How the Ear Works

Description:

Students will make a model ear using common materials. They will then make different sounds to test out how the ear works.

Objectives:

- To demonstrate how the ear works and to show how sensitive the ear is to stimulus
- To make students aware of the effects sounds and noises can have on the ear

Vocabulary:

Vibration, Parts of the ear

Recommended for:

1st – 8th grade students

Materials:

- Cake pans with plastic wrap (or a drum)
- Thin poster paper or construction paper
- Straws
- Ping-pong ball or balloon
- Container of water
- Tape
- Sound meter (optional)
- Drawing of activity and ear (for reference)

Background Information:

Loud sounds and noises can cause physical damage to different parts of the ear and may lead to hearing loss.

Method:

- With students, introduce and discuss all of the different parts of the ear and their functions (See Parts of the Ear Chart below).
- Explain to students that they will make a model of the ear that will allow them to see how it works.
- Split the students into groups.
- Have each group assemble a model using the diagram and instructions provided.

Assembly:

- Remove the bottom of the cake pan, so that only the edges remain. Tightly secure plastic wrap on the now removed bottom. *This will function as the outer ear.* Ask students: What part of the ear do you think this represents and why?
- Cut the poster paper into a triangle with one long side and fold it in half. The paper should now be shaped like a "V." Attach the paper to the center of the plastic wrap with tape. *This will function as a stand for straw to rest on.*
- Attach the straw to the poster paper, in the center of the "V."
- If the straw does not naturally bend, cut the edge of another straw to connect two together. The straw(s) should be at an angle with one end angled toward the water. *This will function as the ear canal.*
- Attach a ping-pong ball to the end of the straw and set it so that it floats in the water. *This will function as the ear drum.*

- Sounds made near the outer ear (the plastic and cake pan) should result in vibrations on the water. *This will serve as the cochlea.*

Hearing with the Model

- Test out the model by making a variety of sounds and noises at different levels near the plastic wrap.
    - Remind students to examine how each sound affects the straws, ping-pong ball, and water surface.
- Have students create a chart and record the effects of sound and noise levels on their model.
    - Students should note the sound, sound level, and impacts on the model.

- *Optional:* You can use a sound meter to test how loud your sounds are and see what happens to the model when you make loud versus soft sounds.

Discussion:

- What happened when you made sounds near the cake pan?
- Did the model react differently when you made loud sounds versus soft sounds?
- What parts of the ear might the different parts of the model represent?
- Imagine the small parts in your ear that this model mimics. If a similar reaction can occur inside your ear when you hear loud sounds, could this cause a problem? Why?
- Look at the sound level chart. What were some of the sounds you made that are equivalent to sounds you hear in everyday life?

For more information contact:

New York City
Department of Environmental Protection
59-17 Junction Boulevard
Flushing, NY 11373
educationoffice@dep.nyc.gov

Also visit DEP's website at:
www.nyc.gov/dep

Ear Model:

