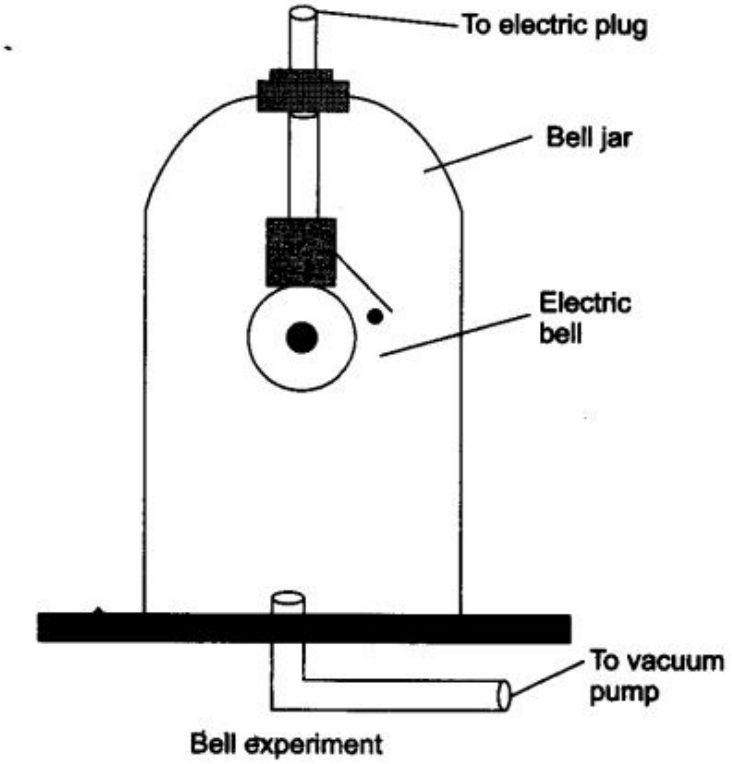
IV. LONG ANSWER TYPE QUESTIONS

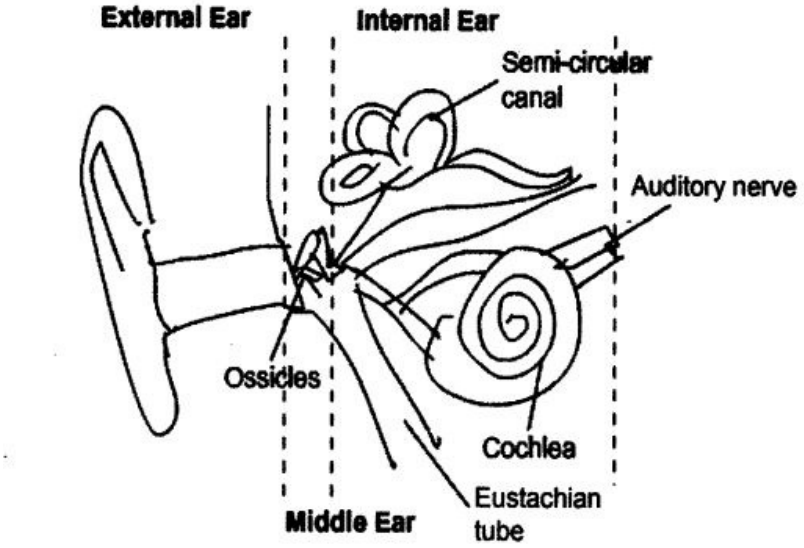
Question 1. Sound cannot travel in vacuum. Describe an experiment to demonstrate this.
Answer: Sound is a mechanical wave and needs a material medium to propagate. It cannot travel in vacuum and can be shown by the following experiment.

- Take an electric bell and an airtight glass bell jar. The electric bell is suspended inside the airtight bell jar. Switch 'ON' the electric bell.
- Now, connect the bell jar to vacuum pump.
- Pump out the air from the jar, the sound becomes fainter, although the same current passes through the bell.
- Pump out some more air from the jar, a very feeble sound is heard.
- When the air is completely removed from the jar, no sound is heard.



Bell experiment

Question 2. Explain the structure of the human ear with the help of a diagram.
Answer:



(a) Outer Ear: Pinna, auditory canal and tympanic membrane.
Pinna: It collects the sound from the surroundings.
Auditory Canal: The sound waves collected passes through this canal.
Tympanic Membrane: It is a thin membrane which receives the vibrations of sound. A compression reaches the eardrum, the pressure on the outside of the membrane increases and pushes the eardrum inward, and moves out when the rarefaction reaches.
(b) Middle Ear: Consists of three small bones called hammer, anvil and stirrup. The vibrations are received by these three bones and the strength of vibrations is increased i.e., the sound is amplified and passed to inner ear.
(c) Inner Ear: It consist of cochlea and auditory nerve. Chochlea receives the amplified vibrations and convert them into electrical signals. These electrical signals are sent to the brain via the auditory nerve and the brain interprets the signals as sound.

