PHYSICS

BOOKS - NAND LAL PUBLICATION

SOUND

Activity

1. Take a tuning fork and set it to vibration by striking its prong on a rubber pad.

What will you find it you bring the vibrating tuning fork near your ear?

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2. Take a tuning fork and set it to vibration by striking its prong on a rubber pad.

What will you find it you bring the vibrating tuning fork near your ear?

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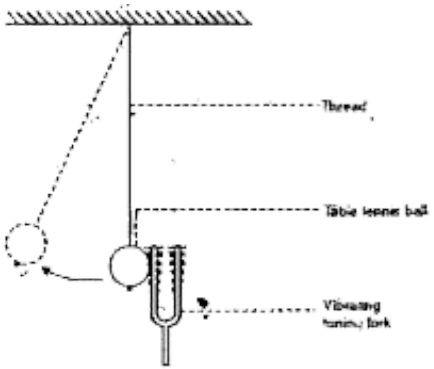
3. Suspend a table tennis ball or a small plastic ball by a thread from a support. You can suspend the ball using thread and a needle. Take a big needle and a thread, put a knot at one end of the thread. Then with tshe help of needle pass the thread through the ball.



Vibrating tuning fork just touching the suspended table tennis ball.

What will happen if you touch the ball with

prong of the tuning fork without setting it into vibration?

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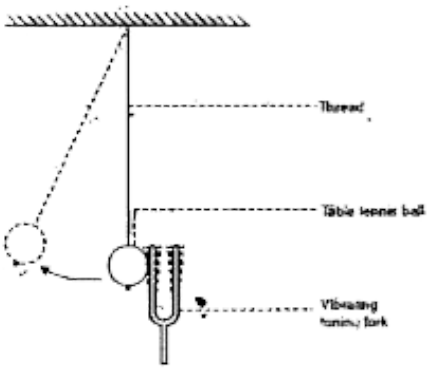
4. Suspend a table tennis ball or a small plastic ball by a thread from a support. You can suspend the ball using thread and a needle. Take a big needle and a thread, put a knot at one end of the thread. Then with tshe help of needle pass the thread through the ball.



Vibrating tuning fork just touching the suspended table tennis ball.

What will happen if you touch the ball with a vibrating tuning fork?

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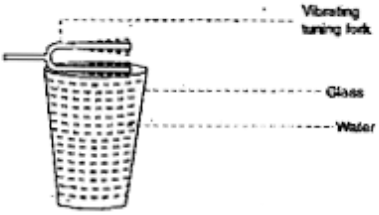
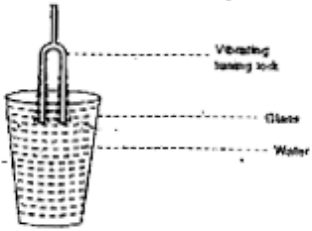
5. Fill water in a beaker or a glass up to its brim. Gently touch the water surface with one of the prongs of the vibrating tuning fork as

shown in Fig. 12.2. Now dip the prongs of vibrating tuning fork in water as shown in Fig. 12.3



One of the prongs of the vibrating tuning fork touching the water surface.



Both the prongs of the vibrating tuning fork dipped in water.

Observe what happens in both the cases?

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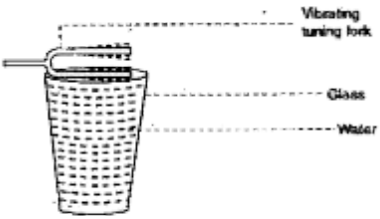
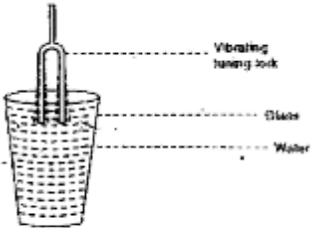
6. Fill water in a beaker or a glass up to its brim. Gently touch the water surface with one of the prongs of the vibrating tuning fork as shown in Fig. 12.2. Now dip the prongs of vibrating tuning fork in water as shown in Fig. 12.3



One of the prongs of the vibrating tuning fork touching the water surface.



Both the prongs of the vibrating tuning fork dipped in water.

Discuss with your friends why this happens.

