NCERT Physics Chapter-15 Q7

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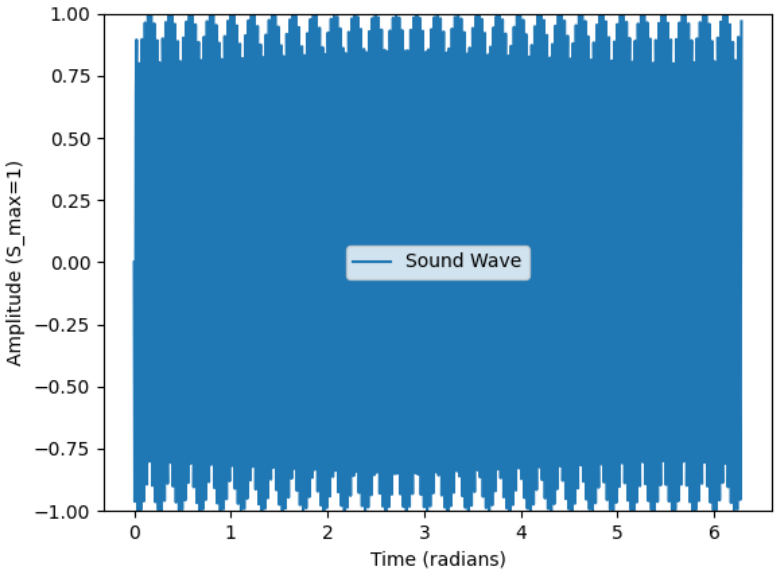
QUESTION 7:

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
f	4.2×10^6	Frequency

Plotting the Sound Wave:



Wave equation for sound is:

$$s(t) = s_{\max} \cos(2\pi f t + \phi)$$

$$c = \frac{\Delta d}{\Delta t}; \quad \Delta t = T \text{ (Time period)}, d = \lambda \text{ (Wavelength)}$$
$$c = \frac{\lambda}{T}$$
$$c = f\lambda; \quad \frac{1}{T} = f$$
$$c = f\lambda$$
$$\lambda = \frac{c}{f}$$