

NCERT-Analog-11.15-6

EE22BTECH11004 - Allu lohith

Q: A bat emits ultrasonic sound of frequency 1000kHz in air. If the sound meets a water surface, what is the wavelength of
(a) the reflected sound
(b) the transmitted sound?
Speed of sound in air is 340ms^{-1} and in water is 1486ms^{-1} .

Ans: Given that the frequency of the Ultra sonic sound = 1000kHz

As we know that the frequency of sound does not change with medium, So the frequency in water is equal to in air.

let the wavelength in air = λ_a and speed in air = v_a

let the wavelength in water = λ_w and speed in water = v_w

As,

$$\text{wavelength}(\lambda) \cdot \text{frequency}(f) = \text{speed}(v) \quad (1)$$

So,

$$\lambda_w = v_w/f \quad (2)$$

$$\lambda_w = 1486/1000\text{kHz} \quad (3)$$

$$\lambda_w = 1.486\text{mm} \quad (4)$$

And similarly,

$$\lambda_a = v_a/f \quad (5)$$

$$\lambda_a = 340/1000\text{kHz} \quad (6)$$

$$\lambda_a = 0.34\text{mm} \quad (7)$$

So the wavelength in air is 0.34mm and wavelength in water is 1.486mm

Parameter	Description	Value
λ	Wavelength of light	
$y_i(t)$	Displacement produced by $S_{i\text{th}}$	
ω	Angular frequency	
I	Intensity of light at $\Delta x = \lambda$	K
k	Wave number	$\frac{2\pi}{\lambda}$
I_{net}, I_R	Net Intensities of resulting waves	kA^2
$\Delta x = x_1 - x_2$	Path difference	$\frac{\lambda}{3}$
A	Amplitudes of light waves	$A_1 = A_2$

TABLE 0
Parameters