

Class: XI  
Subject: Physics  
Topic: Waves  
No. of Questions: 27

- Q1. What is the change in intensity level when the intensity of sound increases by a factor of 105?
- 50 dB
  - 60 dB
  - 70 dB
  - 80 dB
- Q2. What is the phase difference between two successive crests in a wave?
- $\pi$
  - $\pi/2$
  - $2\pi$
  - $4\pi$
- Q3. A simple harmonic wave is represented by  $y = 10 \sin\left(\frac{2\pi t}{T} + \alpha\right)$ , the time period is 30 s. At  $t = 0$ , the displacement is 5 cm. What is the phase angle at  $t = 7.5$  s?
- $120^\circ$
  - $100^\circ$
  - $80^\circ$
  - $60^\circ$

- Q4. The equation of a wave is  $x = 5\sin\left(\frac{t}{0.04} - \frac{x}{4}\right)$  cm. Find the maximum velocity of the particles of the medium.
- 1 m/s
  - 1.5 m/s
  - 1.25 m/s
  - 2 m/s
- Q5. The law applicable for determining the apparent change in frequency when a source and an observer are in motion is \_\_\_\_\_
- Doppler's law
  - Huygens's law
  - Newton's law
  - Galileo's law
- Q6. What fraction of the total energy is kinetic when the displacement is one half of amplitude?
- $\frac{1}{4}$
  - $\frac{3}{4}$
  - $\frac{4}{3}$
  - $\frac{2}{3}$

- Q7. A source and observer are approaching each other with  $50 \text{ ms}^{-1}$  velocity. What will be its original frequency if the observer receives  $400 \text{ cycle/s}$ ?
- a.  $f_o \simeq 300 \text{ cycle/s}$
  - b.  $f_o \simeq 320 \text{ cycle/s}$
  - c.  $f_o \simeq 340 \text{ cycle/s}$
  - d.  $f_o \simeq 330 \text{ cycle/s}$
- Q8. The equation of a simple harmonic wave is given by  $y = 5 \sin \pi/2 (100t - x)$ , where  $x$  and  $y$  are in metre and time is in seconds. The period of the wave in seconds will be
- a. 0.04
  - b. 0.01
  - c. 1
  - d. 5
- Q9. The frequency of a tuning fork is  $256 \text{ Hz}$ . The velocity of sound in air is  $344 \text{ ms}^{-1}$ . The distance travelled (in metres) by the sound during the time in which the tuning fork completes 32 vibrations is
- a. 21
  - b. 43
  - c. 86
  - d. 129

Q10. What is the beat frequency produced when the following two waves are sounded together?

$$x_1 = 10 \sin (404\pi t - 5\pi x), x_2 = 10 \sin (400\pi t - 5\pi x)$$

- a. 4 Hz
- b. 1 Hz
- c. 3 Hz
- d. 2 Hz

Q11. The factor which determines the pitch of a tuning fork is

- a. physical condition
- b. frequency
- c. wavelength
- d. none of these

Q12. When both the listener and source are moving towards each other, then which of the following is true regarding frequency and wavelength of wave observed by the observer?

- a. More frequency, less wavelength
- b. More frequency, more wavelength
- c. Less frequency, less wavelength
- d. More frequency, constant wavelength

Q13. The first overtone of a stretched wire of given length is 320 Hz. The first harmonic is

