# IMPORTANT QUESTIONS CLASS – 11 PHYSICS CHAPTER -14 WAVES

**Question 1.**
**A sitar wife and a tabla when sounded together give 4 beats/ sec. What do we conclude from this? As the tabla membrane is tightened, the beat rate increases or decreases, explain.**

Answer:
When sitar and tabla are sounded together, they give 4 seats/ sec. From this, we conclude that the frequencies of the two sounds differ by 4. If the frequency of tabla is greater than that of a sitar, then on tightening the tabla membrane, the frequency of tabla will further increase and hence the difference in frequencies will increase.

Thus beat rate will increase. If the frequency of tabla is less than that of sitar, then on tightening the tabla membrane, the frequency of tabla will increase and the difference in frequencies will decrease. So beat rate will decrease.

**Question 2.**
**When we start filling an empty bucket with water, the pitch of sound produced goes on changing. Why?**

Answer:
An empty bucket behaves as a closed organ pipe. The frequency of fundamental note produced by it is given by
v = v4l.

As the bucket starts filling, the length (l) of the resonating air column decreases, and hence frequency increases. Since the pitch of a sound depends upon the frequency. So it changes with the change in frequency.

**Question 3.**
**Two loud-speakers have been installed in an open space to listen to a speech. When both are operational, a listener sitting at a .particular- place receives a very faint sound. Why? What will happen if one loud-speaker is kept off?**

Answer:
When the distance between two loud-speakers from the position of listener is an odd multiple of λ2, then due to destructive interference between sound waves from two loud-

speakers, a feeble sound is heard by the listener.

When one loud-speaker is kept off, no interference will take place and the listener will hear the full sound of the operating loud-speaker.

**Question 4.**
**Distinguish between progressive waves and stationary waves.**

Answer:
Progressive waves:

1. The disturbance travels onward. It is1 handed over from one particle to the next.
2. Energy is transported in the medium along with the propagation of waves.
3. Each particle of the medium executes S.H.M. with the same amplitude.
4. No particle of the medium is permanently at rest.
5. Changes in pressure and density are the same at all points of the medium.

Stationary waves:

1. The disturbance is confined to a particular region and there is no onward motion.
2. No energy is transported in the medium.
3. All the particles of the medium except at nodes execute S.H.M. with different amplitude.
4. The particles of the medium at nodes are at rest.
5. The changes of pressure and density are maximum at nodes and minimum at antinodes.

**Question 5.**
**Distinguish between musical sound and noise.**

Answer:
Musical sound:

1. It produces a pleasant effect on the ear.
2. It has a high frequency.
3. There are no sudden changes in the amplitude of the musical sound waves.
4. It is a desirable sound.

Noise:

1. It produces an unpleasant effect on the ear.
2. It has a low frequency.
3. There are sudden changes in the amplitude of noise waves.
4. It is an undesirable sound.

**Question 6.**
**What are the characteristics of wave motion?**

Answer:

1. Wave motion is a form of disturbance that travels in a medium due to repeated periodic motion of the particles of the medium.
2. The wave velocity is different from the particle velocity.
3. The vibrating particles of the medium possess both K.E. and P.E.
4. The particle velocity is different at different positions of its vibrations whereas wave velocity is constant throughout a given medium.
5. Waves can undergo reflection, refraction, diffraction, dispersion, and interference.

**Question 7.**
**Show that for 1°C change in temperature, the velocity of sound changes by 0.61 ms-1.**

Answer:
We know that $v \propto T$––√ .
If $v_t$ and $v_0$ be the velocity of sound at T°C and 0°C respectively,

$$\text{Then} \quad \frac{v_t}{v_0} = \sqrt{\frac{T}{T_0}} = \sqrt{\frac{273+t}{273}}$$

$$= \left(1+\frac{t}{273}\right)^{\frac{1}{2}}$$

$$[\therefore \text{here } T = (273 + t)K,\ T_0 = 273\ K]$$

$$= \left(1+\frac{t}{2\times 273}\right)$$

(using binomial expansion theorem, for $t << 273$)

$$\text{or} \quad \frac{v_t - v_0}{v_0} = \frac{v_0 \times t}{546}$$

$$\text{or} \quad \frac{v_t - v_0}{t} = \frac{v_0}{546}$$

$$\text{or} \quad \alpha = \frac{v_0}{546},$$

where α = vt–v0t is called temp. coefficient of the velocity of sound.

Putting $v_0$ = 332 $ms^{-1}$ at To i.e. 0°C, we get
$\alpha = 332546 = 0.61\ ms^{-1}\ °C^{-1}$

**Question 8.**
**An electric bell is put in an evacuated room (a) near the center (b) close to the glass window, in which case the sound is heard (i) inside the room, (ii) out of the room.**

Answer:

1. Sound is not heard in cases (a) and (b) inside the room as the medium is not there for the propagation of sound.
2. In case (a) sound cannot be heard outside for the reason given in (i) above.

In case (b) since the bell is very close to the window, the glass pane picks up its vibrations which are conveyed to the eardrum through the air outside the room. So, the sound can be heard in condition (b).

**Question 9.**
**A progressive wave is given by**
**y = 12 sin (5t − 4x)**
**On this wave, how far away are the two points having a phase difference of π2?**

Answer:
Here, ΔΦ = phase difference = π2

Let Δx be the corresponding path difference,

$$\therefore \quad \Delta x = \frac{\lambda}{2\pi} \times \Delta\phi$$

$$= \frac{\lambda}{2\pi} \times \frac{\pi}{2} = \frac{\lambda}{4}$$

$$\text{Also} \quad \frac{2\pi}{\lambda} = 4$$

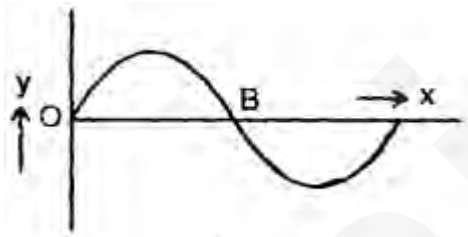
$$\therefore \quad \lambda = \frac{2\pi}{4} = \frac{\pi}{2}$$

$$\therefore \quad \Delta x = \frac{1}{4} \cdot \frac{\pi}{2} = \frac{\pi}{8}$$

**Question 10.**
**The figure here shows the wave, y = A sin (ωt − kx) at any instant traveling in the +x direction.**
**What is the slope of the curve at B?**

Answer:
Here, the particle velocity is maximum at B and is given by
$v_0 = \omega A$.
Also, wave velocity is given by
C = ωk
∴ So the slope v0C=ωAω/k = kA

Question 25.




Two sound waves
$y_1 = A_1 \sin 1000 \pi(t - x220)$
and $y_2 = A_2 \sin 1010 \pi(t - x220)$ are superposed. What is the frequency with which the amplitude varies?
Answer:
Rate of variation of amplitude is equal to the beat frequency.
Here, $2\pi\nu_1 = 1000 \pi$
or
$\nu_1 = 500$
and $2\pi\nu_2 = 1010 \pi$
or
$\nu_2 = 505$

$\therefore$ beat frequency $= \nu_2 - \nu_1$
$= 505 - 500$
$= 5$.