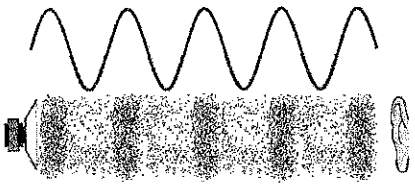
Name _____ Date _____

Sound

"Sound is Vibration, Vibration is Sound"

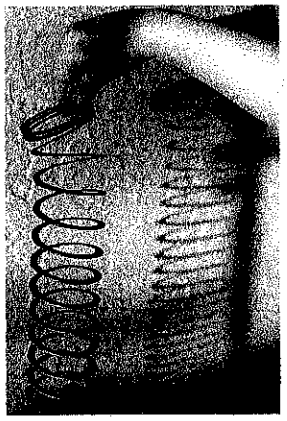
Learn more about this topic! Each section gives more detail on one of the lyrics from the song. Read each section, and then respond by answering the question or taking notes on key ideas.

1. 

Sound travels by moving molecules.

Sound is a type of energy, just like light, heat, motion and electricity. Sound is energy that people can hear. It's produced by **vibration**. A vibration is a quick back and forth movement. If you pulled a rubber band between your fingers so that it made a "twang" noise, it would vibrate. That vibration produces a sound. For sound to travel, it needs a medium, or something with molecules, to carry it. Sound energy can travel underwater, in the air and through doors, walls and windows, too. But it cannot travel if there's no matter to carry it, like in the vacuum of deep space.

Notes

2. 

How do vibrations produce sound? When something vibrates, molecules are compressed, or squeezed together. Then, they are rarefied, or spread out. This creates a wave. The surrounding molecules are compressed and then rarefied. Picture holding the ends of a slinky between two hands. If you compressed the slinky by moving the coils forward in one hand, that compression would travel down the other coils. Those coils would compress and then spread out. The slinky itself wouldn't go anywhere, but the coils would carry the compression along like a wave. That's how molecules carry sound energy. The wave that is created is called a **compression wave** or a **longitudinal wave**. Ears can detect the vibrations, which the brain processes as sound.

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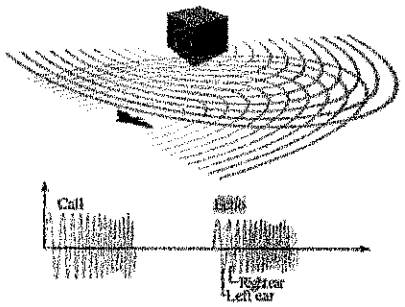

Bats use echoes to navigate.

An **echo** is a sound wave that is reflected off of a surface and back to a listener. When sound waves meet a solid substance, the energy may be carried through that substance. Some of it might be absorbed into the substance. In some cases, some might also be reflected off the surface and bounce back. If you hear the same sound again, it's an echo. Some animals, like bats and dolphins, use echoes to help them navigate. They create sounds and, based on the echoes, they can determine where things are in space. That's called echolocation.

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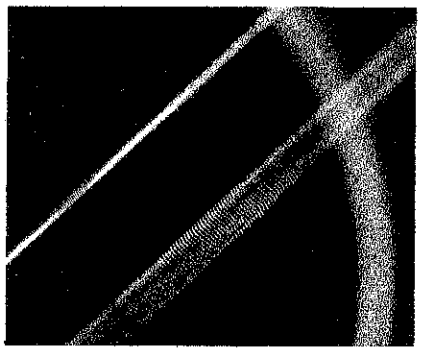

Guitar strings vibrating

We can hear sound. Sometimes, we can see and feel it, too. If you strum on a guitar and look closely at the strings, you can see them vibrating. That vibration is the very sound you hear. If you put a piece of paper over a stereo, you can see the sound vibrating the paper. If you put rice on top of a drum and bang on the drum, you'd see the rice move. Want a simple way to feel sound? Put your hand on your throat and hum.

Notes

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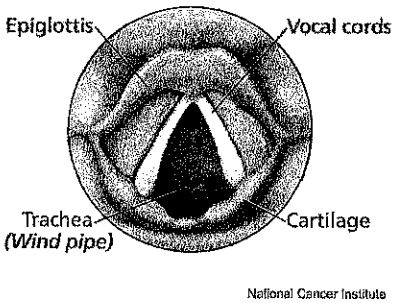


A diagram of human vocal cords

Sound is vibration, and vibration is sound. When sound travels, what you hear is how vibration affects the molecules. There are different ways you can investigate this. When you bang on a drum cymbal, the cymbal makes a sound and moves, or vibrates, back and forth. What happens when it stops moving? The sound stops. The same thing happens when the wind blows against a wind chime outside or when a bell tolls. What about when a person speaks? Inside of the throat, the larynx contains folds known as vocal cords. When a person speaks, air from the lungs moves into the larynx. The vocal cords vibrate, producing a sound.

