Name _____

# Tsunami

Fill in the circle by the correct answer. Then write the answers to numbers 3, 4, and 5.

1. Measuring seismic waves helps scientists _____.
   - Ⓐ learn the wind direction
   - Ⓑ forecast a tsunami wave
   - Ⓒ forecast the weather
   - Ⓓ create a disturbance

2. A tsunami zone is _____.
   - Ⓐ higher ground that is inland
   - Ⓑ an area where a tsunami may strike
   - Ⓒ a sign with a warning on it
   - Ⓓ the surface of the water

3. Explain three ways in which tsunami waves are different from ordinary ocean waves.

_____

_____

4. Give evidence from the text that a tsunami can affect a very wide area.

_____

_____

5. In your opinion, what is the most important reason that scientists should study tsunamis?

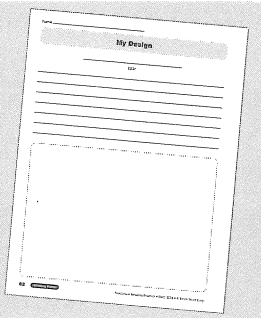
_____

_____

## Write About the Topic

Use the Writing Form to write about what you read.

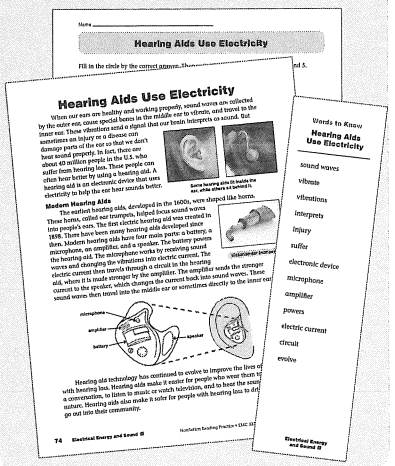
Design a tsunami exhibit for a science museum. List the displays you would include.



# Electrical Energy and Sound

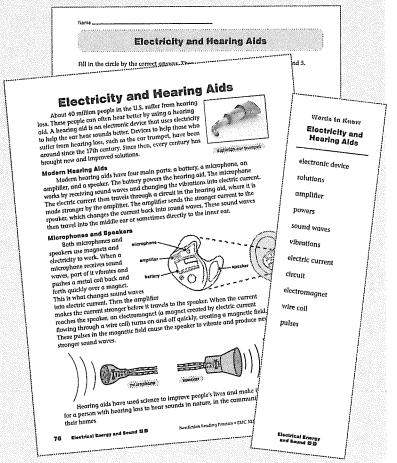
## Level 1 ■

Words to Know list, Reading Selection, and Reading Comprehension questions



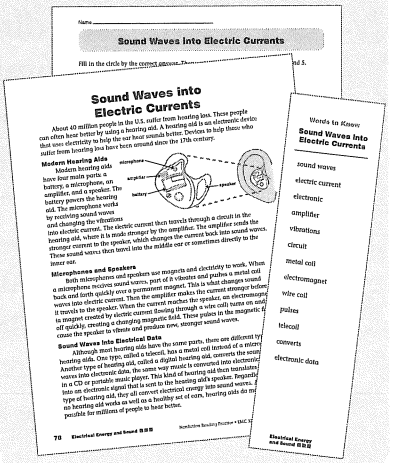

## Level 2 ■■

Words to Know list, Reading Selection, and Reading Comprehension questions




## Level 3 ■■■

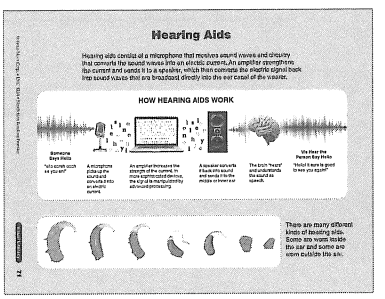
Words to Know list, Reading Selection, and Reading Comprehension questions




## Assemble the Unit

Reproduce and distribute one copy for each student:

- Visual Literacy page: Hearing Aids, page 71
- Level 1, 2, or 3 Reading Selection and Reading Comprehension page and the corresponding Words to Know list
- Graphic Organizer of your choosing, provided on pages 180–186
- Writing Form: Hearing Aids, page 72



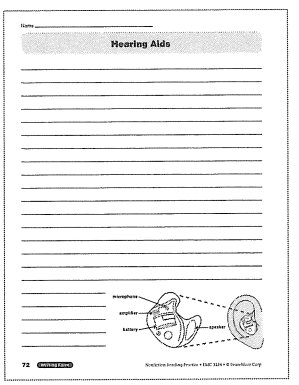

Visual Literacy

## Introduce the Topic

Read aloud the text and discuss the graphics on page 71. Explain that hearing aids use electrical energy. Ask students to share what they know about hearing aids and if they know anyone who wears hearing aids.

