Class 11 Physics · Chapter 14: Waves

Worksheet · 20 marks · about 40 minutes · based on NCERT

Name _____ Class and section _____ Date _____

Scan for the free Class 11 Physics test

1. A harmonic wave of amplitude 3.0 cm and wavelength 0.50 m travels along the +x direction at 20 m s^{-1}. At x = 0 and t = 0 the displacement is zero. With x in metres and t in seconds, the wave is described by [1]

(a) $y = 0.030 \sin(4\pi x + 80\pi t)$ m
(b) $y = 0.030 \sin(4\pi x - 40\pi t)$ m
(c) $y = 0.030 \sin(4\pi x - 80\pi t)$ m
(d) $y = 0.030 \sin(0.50x - 20t)$ m

2. A mechanical wave set up by a loudspeaker travels through the air in a closed hall. This wave must be [1]

(a) transverse, since the air molecules move up and down
(b) longitudinal, since air cannot sustain a shearing stress
(c) electromagnetic, since it travels without a solid medium
(d) either transverse or longitudinal, depending on the loudspeaker

3. Two points on a string carrying a harmonic wave of frequency 40 Hz are 15 cm apart. They are less than one wavelength apart, and the phase difference between their oscillations is π/3. The speed of the wave is [1]

(a) 18 m s^{-1}
(b) 36 m s^{-1}
(c) 6.0 m s^{-1}
(d) 72 m s^{-1}

4. A sound wave travels from a loudspeaker to a listener 10 m away. What is carried from the loudspeaker to the listener? [1]

(a) the layers of air next to the loudspeaker
(b) a steady stream of air, like a wind
(c) energy, while each layer of air only oscillates about its mean position
(d) nothing; the air near the listener vibrates on its own

5. A stationary wave of wavelength 60 cm is set up on a string. The distance between a node and the antinode next to it is [1]

(a) 15 cm
(b) 30 cm
(c) 60 cm
(d) 7.5 cm

6. By what percentage must the tension in a stretched wire be increased so that its fundamental frequency rises by 10%, the length being kept the same? [2]

7. A row of railway bogies stands at a station, each coupled to the next by a spring coupling. An engine gives a sudden push to the first bogie. Explain how the push reaches the last bogie, and state what this shows about a wave. [2]

Every question original, written from NCERT, checked by a second reviewer · photocopy freely for your class

8. A transverse harmonic wave of amplitude 2.0 cm, wavelength 40 cm and frequency 25 Hz travels along the −x direction on a string. The displacement at x = 0 is zero at t = 0. Write the equation of the wave, with x in metres and t in seconds. [2]

9. An air column resonates at 150 Hz, 250 Hz and 350 Hz, and at no frequency in between. The speed of sound is 340 m s^{-1}. Is the column closed at one end or open at both ends? Find its fundamental frequency and its length. [3]

10. For the travelling wave $y(x, t) = a \sin(kx - \omega t)$, follow a point of constant phase to show that the wave speed is $v = \omega/k$, and hence that $v = \lambda\nu$. State what $v = \lambda\nu$ means physically. [3]

11. A pulse of height 5 mm travels along a stretched string towards its end. Describe the reflected pulse, with reasons, when the end is (a) tied to a rigid wall, and (b) tied to a light ring that slides freely on a smooth vertical rod. In case (b), what is the greatest displacement of the end? [3]