Notes

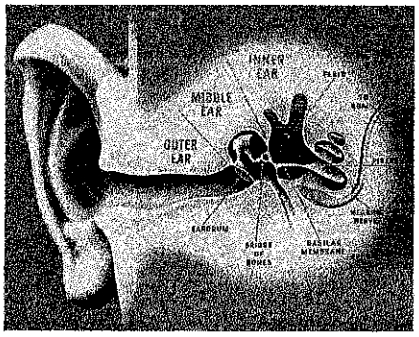
6. 

Diagram of the human ear

We can describe sounds by qualities like pitch and volume. But how do people hear sounds? The ears collect sounds and send them to the brain. The outer ear is the part of the ear that is visible. Its job is to collect sound waves and direct them to the middle ear. The eardrum, which separates the outer ear from the middle ear, is a thin piece of skin stretched tight that vibrates when sound waves reach it. From there, three small bones, the tiniest bones in the body, send the sound waves along to the inner ear. When the last bone hits the cochlea in the inner ear, fluid inside the cochlea moves. This movement causes the hearing nerve to carry a message to the brain.

Notes

7. 

Alarm clocks usually have a high pitch.

A sound's **pitch** is how high or low it is. The rate of vibration determines the pitch. High pitches vibrate quickly, and low pitches vibrate more slowly. When we look at the sound wave produced by a vibration, the **frequency** shows us the pitch. Frequency is the rate at which a wave occurs. If a pitch is high, it vibrates quickly and has a high frequency.

Notes

Name _____ Date _____

Flocabulary

Sound

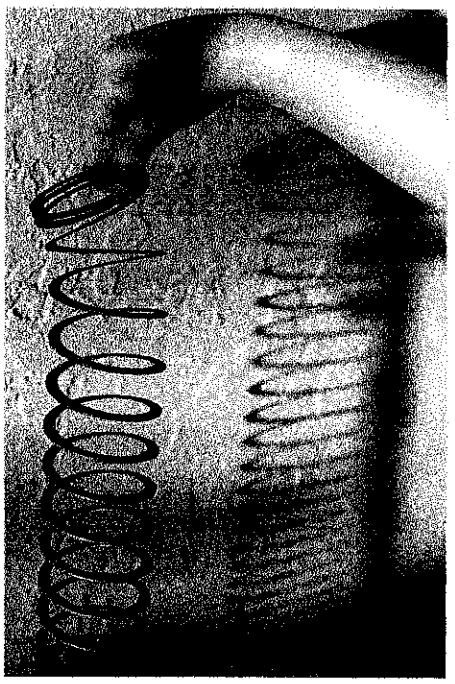
Use the text to answer each question below.

1. **Sound** is a type of energy, just like light, heat, motion and electricity. Sound is energy that people can hear. It's produced by **vibration**. A vibration is a quick back and forth movement. If you pulled a rubber band between your fingers so that it made a "twang" noise, it would vibrate. That vibration produces a sound. For sound to travel, it needs a medium, or something with molecules, to carry it. Sound energy can travel underwater, in the air and through doors, walls and windows, too. But it cannot travel if there's no matter to carry it, like in the vacuum of deep space.

   Based on the passage, sound doesn't travel in deep space because

   A. there is no energy in deep space.
   B. there is no light to see it in deep space.
   C. there are no molecules to carry it in deep space.
   D. there is no heat in deep space.

2. How do vibrations produce sound? When something vibrates, molecules are compressed, or squeezed together. Then, they are rarefied, or spread out. This creates a wave. The surrounding molecules are compressed and then rarefied. Picture holding the ends of a slinky between two hands. If you compressed the slinky by moving the coils forward in one hand, that compression would travel down the other coils. Those coils would compress and then spread out. The slinky itself wouldn't go anywhere, but the coils would carry the compression along like a wave. That's how molecules carry sound energy. The wave that is created is called a **compression wave** or a **longitudinal wave**. Ears can detect the vibrations, which the brain processes as sound.



   In which detail from the passage does the author transition from describing a concept to using an example to illustrate it?

   A. "This creates a wave."
   B. "Picture holding the ends of a slinky between two hands."
   C. "Ears can detect the vibrations, which the brain processes as sound."
   D. "When something vibrates, molecules are compressed, or squeezed together."

3. An **echo** is a sound wave that is reflected off of a surface and back to a listener. When sound waves meet a solid substance, the energy may be carried *through* that substance. Some of it might be absorbed *into* the substance. In some cases, some might also be reflected *off* the surface and bounce back. If you hear the same sound again, it's an echo. Some animals, like bats and dolphins, use echoes to help them navigate. They create sounds and, based on the echoes, they can determine where things are in space. That's called echolocation.