## Read and Respond

Form leveled groups and review the Words to Know lists with each group of students. Instruct each group to read their selection individually, in pairs, or as a group. Have students complete the Reading Comprehension page for their selection.




Writing Form

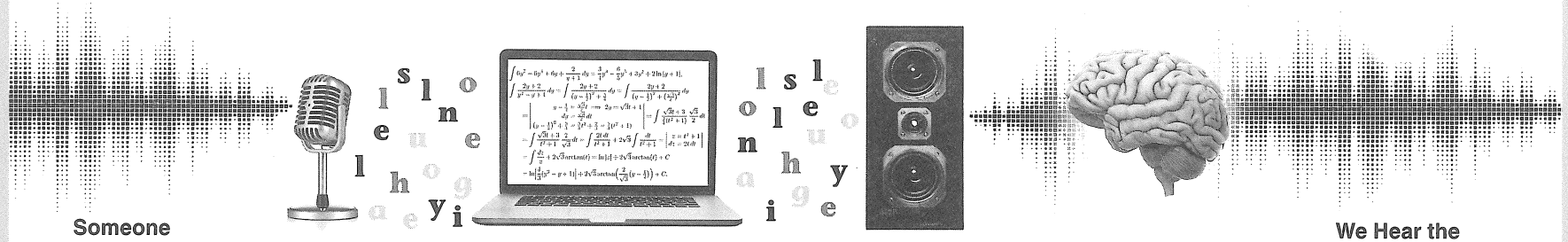
## Write About the Topic

Read aloud the leveled writing prompt for each group. Tell students to use the Graphic Organizer to plan their writing. Direct students to use their Writing Form to respond to their prompt.

# Hearing Aids

Hearing aids consist of a microphone that receives sound waves and circuitry that converts the sound waves into an electric current. An amplifier strengthens the current and sends it to a speaker, which then converts the electric signal back into sound waves that are broadcast directly into the ear canal of the wearer.

## HOW HEARING AIDS WORK



**Someone Says Hello**

"ello ooreh oooh ee you en!"

A microphone picks up the sound and converts it into an electric current.

An amplifier increases the strength of the current. In more sophisticated devices, the signal is manipulated by advanced processing.

A speaker converts it back into sound and sends it to the middle or inner ear.

The brain "hears" and understands the sound as speech.

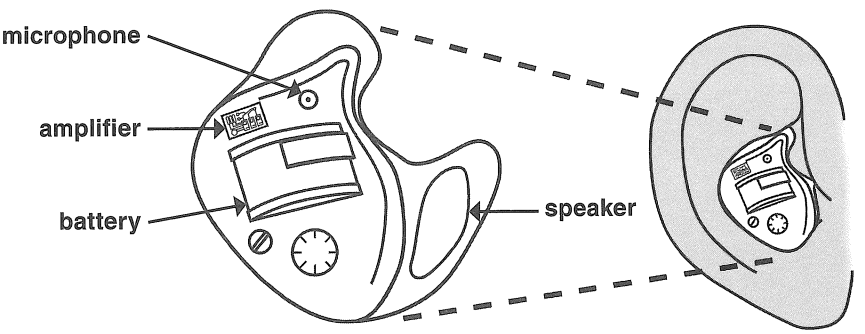
**We Hear the Person Say Hello**

"Hello! It sure is good to see you again!"

There are many different kinds of hearing aids. Some are worn inside the ear and some are worn outside the ear.

