JEE

Prayas JEE (2025)

Physics

Waves

DPP: 2

Q1 A steel wire $0.72\ \text{m}$ long has a mass of $5.0 \times 10^{-3}\ \text{kg}$. If the wire is under tension of $60\ \text{N}$, what is the speed of the transverse waves on the wire?

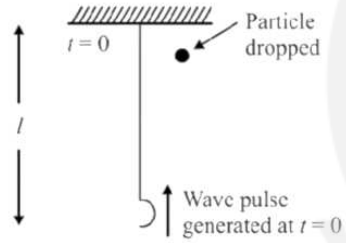
(A) $186\ \text{m/s}$

(B) $\sqrt{2} \times 93\ \text{m/s}$

(C) $93\ \text{m/s}$

(D) $45\ \text{m/s}$

Q2 A uniform rope of length l is suspended from a ceiling as shown. A particle is dropped from the ceiling at the instant a wave pulse is formed at the lower end. Where will the particle meet the pulse?



(A) $\frac{l}{3}$ distance from the top

(B) $\frac{l}{3}$ distance from the bottom

(C) $\frac{l}{4}$ distance from the bottom

(D) At mid-point of the rope

Q3 A uniform metal wire of density ρ, cross-sectional area A and length L is stretched under tension T. The speed of transverse wave in the wire is given by

(A) $\sqrt{\frac{TL}{\rho A}}$

(B) $\sqrt{\frac{T\rho}{AL}}$

(C) $\sqrt{\frac{T}{A\rho}}$

(D) $\sqrt{\frac{T\rho}{A}}$

Q4 A simple harmonic oscillator of frequency f is attached to the end of a cord that has a linear mass density μ and is under a tension T. The power that must be provided to the cord by the oscillator to generate a sinusoidal wave of amplitude A, angular frequency ω and speed v is

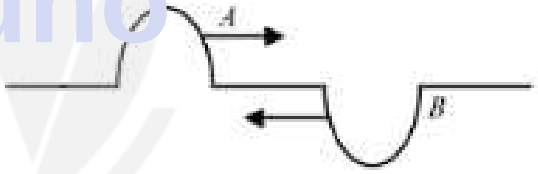
(A) $\mu\omega^2 A^2 v$

(B) $\frac{\mu\omega^2 A^2 v}{2}$

(C) $\frac{\mu\omega^2 A^2 v^2}{2}$

(D) $\frac{3\mu\omega^2 A^2 v}{2}$

Q5 Two identical harmonic pulses travelling in opposite directions in a taut string approach each other. At the instant when they completely overlap, the total energy of the string will be



(A) Zero

(B) Partly kinetic and partly potential

(C) Purely kinetic

(D) Purely potential

Q6 The change in phase if a wave is reflected from a rigid surface is

(A) Zero

(B) π radian

(C) 2π radian

(D) $\frac{\pi}{2}$ radian

Q7 A transverse wave is described by the equation

$$y = y_0 \sin 2\pi \left(ft - \frac{x}{\lambda} \right)$$

The maximum particle velocity is equal to four times the wave velocity if

(A) $\lambda = \pi \frac{y_0}{4}$

(B) $\lambda = \pi \frac{y_0}{2}$

(C) $\lambda = \pi y_0$

(D) $\lambda = 2\pi y_0$

Q8 Given equation is related to

$$y = \cos\left(\frac{2\pi}{\lambda}x\right)\cos(2\pi vt)$$

(A) Transverse progressive

(B) Longitudinal progressive

(C) Longitudinal stationary wave

(D) Transverse stationary wave

Q9 Stationary wave is represented by $\mathrm{Y} = \mathrm{A}\sin(100t)\cos(0.01x)$ where y and A are in mm, t in sec and x in m. The velocity of the wave:

(A) $1\ \mathrm{m/s}$

(B) $10^2\ \mathrm{m/s}$

(C) $10^4\ \mathrm{m/s}$

(D) Zero

Q10 In a standing wave on a string

(A) In one time period all the particles are simultaneously at rest twice

(B) All the particles must be at their positive extremes simultaneously once in a time period

(C) All the particles may be at their positive extremes simultaneously twice in a time period

(D) All the particles are never at rest simultaneously

Answer Key

Q1	(C)	Q6	(B)
Q2	(B)	Q7	(B)
Q3	(C)	Q8	(D)
Q4	(B)	Q9	(C)
Q5	(C)	Q10	(A)