- a. 320 Hz
- b. 160 Hz
- c. 480 Hz
- d. 640 Hz

- Q14. When a wave travels in a medium, the particle displacements are given by  $y(x, t) = 0.03 \sin \pi (2t - 0.01 x)$  Where  $y$  and  $x$  are in meters and  $t$  is in seconds. The wavelength of the wave is
- 10 m
  - 20 m
  - 100 m
  - 200 m
- Q15. A source of sound vibrates according to the equation  $y = 0.05 \cos \pi t$ . It sends out waves of velocity  $1.5 \text{ ms}^{-1}$ . The wavelength of the waves is
- 1.5 m
  - 3.0 m
  - 4.5 m
  - 6.0 m
- Q16. Particle displacements (in cm) in a standing wave are given by  $y(x, t) = 2 \sin (0.1 \pi x) \cos (100 \pi t)$  The distance between a node and the next antinode is
- 2.5 cm
  - 5.0 cm
  - 7.5 cm
  - 10.0 cm
- Q17. A pipe closed at one end and open at the other will give
- all the harmonics
  - all even harmonics
  - all odd harmonics
  - none of the harmonics

- Q18. A tuning fork of frequency 340 Hz is sounded above a cylindrical tube 1 m high. Water is slowly poured into the tube. If the speed of sound is  $340 \text{ ms}^{-1}$ , at what levels of water in the tube will the sound of the fork be appreciably intensified?
- 25 cm, 75 cm
  - 20 cm, 80 cm
  - 15 cm, 85 cm
  - 17 cm, 83 cm
- Q19. Two sources A and B are sounding notes of frequency 680 Hz. A listener moves from A to B with a constant velocity  $u$ . If the speed of sound is  $340 \text{ ms}^{-1}$ , what must be the value of ' $u$ ' so that he hears 10 beats per second?
- $2.0 \text{ ms}^{-1}$
  - $2.5 \text{ ms}^{-1}$
  - $3.0 \text{ ms}^{-1}$
  - $3.5 \text{ ms}^{-1}$
- Q20. A bat flying above a lake emits ultrasonic sound of 100 kHz. When this wave falls on the water surface, it is partly reflected and partly transmitted. What are the wavelengths of the reflected and transmitted waves? (The speed of sound in air is  $340 \text{ m s}^{-1}$  and in water is  $1450 \text{ m s}^{-1}$ ).
- 6.8 mm and 2.9 cm
  - 3.4 mm and 1.45 cm
  - 3.4 mm and 7.8 mm
  - 6.8 mm and 1.45 cm

- Q21. The formula for the time period  $T$  for a loaded spring,  $T = 2\pi \sqrt{\frac{\text{displacement}}{\text{acceleration}}}$   
Does the time period depend on length of the spring?
- Q22. One end of a long string of linear mass density  $8.0 \times 10^{-3} \text{ kg m}^{-1}$  is connected to an electrically driven turning folk of frequency  $256 \text{ Hz}$ . The other end passes over a pulley and is tied to a pan containing a mass of  $90 \text{ kg}$ . The pulley end absorbs all the incoming energy so that reflected waves at this end have negligible amplitude. At  $t = 0$ , the left end of the string  $x = 0$  has zero transverse displacement ( $y = 0$ ) and is moving along positive  $x$  direction. The amplitude of wave is  $5.0 \text{ cm}$ . Write down the transverse displacement  $y$  as function of  $x$  and  $t$  that describes the wave on the string.
- Q23. The transverse displacement of a string (clamped at its two ends) is given by  
$$Y(x, t) = 0.06 \sin \frac{2\pi}{3} x \cos(120\pi t)$$
Where  $x, y$  are in  $\text{m}$  and  $t$  is in  $\text{s}$ . The length of the string is  $1.5 \text{ m}$  and its mass is  $3.0 \times 10^{-2} \text{ kg}$ . Answer the following.
- Does the function represent a travelling or a stationary wave?
  - Interpret the wave as a superposition of two waves travelling in opposite directions. What are the wavelength frequency and speed of propagation of each wave?
  - Determine the tension in the string.
- Q24. Differentiate between closed pipe and open pipe at both ends of same length for frequency of fundamental note harmonics.
- Q25. Why can the transverse waves not be produced in air?
- Q26. Frequency is the most fundamental property of wave, why?
- Q27. A transverse wave travels along  $x$ -axis. The particles of the medium must move in which direction?