Analog Assignment

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Question 23 from chapter 15:WAVES of class 11

Q23) A narrow sound pulse (for example, a short pip by a whistle) is sent across a medium. (a) Does the pulse have a definite (i) frequency, (ii) wavelength, (iii) speed of propagation? (b) If the pulse rate is 1 after every 20 s, (that is the whistle is blown for a split of second after every 20 s), is the frequency of the note produced by the whistle equal to 1/20 or 0.05 Hz ?

Answer:

a) Let us assume that sound pulse produced in a medium of gas having a specific molecular weight **M** and having adiabatic constant γ which is at a constant temperature **T**
Then velocity **V** of sound pulse is given by:

$$\mathbf{V} = \sqrt{\left(\frac{\gamma RT}{M}\right)}$$

(where **R** is Universal gas Constant)

Hence from the above formula the velocity **V** of sound wave remains constant but not frequency ν and wavelength λ

b) We know that for a sound pulse travelling in a medium

The general equation of a point on the wave is given by:

$$y{=}A \ sin(kx{+}\omega t)$$

(where x,y are co-ordinates corresponding to point under observation
A = Ampiltude of sound wave
k = Wave number
ω = Angular frequency of the wave
t = time)

And we know the relation that:

$$\nu = \frac{\omega}{2\pi}$$

Hence, The frequency of the note ν produced will not be equal to 0.05 Hz or $\frac{1}{20}$ Hz