SHORT QUESTIONS

8.1 What feature do longitudinal waves have in common with transverse waves?

Ans. The following features are common in transverse wave and longitudinal waves:

(i) Both are mechanical waves.

(ii) Both waves transfer energy from one point to another point but not matter.

(iii) Both produce disturbance in the medium through which they travel.

(iv) The relation $v = f\lambda$ holds for both the waves here v is speed of wave, "f", frequency and λ is wavelength.

8.2 The five possible waveforms obtained, when the output from a microphone is fed into the y-input of cathode ray oscilloscope, with the time base on, are shown in Fig. 8.23. These waveform are obtained under the same adjustment of the cathode ray oscilloscope controls, indicate the waveform:

(a) which trace represents the loudest note?

(b) which trace represents the highest frequency?

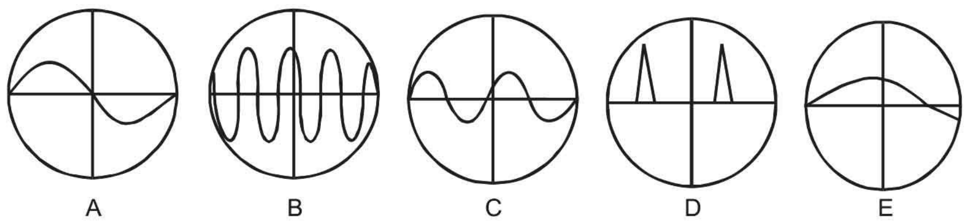


Fig. 8.23

Ans. (a) The trace (B) represents the loudest sound because the loudness of sound depends upon the amplitude of vibration.

(b) The trace (B) represents the highest frequency because the number of waves per second are maximum.

8.3 Is it possible for two identical waves traveling in the same direction along a string to give rise to a stationary wave?

Ans. No, the stationary waves are not produced when the two identical waves are travelling the same direction. Because in order to produce stationary waves, two identical waves should travel in opposite direction.

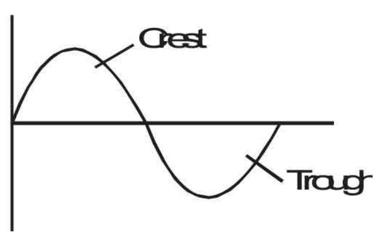
8.4 A wave is produced along a stretched string but some of its particle permanently shows zero displacement. What types of wave is it?

Ans. It will be a stationary wave because in stationary wave, some points will remain permanently at rest i.e., zero displacement called node.

8.5 Explain the terms crest, through, node, and anti-node.

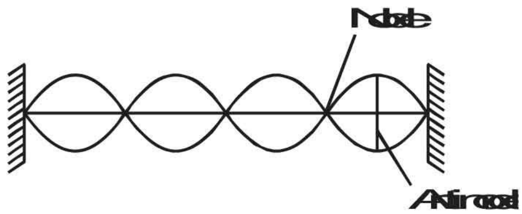
Ans. **Crest:** The upper portion of the transverse wave from the mean position is called crest.

Trough: The lower portion of the transverse wave from the mean position is called trough.



Node: The point at which the displacement of the stationary wave is zero is called node.

Anti-node: The point at which the displacement of the stationary wave is maximum is called anti-node.



8.6 Why does sound travel faster in solid than in gases?

Ans. As we know that the speed of sound is given by the expression

$$v = \sqrt{\frac{E}{\rho}}$$

From this equation we see that speed of sound is directly proportional to square root of modulus of elasticity. As the elasticity of medium is greater for solid as compared to gases and density is also greater for solids. So the effect of elasticity is greater than density thus the sound travels faster in solids than in gases.

8.7 How are beats useful in tuning musical instruments?

Ans. In musical instruments, various notes can be produced by changing the length of air column. To get a particular note, a standard instrument is taken and is sounded together with musical instrument which is to be tuned. The number of beats produced per second are recorded. The frequency of the instrument to be tuned is so adjusted that it gives no beat with standard instrument. So the musical instrument is tuned to a particular frequency with the help of phenomenon of beats.

8.8 When two notes of frequency f_1 and f_2 are sounded together, beats are formed. If $f_1 > f_2$, what will be frequency of beats?

(i) $f_1 + f_2$ **(ii)** $\frac{1}{2}(f_1 + f_2)$ **(iii)** $f_1 - f_2$ **(iv)** $\frac{1}{2}(f_2 - f_1)$

Ans. The number of beats produced in one second is equal to the difference in the frequencies of two notes. So:

Number of beats per second $= f_1 - f_2$

Hence the correct answer is (iii).

8.9 As a result of a distant explosion, an observer senses a ground tremor and then hears the explosion. Explain the time difference.

Ans. We know that sound waves travel faster through solid as compared to gases. So the time difference is due to that waves produced by explosions reach through solid ground much faster than the f sound waves travelling through air.

8.10 Explain why sound travels faster in warm air than in cold air.

Ans. We know that the expression for speed of sound in air is

$$v = \sqrt{\frac{rP}{\rho}}$$

From this equation we see that speed of sound is inversely proportional to $\sqrt{\rho}$. Which means that if density of air is greater, speed of sound will be small and vice versa. As warm air has smaller density than that of cold air therefore sound travel faster in warm air than in cold air.

8.11 How should a sound source move with respect to an observer so that frequency of its sound does not change?

Ans. If both sound waves and observer are moving in same direction with same velocity then their relative velocity is equal to zero. So the frequency of its sound does not change.