–axis respectively

Q 11. y-x curve at an instant for a wave travelling along x axis on a string is shown. Slope at the point A on the curve, as shown, is 53°.



(a) Transverse velocity of the particle at point A is positive if the wave is travelling along positive x axis.
(b) Transverse velocity of the particle at point A is positive if the wave is travelling along negative x axis of the particle at point A
(c) Magnitude of transverse velocity of the particle at point A is greater than wave speed.

(d) Magnitude of transverse velocity of the particle at point A is lesser than wave speed.

Comprehension (Q 12. TO Q 14.)

A pulse is started at a time t = 0 along the +x direction with speed 10 m/sec on a long, taut string. The shape of the pulse at t = 0 is given by function f(x) with

$$f(x)=\begin{cases}\frac{x}{4}+1 & \text{for} \quad -4<x\le 0\\ -x+1 & \text{for} \quad 0<x<1\\ 0 & \text{otherwise}\end{cases}$$

here f and x are in centimeter

Q 12. The shape of the string is drawn at t = 0 and the area of the pulse enclosed by the string and the x-axis is measured. It will be equal to
(a) 2 cm^2 (b) 2.5 cm^2 (c) 4 cm^2 (d) 5 cm^2

Q 13. The vertical displacement of the particle of the string at x = 7 cm and t = 0.01 s will be
(a) 0.75 cm (b) 0.5 cm (c) 0.25 cm (d) zero

Q 14. The transverse velocity of the particle at x = 13 cm and t = 0.015 s will be
(a) –250 cm/s (b) –500 cm/s
(c) 500 cm/s (d) –1000 cm/s

Answer Key

Q.1 b	**Q.2 d**	**Q.3 c**	**Q.4 b**	**Q.5 b**
Q.6 a, b	**Q.7 a, b, c, d**	**Q.8 a,c**	**Q.9 b,c**	**Q.10 b**
Q.11 b, c	**Q.12 b**	**Q.13 c**	**Q.14 a**	