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LESSON 4

Before We Read

MY LEARNING GOALS

I can

- ○ discuss acoustics in a building.
- ○ identify causes and effects.

The Science of Sound

Listen to a band or concert. Did you know that the construction of the building can enhance what you are hearing or detract from it? You have watched movies in your home. Think about how the sound is different when you watch it in a movie theater. That's because the acoustics are different.

Identifying Cause and Effect

The **cause** is something that happens. The **effect** is what happens. A causal chain is a series of events that are connected to each other. One event may be both the effect of an earlier event and the cause of a later event. Words such as *because, as a result of,* and *so* are clues to the reasons things happen.

Complete the chain of causes and effects.

Kafil didn't sleep well.

↓

↓

Because Kafil took a nap, he was late picking up his friend.

↓

Kafil and his friend missed the first ten minutes of the movie.

↓

READING

Let's Read

MY LEARNING GOALS

I can

- read and understand an informational passage about acoustics.
- recognize cause and effect.

Architects and Acoustics

Architects design buildings to be functional and aesthetically pleasing, but it takes special skills to design a concert hall. If an audience can't hear what they came to experience, they can become extremely frustrated. So concert halls, and buildings like churches and theaters where sound is important, are designed with expert help. Acoustics is the scientific study of sound. Acousticians are the experts in the field of sound.

Sound moves in invisible waves. Those waves cause whatever they pass through, whether it's air, water, or solids, to vibrate. Sound travels faster through water and solids than through air because the molecules of water and solids are more densely packed together. The speed of sound depends on how frequently sound waves collide with and vibrate molecules. In air that is 68° Fahrenheit (20° Celsius), the speed of sound is about 1,129 feet (344 meters per second).

Blue and Green Music
Georgia O'Keefe
1919–1921

Underline the word that means "the scientific study of sound."

What are some buildings where sound is important?

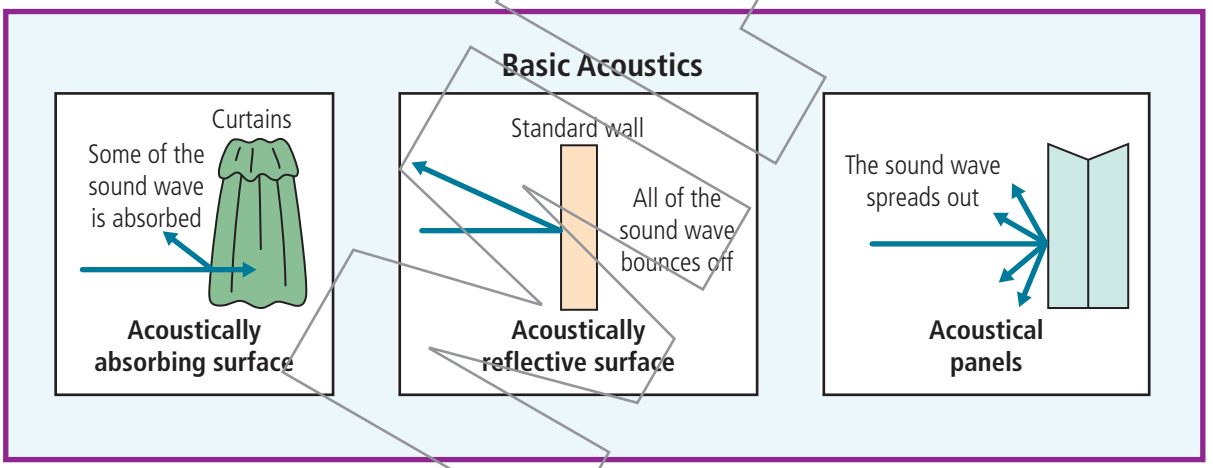
Buildings where sound is important are _____.

Let's Read

Waves of Sound

As a musician plays an instrument, sound waves disperse in every direction. Some travel directly to your ear, but others reflect off side and back walls and hit some seats before they reach you, not as the instrument makes them. Sound may seem instantaneous to you as a listener, but it isn't.

All the components of a concert hall have the right balance of absorbing and reflecting materials for the room to have good acoustics. Large, dense hard objects like walls or panels on the ceiling reflect sound. Soft, textured surfaces, like carpet on the floor and the cushions on the seats, absorb it. The room must be built so that people can't hear outside sounds.



Circle an example of something that absorbs sound.

Why are some restaurants noisier than others?

