

# Teacher Guide

## Listen Up!

Physical Science → Sound → Hearing → Hearing Process and Hearing Loss

### Exploration Summary

Students will build the outer, middle, and inner sections of the ear. When each section is assembled, they will read a summary of how its parts work together to perform its role in the hearing process. Finally, they will use the completed diagram to follow the path of a sound through the ear to the brain.

### Student Learning Objectives

- Identify the parts that make up each section of the ear — *outer ear*, *middle ear*, and *inner ear*.
- Explain how the parts in each section work together to perform its role in the hearing process.

### Exploration Procedure

Explain that the purpose of this exploration is to learn the role in hearing played by the outer, middle, and inner sections of the ear by assembling the parts that make up each section.

Students Perform Exploration Individually	Teacher Performs Exploration
<ol style="list-style-type: none"><li>1. Tell students how much time they will have to complete the exploration and the student worksheet.</li><li>2. Explain how students should proceed:<ul style="list-style-type: none"><li>▪ Follow the instructions on the student worksheet to perform the exploration.</li><li>▪ Take notes as necessary.</li><li>▪ Complete the Check for Understanding questions.</li></ul></li><li>3. Explain that you will be available to help any students who raise their hands.</li><li>4. Tell students to begin the exploration.</li><li>5. When time is up, review the Check for Understanding answers on the next page.</li><li>6. Facilitate a class discussion of the Discussion Questions on the next page.</li></ol>	<ol style="list-style-type: none"><li>1. Read the Introduction and click the <b>Continue</b> button.</li><li>2. Note that the picture of the ear on the right is divided into three sections — <i>outer ear</i>, <i>middle ear</i>, and <i>inner ear</i>.</li><li>3. Roll your mouse over each of the ear parts on the left to reveal its name and function.</li><li>4. Drag each ear part to its place in the picture on the right.</li><li>5. When each section of the ear is assembled, read and discuss the description of how its parts work together to perform its role. Then close the section description.</li><li>6. After building all three sections, read the conclusion and click the <b>Close</b> button.</li><li>7. Tell the students to snap their fingers. Follow the diagram to point out and discuss what happens as the snapping sound is transmitted through the ear to the brain.</li><li>8. Pose each of the Check for Understanding questions on the next page and ask for answers from the class. Replay parts of the exploration as necessary to illustrate the answers.</li><li>9. Facilitate a class discussion of the Discussion Questions on the next page.</li></ol>

# Teacher Guide *(continued)*

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### ***Check for Understanding***

1. Which section of the ear affects your balance?  
**Answer:** Inner ear
2. Which section of the ear collects sound waves?  
**Answer:** Outer ear
3. What do you call the membrane in the middle ear that vibrates from sound waves?  
**Answer:** Eardrum
4. What do you call the tiny bones that pass vibrations to the inner ear?  
**Answer:** Hammer, anvil, and stirrup

### ***Discussion Questions***

#### **1. Why is each section of the ear vital to the hearing process?**

Possible answers:

- Outer ear — collects sound waves and transfers them to the middle ear. Without this section, no sound could enter the ear.
- Middle ear — helps sound waves travel to the inner ear. Without this section, sound waves would never leave the outer ear.
- Inner ear — Converts sound waves to nerve signals, which are sent to the brain to be interpreted. Without this section, sound waves would never reach the brain.

#### **2. What can happen to the ear to cause hearing loss?**

Possible answers:

- Objects inserted forcefully into the ear (can rupture the eardrum).
- Extremely loud, explosive noises (can increase the air pressure inside the ear canal and damage the eardrum).
- A forceful blow to the side of the head (can increase air pressure inside the ear canal, leading to a ruptured eardrum or a disruption of the tiny bones that transmit vibrations to the inner ear).
- Dramatic changes in atmospheric pressure (can cause the auditory tube to compress, resulting in a ruptured eardrum or causing fluid to be pulled into the middle ear).
- Middle ear infections (can cause ruptured eardrum).

#### **3. What can you do to protect your hearing?**

Possible answers:

- Keep your ears free of foreign objects. (Be very careful when using Q-tips. Don't insert objects like hairpins or paper clips into the ear.)
- Protect against excessive noise. (Keep the volume down when listening to music or television. Wear protective earplugs or earmuffs when exposed to continuous loud noise.)
- Protect your ears during flights. (Wear pressure-equalizing earplugs or chew gum during takeoff and landing to keep your ears clear.)
- Get prompt treatment for middle ear infections. (Control the infection before it can rupture your eardrum.) **Note:** Symptoms of middle ear infection include earache and ear pain experienced when swallowing, chewing, or blowing your nose.