HOTS (Higher Order Thinking Skills)

Q. 1. When we put our ear to a railway track, we can hear the sound of an approaching train even when the train is far off but its sound cannot be heard through air. Why?

Ans. Sound travels about 15 times faster in iron (or steel) than in air. So, sound travels much faster through the railway track made of steel than through air. That is why, we can hear the sound of an approaching train even when the train is far off but its sound cannot be heard through air.

Q. 2. In a ripple tank, 12 full ripples are produced in one second. If the distance between a crest and next trough is 10 cm, find
(a) wavelength, (b) frequency and (c) velocity of the wave.

Ans. **(a)** Here, $\frac{\lambda}{2} = 10 \Rightarrow \quad \lambda = 20$ cm = 0.20 m

(b) Frequency, = v Number of ripples produced in 1 second = 12 Hz

(c) Velocity, $v = v\lambda = 12 \times 0.20 = 2.40\ ms^{-1}$

Q. 3. Figure shows the position of layers of air, at one moment, as a sound wave of constant frequency passes through the air. Compressions are labelled C. Rarefactions are labelled R.

(a) State how figure would change if

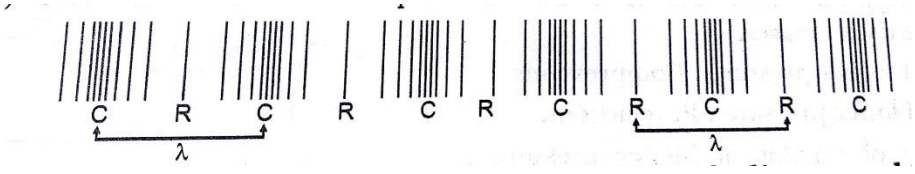
(i) the sound had a higher frequency,

(ii) the sound were louder.

(b) On figure, draw a line marked with arrows at each end to show the wavelength of the sound.

Ans. (a) (i) More compressions and rarefactions will be produced in a given time interval (i.e., C and R will become closer together).

(ii) At compressions, layers become closer together. At rarefactions, layers become farther apart (i.e., C will narrower and rarefactions wider).
(b) Distance between two compressions or two rarefactions are called wavelength (λ).



Q. 4. (a) What should be the minimum distance between the listener and the reflector to hear an echo of sound propagating with a speed v ms-?

(b) Does the speed of sound increase or decrease on a hotter day? Justify.

Ans. (a) Time = $\frac{\text{Distance}}{\text{Speed}}$

or $t = \frac{2d}{v}$

or $d = \frac{v \times t}{2} = \frac{v \times 1}{2 \times 10}$ ($\because$ Time = 0.1 s) = $\frac{v}{2d}$

(b) The speed of sound increases with temperature. So, on a hotter day speed of sound is more.