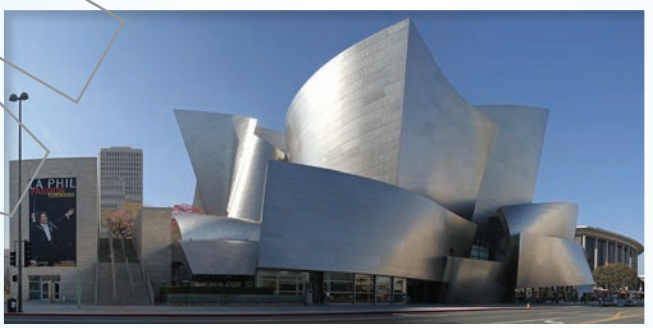
Some restaurants do not have _____.

Concert Halls

The shape of the concert hall is also important. A plain, shoebox shape seems to work best. The outside of a concert hall may look very different than this. The opera house in Sydney, Australia, looks like several huge triangular caves placed next to each other. A Los Angeles concert hall resembles an old-fashioned ship with sails rising up in all directions. Yet, both halls are a shoebox shape inside because it's best for the music.

Acousticians helped to save a poor concert hall in San Francisco by hanging panels called clouds from the ceiling and walls. Clouds spread and redirect the sound. Wood cloud panels were installed, so that they looked like decorations. But they were much more than that. They reflected the sound and made it travel well.

Sydney Opera House



Walt Disney Concert Hall, Los Angeles

Highlight what shape is commonly used for the interior of a concert hall.

What do you think about the design of the Sydney Opera house?

I think _____.

Let's Read

Recording Studios

Classical musicians in an orchestra don't use microphones or other equipment to amplify their music, so it's up to the acoustician to get the best possible sound. However, rock bands use electronic amplifiers, so there's no problem with their sound fading too fast. In fact, it's better for a rock band to have a hall that absorbs sound. If the hall reverberates too much, the echoes must be stopped.

Recording studios have acoustic properties that are the opposite of a concert hall. The recording studio needs to be acoustically dead. The enclosure must absorb sound. Special steps must be taken to make it soundproof from outside noises like traffic or aircraft. The recording enclosure is often isolated with a double wall to create a room within a room. The heating and air conditioning system are also carefully designed and sealed.

Recording Studio

Underline the word that means "appear to vibrate or be disturbed because of a loud noise."

Why does a recording studio need to be soundproofed?

It is soundproofed so that _____.

Show What You Know

Add two events to the causal chain below.

Cause

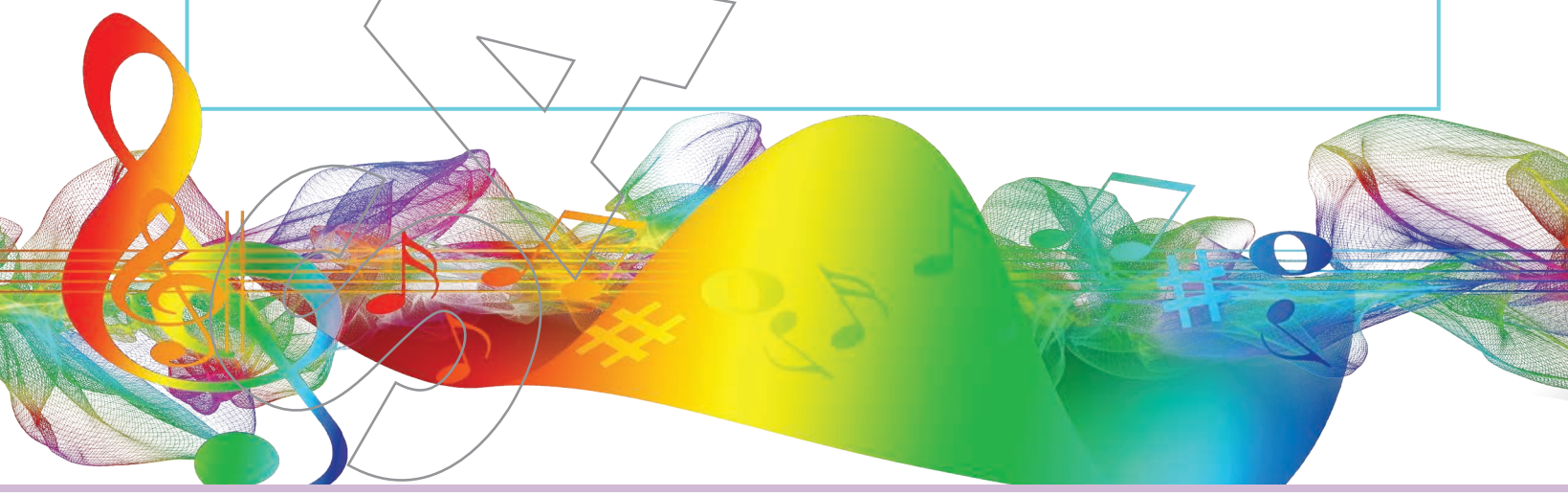
A concert hall had poor acoustics.