Which detail from the passage best explains why a friend's voice might sound muffled if she calls to you through a closed door?

A. "They create sounds and, based on the echoes, they can determine where things are in space."

B. "In some cases, some might also be reflected *off* the surface and bounce back."

C. "That's called echolocation."

D. "Some of it might be absorbed *into* the substance."

4. We can hear sound. Sometimes, we can see and feel it, too. If you strum on a guitar and look closely at the strings, you can see them vibrating. That vibration is the very sound you hear. If you put a piece of paper over a stereo, you can see the sound vibrating the paper. If you put rice on top of a drum and bang on the drum, you'd see the rice move. Want a simple way to feel sound? Put your hand on your throat and hum.

Guitar strings vibrating

Which of the following is the best topic sentence for this passage?

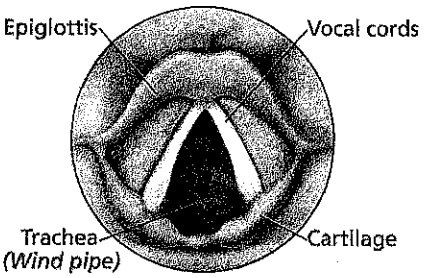
A. Sound moves in waves through a medium.

B. A guitar is a musical instrument that has strings.

C. There are three main components of the human ear.

D. We can perceive sound with our senses.

5. Sound is vibration, and vibration is sound. When sound travels, what you hear is how vibration affects the molecules. There are different ways you can investigate this. When you bang on a drum cymbal, the cymbal makes a sound and moves, or vibrates, back and forth. What happens when it stops moving? The sound stops. The same thing happens when the wind blows against a wind chime outside or when a bell tolls. What about when a person speaks? Inside of the throat, the larynx contains folds known as vocal cords. When a person speaks, air from the lungs moves into the larynx. The vocal cords vibrate, producing a sound.



National Cancer Institute

A diagram of human vocal cords

According to this passage, how does air help a person speak?

A. Air from the lungs makes the vocal cords vibrate.

B. Air keeps the vocal cords from touching.

C. Air carries sound from the throat to the lungs.

D. Air moves the larynx up when a person breathes out.

6. We can describe sounds by qualities like pitch and volume. But how do people hear sounds? The ears collect sounds and send them to the brain. The outer ear is the part of the ear that is visible. Its job is to collect sound waves and direct them to the middle ear. The eardrum, which separates the outer ear from the middle ear, is a thin piece of skin stretched tight that vibrates when sound waves reach it. From there, three small bones, the tiniest bones in the body, send the sound waves along to the inner ear. When the last bone hits the cochlea in the inner ear, fluid inside the cochlea moves. This movement causes the hearing nerve to carry a message to the brain.

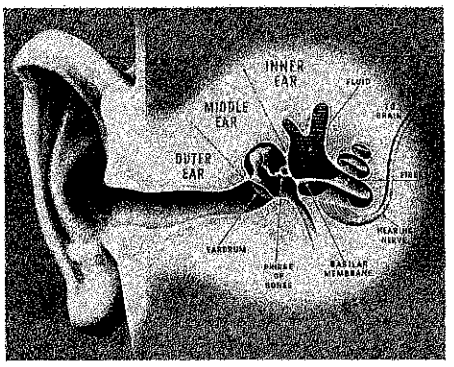


Diagram of the human ear

Based on this passage, which of the following is an accurate summary of how people hear sounds?

A. A sound is passed from the outer ear to the middle ear and then to the inner ear as a vibration. In the inner ear, the vibration causes a series of movements ending in fluid motion that triggers a nerve to carry a message to the brain.

B. A sound is collected by the ear drum and sent to the cochlea where it is converted into a nerve signal. Fluid carries that signal to the brain.

C. A sound is collected by the outer ear and sent to the cochlea as a nerve signal. The signal is processed by fluid in the cochlea as the sound a person hears.

D. A sound is passed from the inner ear to the middle ear and then to the outer ear, where the eardrum vibrates. This vibration triggers the brain to send a signal to a nerve.

7. A sound's **pitch** is how high or low it is. The rate of vibration determines the pitch. High pitches vibrate quickly, and low pitches vibrate more slowly. When we look at the sound wave produced by a vibration, the **frequency** shows us the pitch. Frequency is the rate at which a wave occurs. If a pitch is high, it vibrates quickly and has a high frequency.

Based on this passage, what is the relationship between a vibration and the frequency of a sound wave?

A. the longer the vibration lasts, the higher the frequency of the sound wave

B. the faster the vibration, the lower the frequency of the sound wave

C. the faster the vibration, the higher the frequency of the sound wave

D. the longer the vibration lasts, the shorter the frequency of the sound wave