

Chapter	7 Waves and Vibrations	Class	1 st Year	Subject	Physics
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Give Short Answers of the Following Questions

1. What are the conditions for interference to occur?

Ans. Conditions for detectable interference pattern

The following condition must be met, in order to observe the interference phenomenon;

1. The interfering beams must be monochromatic. (single wavelength)
2. The interfering beams of light must be coherent. (same phase or constant phase difference)
3. The source should be narrow and very close to each other.
4. The intensity of the two sources be comparable.

2. Differentiate between constructive and destructive interference of waves.

Ans.

Constructive Interference	Destructive Interference
1. When two waves meet at a point with same phase then they reinforce each other.	1. When two waves meet at a point out of phase, they cancel the effect of each other.
2. Path difference between two waves is $\Delta S = n\lambda$ where $n = 0, \pm 1, \pm 2, \dots$	2. Path difference between two waves is $\Delta S = (2n + 1)\frac{\lambda}{2}$ where $n = 0, \pm 1, \pm 2, \dots$
3. Phase difference between two wave is $2n\pi$ where $n = 0, 1, 2, 3, \dots$	3. Phase difference between two waves is $(2n + 1)\pi$ where $n = 0, 1, 2, 3, \dots$
4. Amplitude of resultant waves increases.	4. Amplitude of resultant waves decreases.

3. What are coherent waves and coherent sources? Give examples.

Ans. Coherent waves

The waves that have a constant phase difference and the same frequency.

Coherent Sources:

A coherent source is a source that emits coherent waves.

Examples:

- Two slits from the same light source.
- Sound waves emitted by loud speakers caused by same audio source.

4. Distinguish between longitudinal and transverse waves.

Ans.

Longitudinal waves	Transverse waves
1. In longitudinal waves, the particles of the medium vibrate parallel to the direction of wave propagation.	1. In transverse waves, the particles of the medium vibrate at right angles to the directions of wave propagation.

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2. Longitudinal waves consists of compressions and rarefactions.	2. Transverse waves consists of crests and troughs.
3. Longitudinal waves cannot be polarized.	3. Transverse waves can be polarized.
4. Sound wave is an example of longitudinal wave.	4. Light wave and waves on string are examples of transverse wave.

5. Is it possible for two identical waves travelling in the same direction along a string to give rise to a stationary wave? How is it so?

Ans. No, it is not possible.

Reason

Stationary waves are produced only when two identical waves traveling in opposite direction along the same string superpose.

6. How would you apply Doppler effect in studying cardiac problems in humans?

Ans. Doppler echocardiography is applied to study cardiac problems by measuring blood flow velocities. Velocity of blood flow is detected by using Doppler effect by noting the Dopplers shift (change in frequency). The Doppler effect can be used to monitor blood flow through major arteries. Ultrasonic waves of frequencies 5MHz to 10MHz are directed towards the artery and a receiver detects the back scattered frequency.

7. What is meant by diffraction of waves? For what purpose, the ripple tank is used?

Ans. Diffraction of Waves:

Diffraction is the bending of waves around obstacles or the spreading of waves through small openings. The diffraction of wave depends upon the wavelength.

Ripple Tank:

A ripple tank is a shallow container filled with water, used to study wave behavior, including diffraction. The tank is consists of a vibrating rod or a stone dropper to create water waves.