Question 3. Given that sound travels in air at 340 m/sec, find the wavelength of the waves in air produced by 20 kHz sound source. If the same source is put in a water tank, what would be the wavelength of the sound waves in water? (Speed of sound in water = 1480 m/s.)
Answer:

$$\text{Speed of sound in air} = 340 \text{ m/s.}$$
$$\text{Frequency} = 20 \text{ kHz} = 20 \times 10^3 \text{ Hz}$$
$$\text{Wavelength} = ?$$
$$\therefore \quad \text{Speed} = \text{Wavelength} \times \text{Frequency}$$
$$v = \lambda \nu$$
$$\therefore \quad \lambda = \frac{v}{\nu} = \frac{\text{Speed}}{\text{Frequency}} = \frac{340}{20 \times 10^3} = 0.017 \text{ m.}$$
$$\text{Speed of sound in water} = 1480 \text{ m/s}$$
$$\text{Frequency} = 20 \times 10^3 \text{ Hz}$$
$$\text{Wavelength} = ?$$
$$\therefore \quad \text{Speed} = \text{Wavelength} \times \text{Frequency}$$
$$\text{Wavelength} = \frac{\text{Speed}}{\text{Frequency}}$$
$$= \frac{1480}{20 \times 10^3} = 0.074 \text{ m.}$$

Question 4. A child watching Dussehra celebration from a distance sees the effigy of Ravana burst into flames and hears the explosion associated with it 2 sec after that. How far was he from the effigy if the speed of sound in air that night was 335 m/sec?

Answer:

Speed of sound in air = 335 m/s.
time required to reach the sound = 2 sec
distance of the source of sound =?

$$\therefore \quad \text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

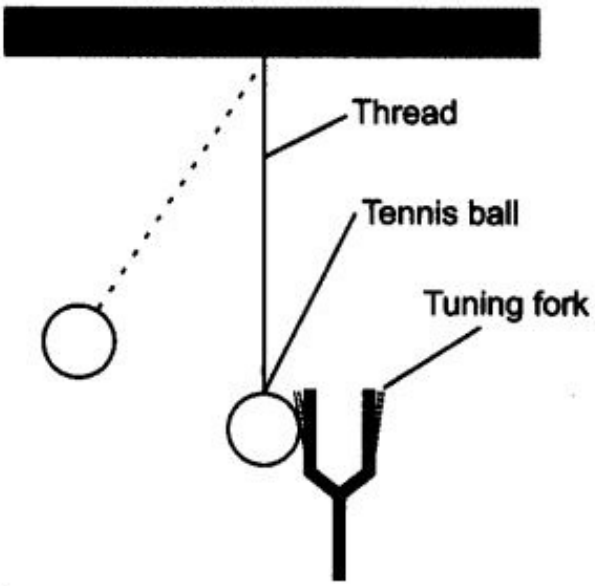
$$\therefore \quad \text{Distance} = \text{Speed} \times \text{Time}$$
$$= 335 \times 2 \text{ sec}$$
$$= 670 \text{ m.}$$

A child was 670 m away from the spot where effigy burnt.

V. ACTIVITY-BASED QUESTIONS

Question 1.

- Take a tuning fork and set it vibrating by striking its prong on a rubber pad. Bring it near your ear.
- Do you hear any sound?
- Touch one of the prongs of the vibrating tuning fork with your finger and share your experience with your friends.
- Now, suspend a table tennis ball or a small plastic ball by a thread from a support. Touch the ball gently with the prong of a vibrating tuning fork.
- Observe what happens and discuss with your friends.

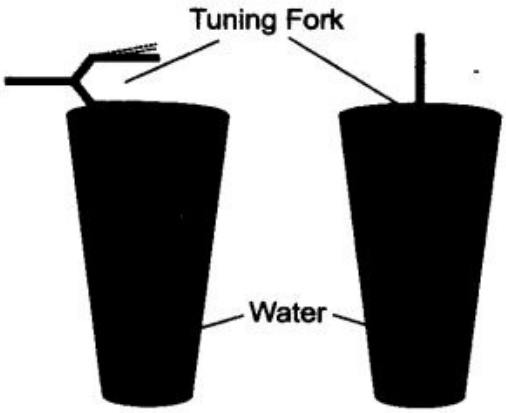


Answer: Yes, we heard sound. If we touch the ball with tuning fork set into vibration, the ball gets displaced from its mean position and starts moving.

