

AIM | How does sound travel?

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A friend calls to you. He is across the street. Yet you hear him clearly. His voice is traveling through the air to your ears.

If you and your friend were on the moon, you could not hear him—even if he shouted. The moon has no air to carry his voice vibrations.

Sound moves from place to place but only where there is matter. Matter is made up of atoms and molecules. Molecules (or atoms) are needed for sound to travel. The vibrations are passed on from molecule to molecule.

A substance through which sound travels is called a *medium* of sound. *Solids, liquids, and gases* are the mediums of sound.

Sound travels at different speeds through different mediums. The speed depends upon how closely packed the molecules are.

The more closely packed, the *faster* the speed of sound.

The more loosely packed, the *slower* the speed of sound.

■ The molecules of *solids* are the most *tightly* packed. Sound, therefore, travels *fastest* through solids.

■ The molecules of *gases* are the most *loosely* packed. Sound, therefore, travels *slowest* through gases.

■ The molecules of *liquids* are spaced neither very close nor very far apart. Sound, therefore, travels at an *in-between* speed through liquids.

The ability to make things move is called *energy*. Sound is a form of energy because it makes matter vibrate.

Sound vibrations move in all directions. The vibrations cause *waves*. A wave is like a disturbance. Think of a rock being thrown in water. The rock hits the water. The water makes ripples that move outward. Sound waves move in the same way.

You will learn more about sound waves in Aim 4.

SOUND SPEED IN DIFFERENT MEDIUMS

Look at Figures A, B, and C. Each stands for a different medium of sound. The dots are the molecules.

Study the figures. Answer the questions by figure letters.

1. The molecules are spaced closest in _____.

A, B, C

2. The molecules are spaced farthest apart in _____.

A, B, C

3. The molecules are spaced neither very tightly nor very loosely in _____.

A, B, C

4. Which is the solid? _____

A, B, C

5. Which is the liquid? _____

A, B, C

6. Which is the gas? _____

A, B, C

Figure A

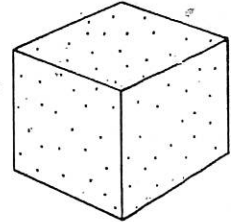


Figure B

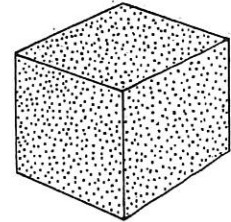
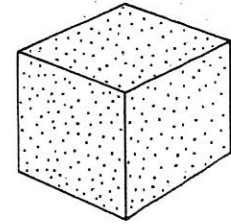


Figure C



Before you answer the remaining questions about sound mediums, look at Figure D.

7. a) Which row of dominoes will fall first? _____

b) Why? _____

8. a) Which row will fall last? _____

b) Why? _____

Now let's get back to the sound mediums.

9. a) Sound will travel fastest through _____.

solids, liquids, gases

b) Why? _____

10. a) Sound will travel slowest through _____.

solids, liquids, gases

b) Why? _____

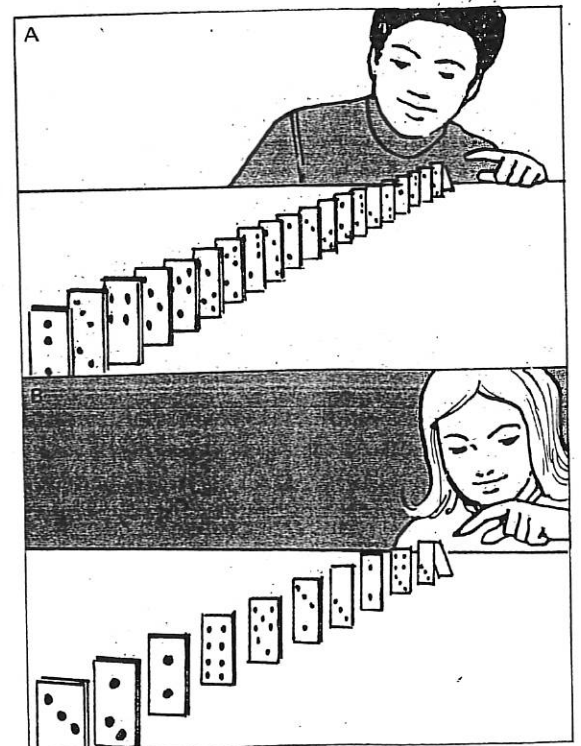


Figure D

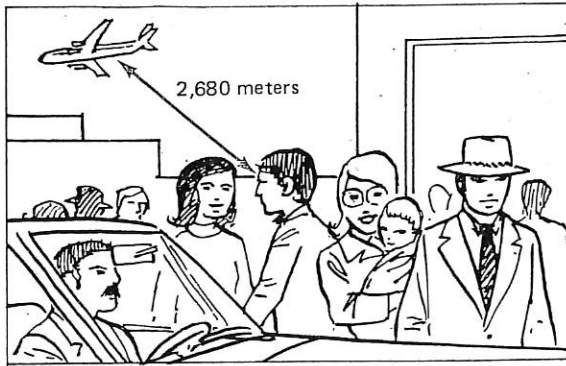


Figure E

How fast does sound travel through air? It travels about 335 meters (1,100 feet) per second.

In Figure F, the divers on the left are chopping away coral.