Name _____

# Hearing Aids



Words to Know

## Hearing Aids Use Electricity

sound waves

vibrate

vibrations

interprets

injury

suffer

electronic device

microphone

amplifier

powers

electric current

circuit

evolve

Electrical Energy and Sound ■

Words to Know

## Electricity and Hearing Aids

electronic device

solutions

amplifier

powers

sound waves

vibrations

electric current

circuit

electromagnet

wire coil

pulses

Electrical Energy and Sound ■■

Words to Know

## Sound Waves into Electric Currents

sound waves

electric current

electronic

amplifier

vibrations

circuit

metal coil

electromagnet

wire coil

pulses

telecoil

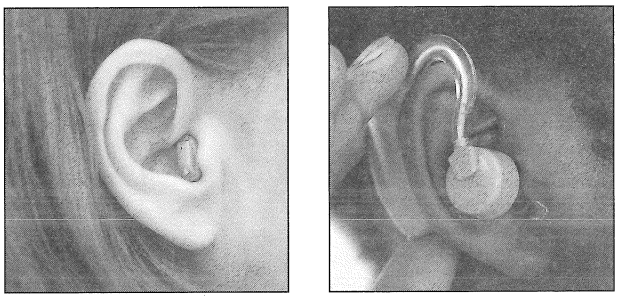
converts

electronic data

Electrical Energy and Sound ■■■

# Hearing Aids Use Electricity

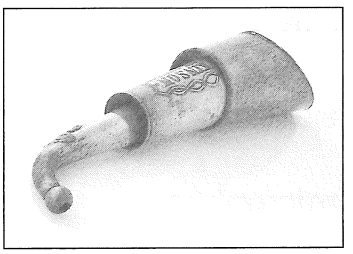
When our ears are healthy and working properly, sound waves are collected by the outer ear, cause special bones in the middle ear to vibrate, and travel to the inner ear. These vibrations send a signal that our brain interprets as sound. But sometimes an injury or a disease can damage parts of the ear so that we don't hear sound properly. In fact, there are about 40 million people in the U.S. who suffer from hearing loss. These people can often hear better by using a hearing aid. A hearing aid is an electronic device that uses electricity to help the ear hear sounds better.



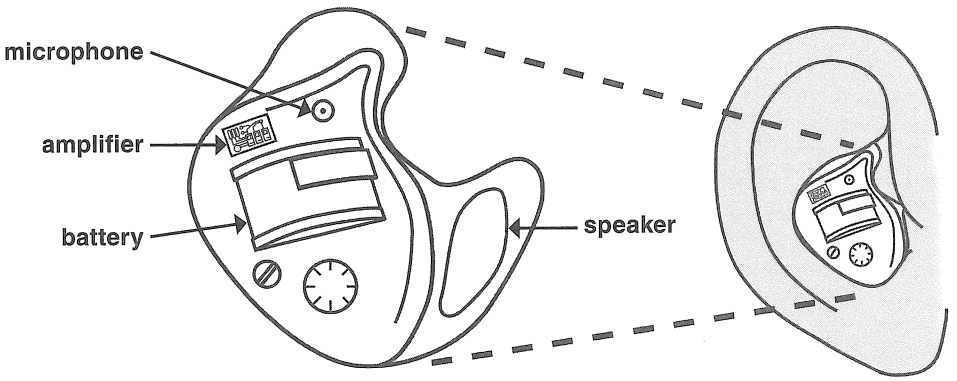
Some hearing aids fit inside the ear, while others sit behind it.

## Modern Hearing Aids

The earliest hearing aids, developed in the 1600s, were shaped like horns. These horns, called ear trumpets, helped focus sound waves into people's ears. The first electric hearing aid was created in 1898. There have been many hearing aids developed since then. Modern hearing aids have four main parts: a battery, a microphone, an amplifier, and a speaker. The battery powers the hearing aid. The microphone works by receiving sound waves and changing the vibrations into electric current. The electric current then travels through a circuit in the hearing aid, where it is made stronger by the amplifier. The amplifier sends the stronger current to the speaker, which changes the current back into sound waves. These sound waves then travel into the middle ear or sometimes directly to the inner ear.



Victorian ear trumpet




Hearing aid technology has continued to evolve to improve the lives of people with hearing loss. Hearing aids make it easier for people who wear them to have a conversation, to listen to music or watch television, and to hear the sounds of nature. Hearing aids also make it safer for people with hearing loss to drive and go out into their community.