↓

↓

The acoustics were improved.

↓



What Did You Learn?

Think about what you learned from the passage. Then circle the letter of the correct answer.

1. What does the word *instantaneous* mean _____?
   - **A** very loud
   - **B** easily understood
   - **C** without delay
   - **D** with emotions

2. You can decide from the passage that a room with reverberations needs to _____.
   - **A** move dense objects to reflect sound
   - **B** use curtains to reflect the sound
   - **C** use electronics to make sounds louder
   - **D** use more soft, textured surfaces to stop echoes

3. The main idea of the second paragraph is to explain _____.
   - **A** how a concert hall looks
   - **B** how sound is instantaneous
   - **C** how sound moves in waves
   - **D** how instruments must be played

4. The more that sound waves collide with molecules _____.
   - **A** the faster the sound waves move
   - **B** the easier you hear a sound
   - **C** the more acousticians like it
   - **D** the better it is for rock concerts

LISTENING

Listen and Discuss

MY LEARNING GOALS

I can

- ○ listen to a conversation about how sound is measured.
- ○ use language to ask questions and contribute to a conversation.

Listen to a conversation between two students about sound. While you listen the second time, take notes on the chart below.

1.

2.

3.

4.

5.

SPEAKING

Listen and Discuss

What is sound intensity?

Whisper

Rock Concert

Sound	Decibels (dB)	Exponential Increase
hearing threshold	0	$10^0 = 1$
	10	$10^1 = 10$
whisper at 1 m	20	$10^2 = 100$
	30	$10^3 = 1{,}000$
	40	$10^4 = 10{,}000$
	50	$10^5 = 100{,}000$
normal speech	60	$10^6 = 1{,}000{,}000$
	70	$10^7 = 10{,}000{,}000$
	80	$10^8 = 100{,}000{,}000$
power tools	90	$10^9 = 1{,}000{,}000{,}000$
	100	$10^{10} = 10{,}000{,}000{,}000$
earphones on high	110	$10^{11} = 100{,}000{,}000{,}000$
rock concert	120	$10^{12} = 1{,}000{,}000{,}000{,}000$

MY LEARNING GOALS

I can

- ○ use apostrophes correctly.
- ○ form contractions.

Apostrophes

An **apostrophe (’)** is used to take the place of the letter or letters that are left out of a contraction. A contraction is a shortened form of two words used together.

do not	can not	will not	it is	is not	there is
don’t	can’t	won’t	it’s	isn’t	there’s

Read these sentences from the passage. Then write out what the underlined contraction means.

1. Sound may seem instantaneous to you as a listener, but it isn’t. _____

2. The room must be built so that people can’t hear outside sounds. _____

3. Classical musicians in an orchestra don’t use microphones or other equipment to amplify their music, so it’s up to the acoustician to get the best possible sound. _____

4. However, rock bands use electronic amplifiers, so there’s no problem with their sound fading too fast. _____

Learning About Language

Some contractions are made up of a pronoun and a verb. Draw a line to match the word with its contraction.

1.	he is	he'd
2.	they are	I'm
3.	she will	you're
4.	you are	he's
5.	he had	she'll
6.	I am	they're

Write the two words that form the contraction on the line.

1. mustn't _____

2. what's _____

3. who're _____

4. wouldn't _____

5. let's _____

WRITING

Write About It

MY LEARNING GOALS

I can

- ○ write about a problem and its solution.
- ○ make my writing better with help from my teacher and classmates.

Noise pollution is a problem in some areas. High-decibel sounds can take a toll on people's hearing. People are working on ways to lessen the effect of noise on people. Think about an everyday problem that you had to solve. How did you solve it? Write a paragraph that states the problem and tells how you came up with a solution.

Plan My Writing

Fill in the chart with the problem and its solution to help you plan your writing.

Problem
Solution

WRITING

Write About It

One problem that I had was _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____.

I solved it by _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____.