Chapter 2: Mechanical wave

MCQs

1. The equation of a wave traveling in a string can be written as $y = 3\cos\pi(100\,t - x)$. Its wavelength is
   (a) 2 cm (b) 3 cm (c) 5cm (d) 10 cm
2. Angle between particle velocity and wave velocity in the transverse wave is
   (a) 0 (b) π (c) $\pi/2$ (d) $\pi/4$
3. Sound travels the fastest in
   (a) solid (b) liquid (c) gas (d) same in all medium
4. Laplace's correction in the expression for the velocity of sound given by Newton is needed because sound waves propagate
   (a) longitudinally (b) adiabatically (c) isothermally (d) none of them
5. Speed of sound is maximum in
   (a) monoatomic gas (b) diatomic gas (c) polyatomic gas (d) equal in all
6. Which of the following sounds have a maximum speed in the air? The sound produced by an explosion of a bomb, the roaring of a lion and the buzzing sound of a mosquito.
   (a) the sound produced by an explosion of a bomb (b) the roaring of a lion
   (c) the buzzing sound of a mosquito (d) all the above have equal speed
7. The velocity of sound is generally greater in solids than in gas because
   (a) the density of the solid is high but the elasticity is low. (b) both the density and elasticity of solids are low.
   (c) the elasticity of the solid is very high. (d) the density of the solid is low but the elasticity is high.
8. A ship sends a longitudinal wave toward the bottom of the sea. The wave returns from the bottom of the sea after 2 sec. If the bulk modulus of seawater is $2.2 \times 10^9\ N/m$ and the density is 1.1 gm/cc. The depth of seawater is
   (a) 1100 m (b) 1410 m (c) 1500 m (d) 2820 m
9. Young's modulus of the material of the rod is $2 \times 10^{11}\ N/m$ and its density is $8000\ kg/m^3$. Then the time taken by the sound wave to transverse 1 m of the rod is
   (a) 1×10^{-4} sec (b) 2×10^{-4} sec (c) 4×10^{-4} sec (d) 16×10^{-4} sec
10. Which one of the following properties of sound is affected by the change in air temperature?
    (a) amplitude (b) frequency (c) wavelength (d) intensity
11. The increase in the velocity of sound for a 1°C rise in temperature is ($v_o = 332\ m/s$)
    (a) 0.16 m/s (b) 0.61 m/s (c) 0.1 m/s (d) 1 m/s
12. The temperature at which the speed of sound in the air becomes double of its value of 27^oC is:
    (a) 54 °C (b) 327 °C (c) 927 °C (d) -123 °C
13. The speed of sound in the air at NTP is 300 m/s. If air pressure becomes four times, then the speed of sound will be
    (a) 150 m/s (b) 300 m/s (c) 600 m/s (d) 1200 m/s
14. A man heard the thunder 6 seconds later he saw lightning. The temperature of the air is 27°C. How far was the flash of light from the man? (Velocity of sound in air at 0°C is 332 m/s)
    (a) 1822 m (b) 2088 m (c) 2445 m (d) 2332 m
15. A man stands on top of a cliff and shouts. He hears the echo on the third clap when he claps his hand at the rate of two claps per second. What is the distance between man and the obstruction, if the velocity of sound is 320 m/s?
    (a) 320 m (b) 460 m (c) 640 m (d) 160 m
    [Hint: time for third clap after first clap is 1 $second$] OR [After first clap, time for third clap is 1 sec (2 claps/s]
16. Velocity of sound in air at STP is 330 m/s. The distance covered by sound in 2 seconds when the atmospheric temperature is 30 °C, will nearly be
    (a) 0.5 km (b) 0.7 km (c) 1 km (d) 2 km
17. The equation of a progressive wave is given by $y = 6\cos(1800\,t - 60x)$ where x is in m, y is in microns and t is in seconds. Then the ratio of the maximum velocity of a particle of medium to the wave velocity is
    (a) 3.6×10^{-6} (b) 3.6×10^{-5} (c) 3.6×10^{-4} (d) 360