SOUND

Overview

Sound is a type of **longitudinal wave**. As it travels through its medium, the mediums particles show areas of **compression** and **rarefaction**. While the most common medium for sound is air, we know it can travel through many other substances. The diagram below shows a typical sound wave.

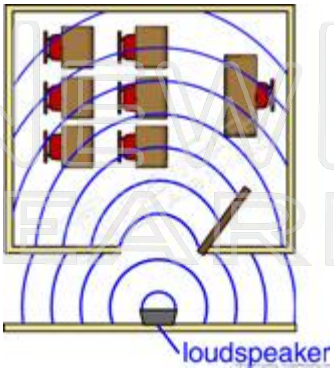
LESSON CHECKPOINT:
What is a sound wave?

Sound Wave Interactions

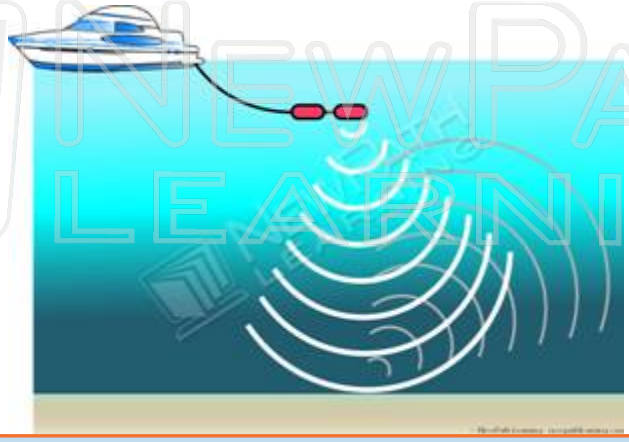
Typical ch other i

The firs off an object

The second type of interaction is called **diffraction**. This has to do with sounds ability to go around corners and spread out. We know that the sound produced in one room can be heard in another. This is the result of diffraction.



The meeting of sound waves is called **interference** and this is the third type of interaction. Depending on what happens, this interference can be either constructive or destructive.



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PREVIEW

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medium		speed
gases	air (0° C)	331
	air (20° C)	343
liquids (30° C)	fresh water	1,509
	salt water	1,546
solids (25° C)	lead	1,210
	iron	4,480
	aluminum	5,000
	glass	5,170

The speed of sound is also influenced by the **density** and **elasticity** of the medium. Notice in the chart above how different media conduct sound at different speeds.

Elasticity has to do with how well the particles of a medium bounce back after energy passes through them. The reason sound travels faster through a solid than it does through water or air is because solids are far more elastic than liquids or vapors.

LESSON CHECKPOINT:
What factors affect the speed of sound?

Loudness of Sound

The **loudness** of sound depends upon its intensity and the distance from the sound's ergy the sou sound is comi **decibe** .

jackhammer	120
jet plane at takeoff	120-160

Sound Pitch

Sound's **pitch** depends upon its frequency. At certain frequencies certain sounds seem quite high, while at other frequencies sounds can seem quite low. The frequency of sound is measured in units called **hertz**. Humans normally can hear frequencies between 20 and 20,000 hertz. Sounds above this frequency are referred to as **ultrasound**.

LESSON CHECKPOINT:
What is the difference between the loudness of a sound and its pitch?

Doppler Effect

When the frequency of sound changes as its source moves in relationship to someone listening, this is called the **Doppler Effect**. In the diagram below, the sound of the fire truck seems to change as it passes the people on the street. This is the result of the Doppler Effect.

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LESSON CHECKPOINT:
What factors influence the quality of a sound?

Hearing Sound

The hearing of sound requires both our ears and our brain.

1. The outer ear shown below captures the sound wave and uses its energy to move small bones in the middle ear.
2. The movement of these bones causes nerve endings in the inner ear to be stimulated.

3. The nerves send impulses to the hearing center in the brain.
4. The brain interprets the nerve impulses as particular sounds.

Overall, the ear converts the mechanical energy of air to the mechanical energy of bones in the middle ear to electrical energy sent to the brain.

Wha ***aring***

Using

Sound used by anir o watch m below them. **Sonar** involves the bouncing of sound off a surface and having it reflect back to the sonar screen as a visual picture.

Doctors use a similar method called **ultrasound testing**. In this type of testing, sounds of ultrahigh frequency are beamed into the body and as they bounce back they create of picture of what they reflected.

LESSON CHECKPOINT:
Name two ways we use sound today, beyond hearing.