Name _____

# Hearing Aids Use Electricity

Fill in the circle by the correct answer. Then write the answers to numbers 3, 4, and 5.

1. Hearing aids were first developed in the _____.
   - Ⓐ 1600s
   - Ⓑ 1800s
   - Ⓒ 1900s
   - Ⓓ 2000s

2. The four main parts of a hearing aid are _____.
   - Ⓐ the sound current, the vibrations, the circuit, and the speaker
   - Ⓑ the sound waves, the current, the vibrations, and the circuit
   - Ⓒ a battery, a microphone, an amplifier, and a speaker
   - Ⓓ a battery, a microphone, an amplifier, and a device

3. How does the microphone on a hearing aid work?

   _____

   _____

4. How does a hearing aid improve the lives of people with hearing loss?

   _____

   _____

5. Is an amplifier an important part of a hearing aid? Explain why or why not.

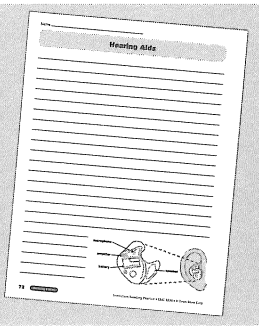
   _____

   _____

## Write About the Topic

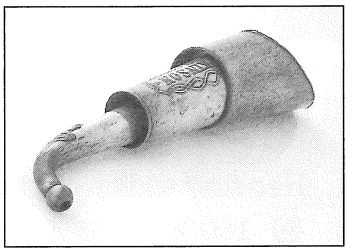
Use the Writing Form to write about what you read.

Write about modern hearing aids. Explain how they work and why they are helpful to people who have hearing loss.



# Electricity and Hearing Aids

About 40 million people in the U.S. suffer from hearing loss. These people can often hear better by using a hearing aid. A hearing aid is an electronic device that uses electricity to help the ear hear sounds better. Devices to help those who suffer from hearing loss, such as the ear trumpet, have been around since the 17th century. Since then, every century has brought new and improved solutions.



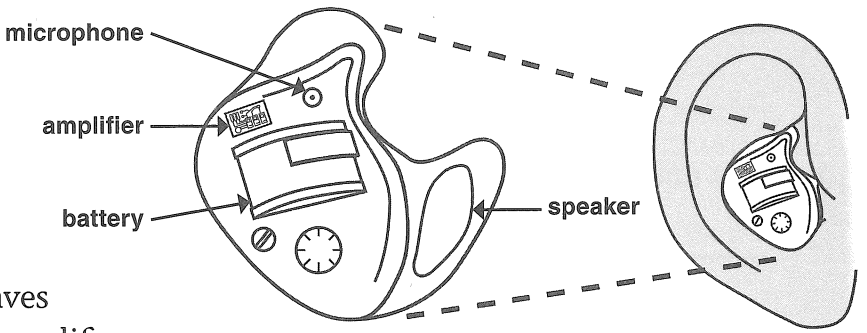
Victorian ear trumpet

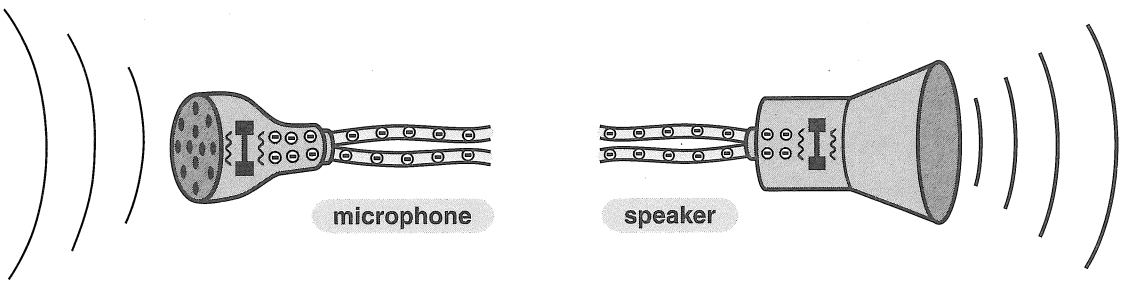
## Modern Hearing Aids

Modern hearing aids have four main parts: a battery, a microphone, an amplifier, and a speaker. The battery powers the hearing aid. The microphone works by receiving sound waves and changing the vibrations into electric current. The electric current then travels through a circuit in the hearing aid, where it is made stronger by the amplifier. The amplifier sends the stronger current to the speaker, which changes the current back into sound waves. These sound waves then travel into the middle ear or sometimes directly to the inner ear.

