<u>Class XI</u>

Oscillations and waves worksheet 5

1.	Velocity of sound increases on a cloudy day. Why?	1
Ans.	Since on a cloudy day, the air is wet i.e. it contains a lot of moisture, As a result of which the density of	
	air is less and since velocity is inversely proportional to density, hence velocity increases.	
2.	Sound of maximum intensity is heard successively at an interval of 0.2 second on sounding two tuning	1
	fork to gather. What is the difference of frequencies of two tuning forks?	
Ans.	The beat period is 0.2 second so that the beat frequency is $\frac{1}{0.2} = 5Hz$	
	Therefore, the difference of frequencies of the two tuning forks is 5Hz.	
3.	If two sound waves has a phase difference of 60° , then find out the path difference between the two	1
	waves?	
Ans.	$\phi = \frac{2\pi}{2}x$	
	λ	
	$\frac{\pi}{2\pi} = \frac{2\pi}{x}$	
	3λ	
	$r - \frac{\lambda}{m}$	
	-6^{m}	
4.	Why are all stringed instruments provided with hollow boxes?	2
Ans.	The stringed instruments are provided with a hollow box called sound box. When the strings are set into	
	vibration, forced vibrations are produced in the sound box.	
	Since sound box has a large area, it sets a large volume of air into vibration. This produces a loud sound	
	of the same frequency of that of the string.	
5.	Two waves have equations $X_1 = a \sin(wt + \phi_1)$ and $X_2 = a \sin(wt + \phi_2)$	2
	If in the resultant wave, the amplitude remains equal to the amplitude of the super posing waves.	
	Calculate the phase difference between X1 and X2?	
Ans.	$X_1 = a\sin(wt + \phi_1), X_2 = a\sin(wt + \phi_2)$	
	$A = \sqrt{a_1^2 + a_2^2 + 2a_1a_2\cos\phi}$	
	$a = \sqrt{a^2 + a^2 + 2a^2 \cos \phi}$	
	$a = \sqrt{2a^2 + 2a^2 \cos \phi}$	
	$a = \sqrt{2a^2 \left(1 + \cos \phi\right)}$	
	$\sqrt{\frac{1}{2}}$	
	$a = \sqrt{2a^2 \times 2\cos^2 \frac{\pi}{2}}$	
	$a = 2a\cos\frac{\phi}{2}$	
	$1 \qquad \phi$	
	$\frac{-\cos -2}{2}$	
	$60^{\circ} = \frac{\phi}{2}$, $\phi = 120^{\circ}$	
1		1

6.	A vehicle with horn of frequency 'n' is moving with a velocity of 30 m 's in a direction perpendicular to the straight line joining the observer and the vehicle. If the observer perceives the sound to have a frequency of $n + n_1$. Calculate n_1 ?	3
Ans.	But in our case, the source and observer move at right angles to each other. The Doppler Effect is not observed when the source of the sound and the observer are moving at right angles to each other. So, if $n = $ original frequency of sound the observer will perceive the sound with a frequency of n (because of no Doppler effect). Hence the $n_1 = $ charge frequency = 0.	
7.	We cannot hear echo in a room. Explain?	3
Ans.	We know that, the basic condition for an echo to be heard is that the obstacle should be rigid and of large size. Also the obstacle should be at least at a distance of 17m from the source. Since the length of the room is generally less than 17m, the conditions for the production of Echo are not satisfied. Hence no echo is heard in a room.	
8.	Show that the frequency of nth harmonic mode in a vibrating string which is closed at both the end is 'n' times the frequency of the first harmonic mode?	1
Ans.		