11. How long will it take the sound of the airplane to reach the people?

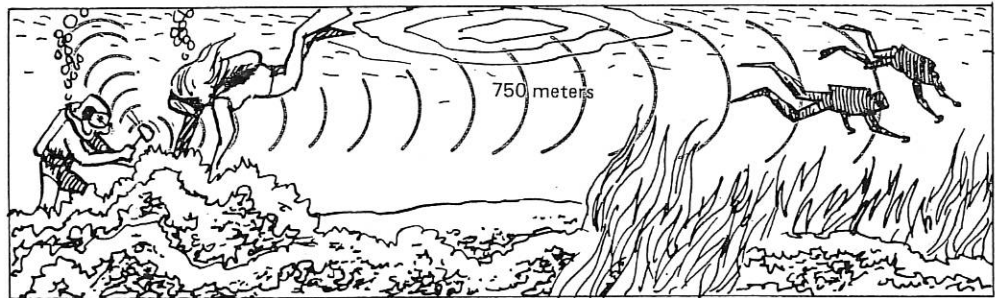


Figure F

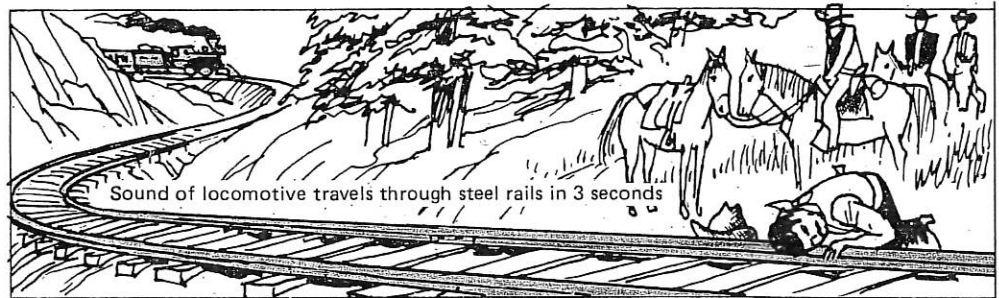


Figure G

How fast does sound travel through solids? It depends upon the solid. For example:

- Sound travels through glass at a speed of 3,720 meters (12,200 feet) per second.
- Sound travels through steel at a speed of 5,200 meters (17,060 feet) per second.

13. How far away is the locomotive in Figure G?

_____ meters _____ feet

TEST YOUR UNDERSTANDING

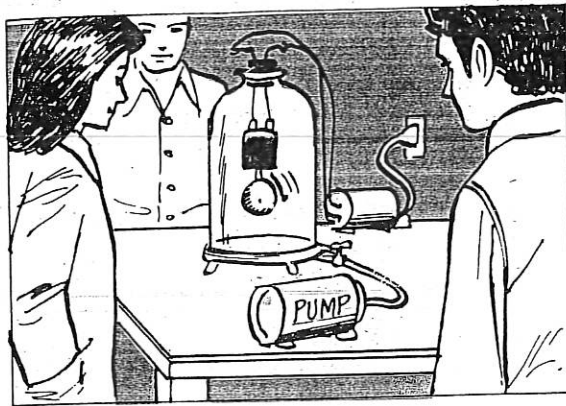


Figure H

Look at Figure H. Then answer the questions.

There is air in this jar. However, the pump is removing the air.

1. a) As the air is removed, the sound becomes _____
softer, louder

b) Why? _____

2. How will you know when just about all the air has been removed? _____

3. Sound needs two things: vibrations and a *medium*. Which of these is being removed here? The _____

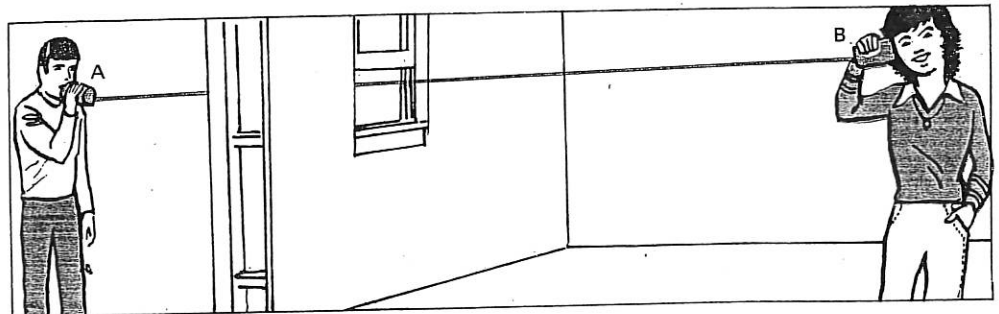


Figure I

Figure I shows a string telephone. You can make one yourself. All you need are two paper cups and about 9 meters (30 feet) of thin string.

The following sentences explain how the string telephone works. But they are not in proper order. Rewrite the sentences in proper order on lines 4–8.

- The cord vibrates.
- The boy's vocal cords vibrate.
- The air in cup B vibrates.
- The vibrations go into the girl's ear.
- The air in cup A vibrates.

4. _____
5. _____
6. _____
7. _____
8. _____

COMPLETING SENTENCES

Complete the sentences with the choices below. Two of these may be used twice.

medium
move
gas
atoms

liquid
solids
vibrations
directions

gases
molecules
solid

1. Sound is caused by _____.
2. Sound travels through matter. Any matter through which sound travels is called a _____ of sound.
3. All matter is made up of _____ and _____.
4. Matter is any _____, _____, or _____.
5. Molecules are *most* tightly packed in _____.
6. Molecules are spaced farthest apart in _____.
7. Sound travels fastest through _____.
8. Sound travels slowest through _____.
9. Sound is a form of energy because it can make matter _____.
10. Sound waves move out in all _____.

REACHING OUT

Sound waves reach out in all directions. They travel in straight lines. But sound waves can also *turn corners*. How do you know this is true? _____

