NCERT Physics Chapter-15 Q7

EE23BTECH11059 - Tejas

QUESTION 7:

A hospital uses an ultrasonic scanner to locate tumors in a tissue. What is the wavelength of sound in the tissue in which the speed of sound is 1.7 km/s? The operating frequency of the scanner is 4.2 MHz.

SOLUTION:

Input Parameter	Value	Description
c	1.7×10^3	Speed of Wave (Distance travelled per unit time)
f	4.2×10^6	Frequency (Number of oscillations per seconds)
A	1	Wave Amplitude (Maximum distance reached longitudinally by the wave during oscillation)
T	$2.38 \times 10^{-}7$	Time period(Time taken to complete one osciallation)
$s(t)$	$s(t) = A\cos(2\pi f t + \phi)$	Wave equation (Equation describing the motion of the wave)

Wave equation for sound is:

$$c = \frac{\Delta d}{\Delta t} \tag{1}$$

$$\frac{1}{T} = f; \Delta d = \lambda \tag{2}$$

$$c = \frac{\lambda}{T} \tag{3}$$

$$c = f\lambda \tag{4}$$

$$\lambda = \frac{c}{f} \tag{5}$$