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7. Fill water in a beaker or a glass up to its brim. Gently touch the water surface with one of the prongs of the vibrating tuning fork as

shown in Fig. 12.2. Now dip the prongs of vibrating tuning fork in water as shown in Fig. 12.3

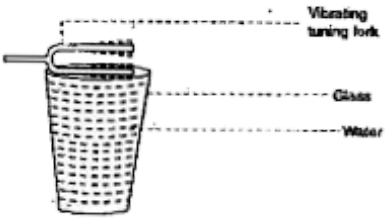
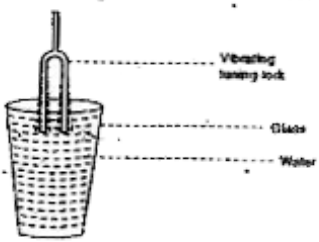


Fig. 12.2. One of the prongs of the vibrating tuning fork touching the water surface.



Both the prongs of the vibrating tuning fork dipped in water.

What can you conclude from activity 12.1 and 12.2?

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8. Make a list of different types of musical instruments and discuss with your friends which part of the instrument vibrates to produce sound.

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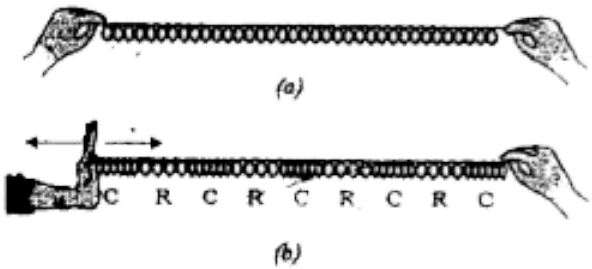
9. Take a slinky. Ask your friend to hold one end. You hold the other end. Now stretch the slinky as shown in Fig. 12.8 (a) Then give it a sharp push towards your friends.

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 will observe that the dot on the slinky will move back and forth parallel to the direction of the propagation of the disturbance.



Longitudinal wave in a slinky.

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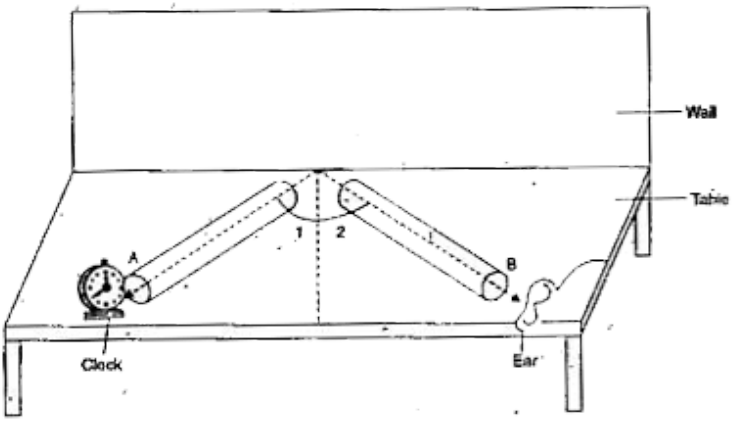
10. Take two identical pipes, as shown in Fig 12.23. You can make the pipe using chart paper. The length of the pipes should be sufficiently long as shown paper. Arrange them on a table near a wall. Keep a clock near the open end of one of the pipes, say pipe A and try to hear the sound of the clock through the other pipe. Put a playwood sheet between the two tubes perpendicular to the wall. This does not allow the direct hearing of the ticking sound of the clock. Ajust the position of the pipes so that you can best hear the sound of the clock.



Reflection of sound.

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

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11. Take two identical pipes, as shown in Fig 12.23. You can make the pipe using chart paper.

The length of the pipes should be sufficiently long as shown paper. Arrange them on a table near a wall. Keep a clock near the open end of one of the pipes, say pipe A and try to hear the sound of the clock through the other pipe. Put a playwood sheet between the two tubes perpendicular to the wall. This does not allow the direct hearing of the ticking sound of the clock. Ajust the position of the pipes so that you can best hear the sound of the clock.

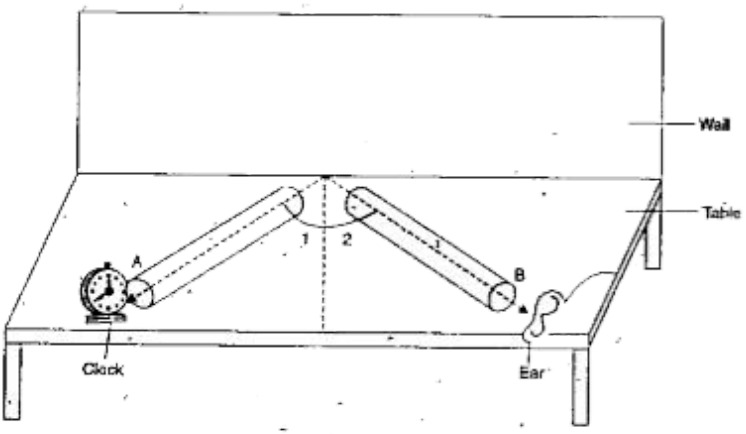

Fig. 12.23. Reflection of sound.