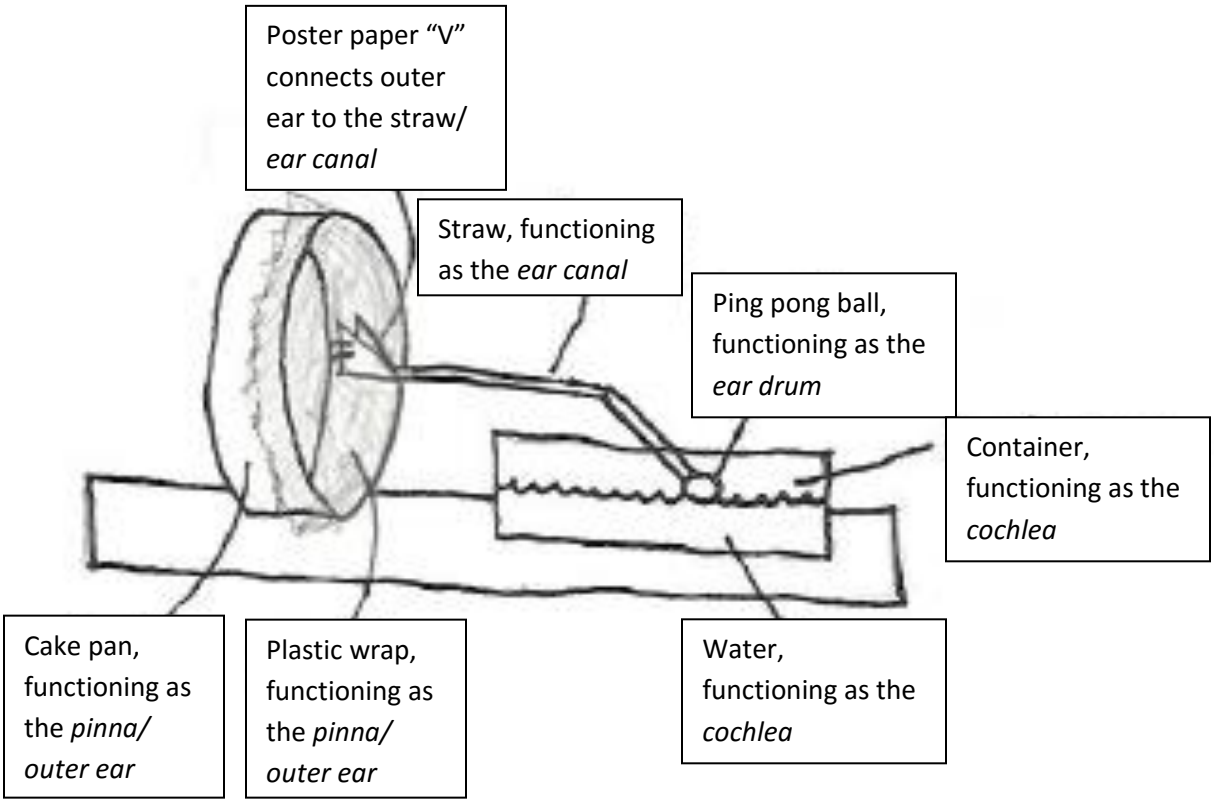
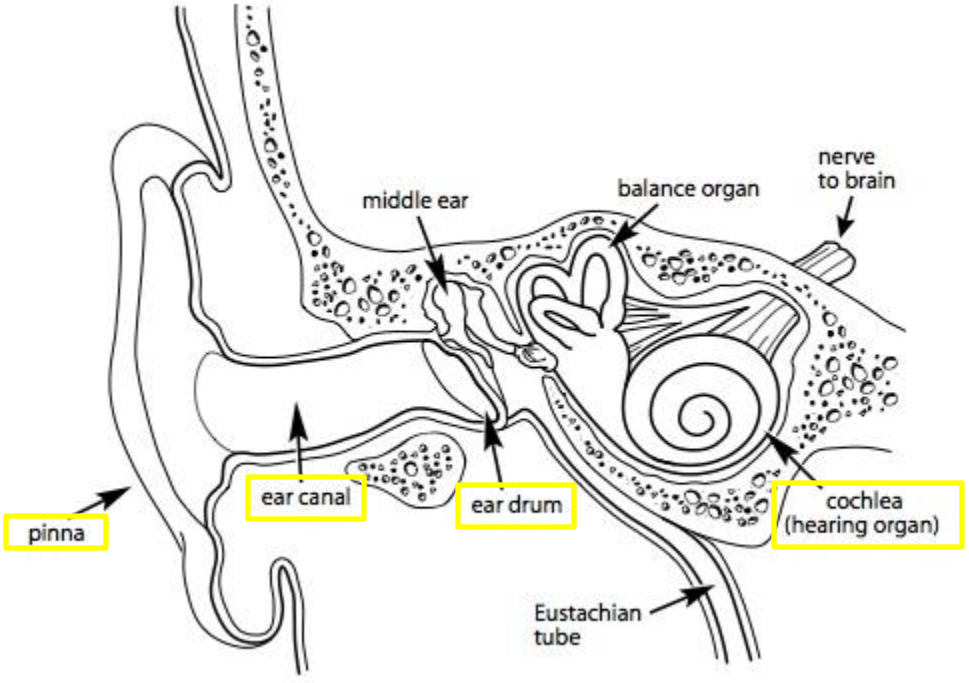


Diagram of the Human Ear:



Parts of the Ear Chart

Ear	The sense organ that detects sounds
Outer Ear/ Pinna	Acts as a funnel on the outside of the ear that directs sound into the ear
Ear Canal	A tube running from the outer ear to the middle ear to transmit sound
Inner Ear/Cochlea	A hollow tube in the inner ear of higher vertebrates, usually coiled like a snail shell where sound waves are transformed into electrical impulses which are sent on to the brain