## Microphones and Speakers

Both microphones and speakers use magnets and electricity to work. When a microphone receives sound waves, part of it vibrates and pushes a metal coil back and forth quickly over a magnet. This is what changes sound waves into electric current. Then the amplifier makes the current stronger before it travels to the speaker. When the current reaches the speaker, an electromagnet (a magnet created by electric current flowing through a wire coil) turns on and off quickly, creating a magnetic field. These pulses in the magnetic field cause the speaker to vibrate and produce new, stronger sound waves.




Hearing aids have used science to improve people's lives and make it possible for a person with hearing loss to hear sounds in nature, in the community, and in their homes.

Name _____

# Electricity and Hearing Aids

Fill in the circle by the correct answer. Then write the answers to numbers 3, 4, and 5.

1. A hearing aid is _____.
   - Ⓐ a new device
   - Ⓑ an electronic device
   - Ⓒ not used by many people
   - Ⓓ not a scientific device

2. Sound waves are changed into _____.
   - Ⓐ a speaker
   - Ⓑ an amplifier
   - Ⓒ a magnet
   - Ⓓ an electric current

3. What part of a hearing aid is needed to make an electric current?

   _____

   _____

4. What would happen if a hearing aid did not have an amplifier?

   _____

   _____

5. How are microphones and speakers different?

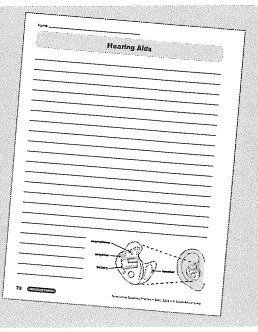
   _____

   _____

## Write About the Topic

Use the Writing Form to write about what you read.

Write about modern hearing aids and how they use electricity to work.



# Sound Waves into Electric Currents

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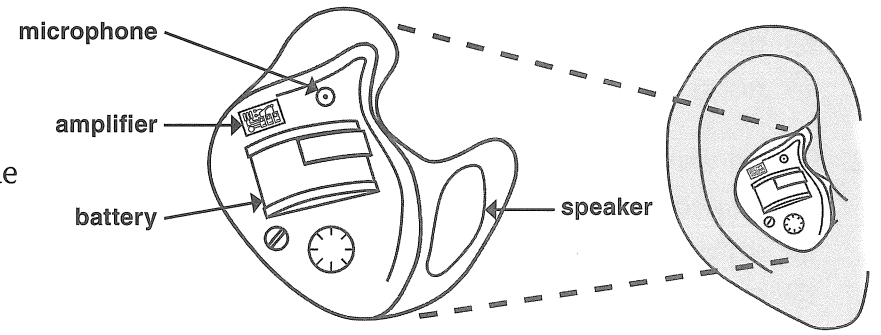
## Modern Hearing Aids

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## Microphones and Speakers

Both microphones and speakers use magnets and electricity to work. When a microphone receives sound waves, part of it vibrates and pushes a metal coil back and forth quickly over a permanent magnet. This is what changes sound waves into electric current. Then the amplifier makes the current stronger before it travels to the speaker. When the current reaches the speaker, an electromagnet (a magnet created by electric current flowing through a wire coil) turns on and off quickly, creating a changing magnetic field. These pulses in the magnetic field cause the speaker to vibrate and produce new, stronger sound waves.

## Sound Waves into Electrical Data

Although most hearing aids have the same parts, there are different types of hearing aids. One type, called a telecoil, has a metal coil instead of a microphone. Another type of hearing aid, called a digital hearing aid, converts the sound waves into electronic data, the same way music is converted into electronic data in a CD or portable music player. This kind of hearing aid then translates the data into an electronic signal that is sent to the hearing aid's speaker. Regardless of the type of hearing aid, they all convert electrical energy into sound waves. And while no hearing aid works as well as a healthy set of ears, hearing aids do make it possible for millions of people to hear better.