Physicsaholics

DPP – 1 (Waves)

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Q 1. A wave is represented by the equation $y = 7\sin\{\pi(2t - 2x)\}$ here x is in metres and t in seconds. The velocity of the wave is
(a) 1 m/s (b) 2 m/s
(c) 5 m/s (d) 10 m/s

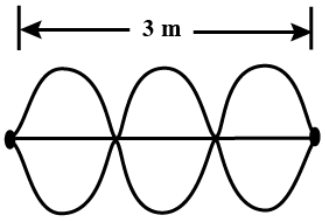
Q 2. The equation of a wave motion (with t in seconds and x in meters) is given by $y = 7\sin\left\{7\pi t - 0.4\pi x + \frac{\pi}{3}\right\}$. The velocity of the wave will be
(a) 17.5 m/s (b) 49π m/s
(c) $\frac{49}{2\pi}$ m/s (d) $\frac{2\pi}{49}$ m/s

Q 3. The equation of a wave is $y = 4\sin\left[\frac{\pi}{2}\left(2t + \frac{1}{8}x\right)\right]$, where y and x are in centimeters and t is in seconds. Which of the following is incorrect statement?
(a) The amplitude, wavelength, velocity, and frequency of wave are 4cm,16cm,32cm/s and 1 Hz, respectively, with wave propagating along-x direction.
(b) The amplitude, wavelength, velocity, and frequency of wave are 4cm,32cm,16cm/s and 0.5 Hz, respectively, with wave propagating along-x direction.
(c) two positions occupied by the particle at time interval of 0.4 s have a phase difference of 0.4π radian.
(d) two positions occupied by the particle at separation of 12cms have a phase difference of 135°.

Q 4. The equation of a wave is $y = 2\sin[\pi(0.5x - 200t)]$, where x and y are expressed in cm and t in sec. The wave velocity is
(a) 100 cm/sec (b) 200 cm/sec
(c) 300 cm/sec (d) 400 cm/sec

Q 5. The wave described by $y = 0.25\sin[(10\pi x - 2\pi t)]$, where x and y are in meters and t in seconds, is a wave travelling along the
(a) $+ve$ x direction with frequency 1 Hz and wavelength λ=0.2m
(b) $-ve$ x direction with amplitude 0.25 m and wavelength λ=0.2m
(c) $-ve$ x direction with frequency 1 Hz
(d) $+ve$ x direction with frequency π Hz and wavelength λ=0.2m

Q 6. Calculate the wavelength of the wave as shown above:



(a) 1 m (b) 2 m
(c) 3 m (d) 6 m

Q 7. The equation of a progressive wave is $y = 8\sin\left[\pi + \left(\frac{t}{10} - \frac{x}{4}\right)\frac{\pi}{3}\right]$. The wavelength of the wave is (where x and y are in meter)
(a) 24 m (b) 4 m
(c) 2 m (d) 10 m

Q 8. A plane wave is represented by $x = 1.2\sin(314t + 12.56y)$ Where x and y are distances measured along in x and y direction in meters and t is time in seconds. This wave has
(a) A wavelength of 0.25 m and travels in + ve x direction
(b) A wavelength of 0.25 m and travels in + ve y direction
(c) A wavelength of 0.5 m and travels in - ve y direction
(d) A wavelength of 0.5 m and travels in - ve x direction

Q 9. A travelling wave passes a point of observation. At this point, the time interval between successive crests is 0.2 seconds
(a) The wavelength is 5 m
(b) The frequency is 5 Hz
(c) The velocity of propagation is 5 m/s
(d) The wavelength is 0.2 m

Q 10. At a moment in a progressive wave, the phase of a particle executing S.H.M. is $\frac{\pi}{3}$. Then the phase of the particle 15 cm ahead and at the time $\frac{T}{2}$ will be, if the wavelength is 60 cm
(a) $\frac{\pi}{2}$ (b) $\frac{2\pi}{3}$
(c) zero (d) $\frac{5\pi}{6}$

Q 11. Which one of the following does not represent a travelling wave?
(a) $y = \sin(x - vt)$ (b) $y = y_m \sin k(x + vt)$
(c) $y = y_m \log(x - vt)$ (d) $y = f(x^2 - vt^2)$

Q 12. If the equation for the transverse wave in a string is given by $y = 5\sin\left[2\pi\left(\frac{t}{0.02} - \frac{x}{50}\right)\right]$ with lengths expressed in cm and time period in seconds, calculate the wave velocity and maximum particle velocity

(a) 25 m/s, 5π m/s (b) 5π m/s, 25 m/s
(c) 25 m/s, $\frac{5}{\pi}$ m/s (d) $\frac{5}{\pi}$ cm/s, 25 m/s

Q 13. The equation of a simple harmonic wave is given by $y = 3\sin\left[\frac{\pi}{2}(50t - x)\right]$ where x and y are in meters and x is in second. The ratio of maximum particle velocity to the wave velocity is

(a) 2π (b) $\frac{3}{2}\pi$
(c) 3π (d) $\frac{2}{3}\pi$

Q 14. A transverse wave is given by $y = A\sin\left[2\pi\left(\frac{t}{T} - \frac{x}{\lambda}\right)\right]$. The maximum particle velocity is equal to 4 times the wave velocity when

(a) $\lambda = 2\pi A$ (b) $\lambda = \frac{1}{2}\pi A$
(c) $\lambda = \pi A$ (d) $\lambda = \frac{1}{4}\pi A$

Answer Key

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