Lift the pipe on the right vertically to a small height and observe what happens?

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Intext Questions

1. How does the sound produced by the vibrating object in a medium reach your ear ?

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2. Explain how sound is produced by your school bell ?

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3. Why are sound waves called mechanical waves ?

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4. Suppose you and your friend are on the moon. Will you be able to hear any sound produced by your friend ?

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5. Which wave property determines: Loudness.

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6. Which wave property determines: pitch.

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7. Guess, which sound has a higher pitch : guitar or a car horn ?

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8. What are wavelength, frequency, time period and amplitude of a sound wae?

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9. How are the wavelength and frequency of a sound wave related to its speed ?

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10. Calculate the wavelength of a sound wave whose frequency is 220 Hz and speed is $440ms^{-1}$ in a given medium.

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11. A person is listening to a tone of 500 Hz sitting at a distance of 450 m from the source of sound. What is the time interval between successive compressions from the source ?

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12. Distinguish between loudness and intensity of sound.

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13. In which of the three media, air, water or iron sound travel the fastest at a particular temperature ?

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14. An echo returned in 3 s. What is the distance of reflecting surface from the source ? Given that the speed of sound is $342s^{-1}$.

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15. Why are the ceilings of concert halls curved?

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16. What is the audible range of average human ear?

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17. What is the range of frequencies associated with : infrasound ?

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18. What is the range of frequencies associated with: ultrasound?

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19. A submarine emits a sonar pulse, which returns from underwater cliff in 1.02 s. If the speed of sound in salt water is $1531 ms^{-1}$ how far away is the cliff ?

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Exercises

1. What is sound and how is it produced ?

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2. Describe with the help of diagram, how compressions and rarefactions are produced in air near a source of sound ?

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3. Cite an experiment to show that sound need a material medium for its propagation?

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4. Why is sound wave called longitudinal wave?

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5. Which characteristic of the sound help you to identify your friend by this voice while

sitting with others in a dark room.

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6. Flash and thunder are produced simultaneously. But thunder is heard a few seconds after the flash is seen. Why?

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7. A person has a hearing range from 20 Hz to 20 KHz. What is the typical wavelength of

sound waves in air corresponding to these frequencies ? Take the speed of sound in air as $344 ms^{-1}$.

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8. Two children are at opposite ends of an aluminium rod. One strikes the end of the rod with a stone. Find the ratio of times taken by the sound wave in air and in aluminium to reach the second child.

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9. The frequency of source of sound is 100 Hz. How many times does it vibrate in a minute ?

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10. Does sound follow the same laws of reflection as light does ? Explain.

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11. When a sound is reflected from a distant object, an echo is produced. Let the distance between the reflecting surface and the source of sound production remains the same. Do you hear echo sound on a hotter day ?

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12. Give two practical applications of reflection of sound waves.

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13. A stone is dropped from the top of a tower 500 m high into a pond of water at the base of the tower. When is the splash heard at the top ? Given, $g = 10ms^{-2}$ and speed of sound = $340ms^{-1}$.

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14. A sound wave travels at a speed of $339ms^{-1}$. If its wavelength is 1.5 cm, what is the frequency of the wave ? Will it be audible ?

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15. What is reverberation ? How can it be reduced ?

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16. What is loudness of sound ? What factors does it depend on ?

Watch Video Solution

17. What is loudness of sound ? What factors does it depend on ?

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18. Explain how bats use ultrasounds to catch a prey ?

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19. How is ultrasound used for cleaning ?

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20. Explain the working and applications of SONAR.

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21. A sonar device on a submarine sends out a signal and receives an echo 5s later. Calculate the speed of sound in water if the distance of the object from submarine is 3,625 m.

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22. Explain how defects in a metal block can be detected using ultrasound ?

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23. Explain how the human ear works.

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Additional Question Very Short Answer Type Questions

1. Name few sources of sound which we hear everyday.

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2. What is sound ?

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3. Name some forms of energy.

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4. What happens when you clap your hands?

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Additional Question Short Answer Type Questions

1. What is a wave or wave motion ?

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2. Cite an experiment to show that sound need a material medium for its propagation?

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3. State the characteristics of wave motion.

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4. Which property of the medium enables the transverse waves to pass through it?

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Additional Question Long Answer Type Questions

1. How is the depth of sea or the location of submerged object determined by SONAR method?

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2. What is echo-ranging?

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