NCERT-Analog-11.15-6

EE22BTECH11004 - Allu lohith

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

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

$$wavelength\,(\lambda) \cdot frequency\,(f) = speed\,(v) \tag{1}$$

Parameter	Description	Value	Formulae
v	Frequency of sound	$1000KHz$	
v_a	Speed of sound in air	$340ms^{-1}$	
v_w	Speed of sound in water	$1486ms^{-1}$	
λ_a	Wavelength of sound in air		v_a/f
λ_w	Wavelength of sound in water		v_w/f

TABLE 0
Parameters

So,

$$\lambda_w = v_w/\mathrm{f} \tag{2}$$
$$\lambda_w = 1486/1000KHz \tag{3}$$
$$\lambda_w = 1.486mm \tag{4}$$

And similarly,

$$\lambda_a = v_a/\mathrm{f} \tag{5}$$
$$\lambda_a = 340/1000KHz \tag{6}$$
$$\lambda_a = 0.34mm \tag{7}$$

Parameter	Description	Formula	value
λ_a	Wave length of the reflected sound	v_a/f	$0.34mm$
λ_w	Wave length of the reflected sound	v_w/f	$1.486mm$

TABLE 0
Results