Question 2.

- Fill water in a beaker or a glass up to the brim. Gently touch the water surface with one of the prongs of the vibrating tuning fork.
- Next dip the prongs of the vibrating tuning fork in water.
- Observe what happens in both the cases.
- Discuss with your friends why this happens.
- Arrange them on a table near a wall.
- Keep a clock near the open end of one of the pipes and try to hear the sound of the clock through the other pipe.
- Adjust the position of the pipes, so that you can best hear the sound of the clock.

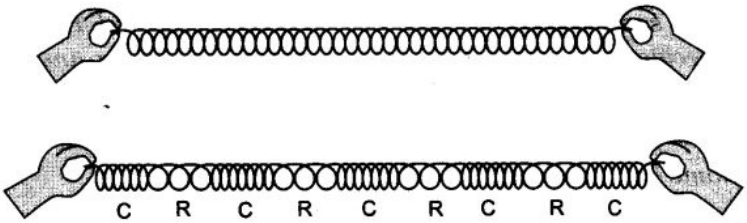
- Now, measure the angles of incidence and reflection and see the relationship between the angles.



Answer: In both the cases, sound will be produced by the tuning fork which produces ripples. But in case (1) ripples are produced which will move up and down and in case (2) ripples are produced which will move in sideways.

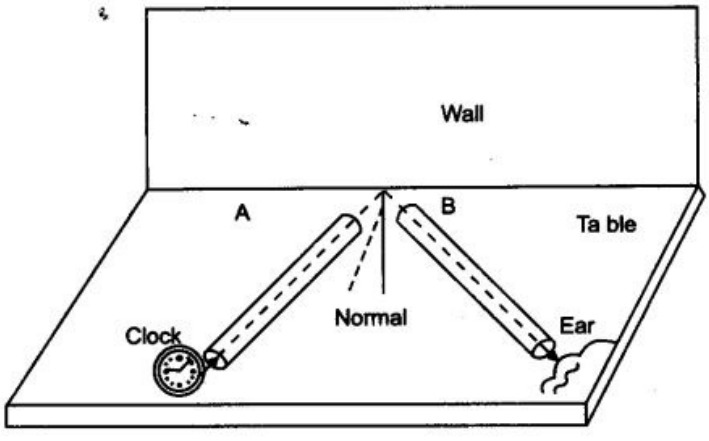
Question 3.

- Take a slinky. Ask your friend to hold one end. You hold the other end. Now stretch the slinky and give it a sharp push towards your friend.
- What do you notice? If you move your hand pushing and pulling the slinky alternatively, what will you observe?
- If you mark a dot on the slinky, you'll observe that the dot on the slinky will move back and forth parallel to the direction of propagation of the disturbance.



Answer: When we give a small jerk a hump is produced and this travels forward. When we give a sharp push continuous disturbance is produced. When we give a push or pull to the slinky, slinky starts moving in the forward and backward direction parallel to the direction of propagation of the disturbance.

Question 4. (i) Take two identical pipes. The length of the pipes should be sufficiently long.



(ii) Lift the pipes on the right vertically to a small height and observe what happens.
Answer: (i) Reflection of sound is similar to reflection of light i.e. Angle of incidence = Angle of reflection.
(ii) If we lift the pipe vertically to a small height, well not be able to hear the sound through the other end of the pipe because Angle of incidence * Angle of reflection. Therefore the reflected ray will not travel through the pipe B.

VI. VALUE-BASED QUESTIONS

Question 1. Raj noticed that his pet dog was frightened and trying to hide in safe place in his house when some crackers were burst in the neighbourhood. He realized the problem and he decided not to burst crackers during diwali or for any other celebrations.
(a) What must be the range of crackers sound?
(b) Name two diseases that can be caused due to noise pollution.
(c) Name the values of Raj reflected in above act.
Answer: (a) The range of crackers sound must be between 20 Hz to 20 kHz.
(b) Two diseases that can occur due to noise pollution are heart attack and high blood pressure.
(c) Raj reflects the value of respecting sensitivity for animals and caring for animals.

Question 2. It is not advisable to construct houses near airports, in spite of that many new residential apartments are constructed near airports. Sumit files RTI and also complains the municipal office about the same.
(a) Why one should not reside near airport?
(b) Name other two places where there is noise-pollution.
(c) What value of Sumit is reflected in this act?
Answer: (a) The landing and taking off of the air-planes causes lot of noise pollution which may lead to deafness, high blood pressure and other health problems.
(b) The other two places where there is noise-pollution is, residing near the heavy traffic routes and railway stations or lines.
(c) Sumit shows participating citizen and moral responsibility values.

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