

Make A Model Eardrum

Introduction

Learn about how sound travels and how our ears help us hear by making a model eardrum using household materials.

Think About This

How do sound waves move through the human ear?

Materials Needed

- Bowl (a glass bowl is ideal)
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 - A cup, pan, or water bottle also could be used
- 2 tablespoons of Rice or Salt
 - Dry beans, sand, or sprinkles could also be used
- Plastic Wrap
- Rubber Band
- Baking Sheet
- Activity Sheet
 - Print out or use paper to draw an activity sheet

Do Ahead of Time

Print, or draw, the activity sheet (see at right)

Directions

Vibrations caused by sound waves hitting our eardrums results in us hearing a sound. Make a model eardrum and observe what you see - and hear!

- 1 Tear off a piece of plastic wrap larger than the edge of the bowl.
- 2 Stretch the plastic wrap tightly across the bowl and over the edges. Make sure that any wrinkles in the plastic wrap are smoothed out. This smooth surface is the eardrum.

- 3 If necessary, secure the plastic wrap with a rubber band.
- 4 Evenly sprinkle the uncooked rice (or other food being used) on top of the plastic wrap. Avoid piles or large clumps.
- 5 Draw what the model eardrum looks like in the left column of the Activity Sheet.
- 6 In the middle column, draw what you think the eardrum model and rice will look like after a sound is made
- 7 Make some noise! Hold the baking sheet next to the bowl and bang on it with your hand.
 - You could also try clapping, humming, or playing loud music.
- 8 Draw what happened after each noise was made.

Activity Sheet

Eardrum	I Expect to See This...	Eardrum After Banging on Pan

Make A Model Eardrum Continued

Activity Sheet

Eardrum After Clapping	Eardrum After Clapping	Eardrum After Loud Music

Questions to Ponder:

- Why do some sounds make the rice move more?
- Is there a sound that works best to make the rice move?

Take It Further:

- Try changing the material used in this investigation. Sprinkles, dry beans, sugar, or salt could be used in place of rice.
- Try using the eardrum model without rice. Lightly touch the plastic wrap with your fingers and see if you can feel the vibrations. How quiet of a sound can your fingers pick up?
- Test the eardrum model using a smart phone and a free tone-generating app (like **Tone Gen** or **Sonic**) to make vibrations of only one frequency. What seems different about the rice when the sound is only one frequency?
 - A small Bluetooth speaker can be placed inside or under the bowl if the volume from the phone isn't loud enough.
- Check out [this video](#) on YouTube and see how a metal plate resonates at different frequencies in response to sound. Musical instruments do the same thing!

What's Happening

All sounds are caused by vibrations – the rapid back-and-forth movement of particles. A vibrating object causes the air around it vibrate, and this sound energy is carried in all directions. The energy in a sound wave will cause another object to vibrate when they hit it.

Sound waves have both a **frequency**, how many sound waves pass a point in a second, and an **amplitude**, how much energy the sound wave has. Sound waves with high frequencies have thousands of waves in a second, sound waves with low frequencies have tens or hundreds.

As sound waves hit the plastic wrap of the eardrum model, they transferred their energy to the plastic wrap, which made it start to vibrate as well. This happened so fast that your eyes might not have seen it. Louder sounds have enough energy (amplitude) to make the rice on top of the plastic wrap vibrate, making it easier to see.

Human ears hear sound in a similar way. Sound waves enter the ear and travel until they hit the eardrum, a thin piece of tissue that is very sensitive to vibrations. When the eardrum vibrates, tiny bones inside the ear transfer those vibrations to something called the cochlea. The cochlea is shaped like a snail shell and is filled with fluid and thousands of tiny hairs.

Each of these hairs reacts to vibrations and send signals to your brain, which turns those signals into sounds you can recognize.

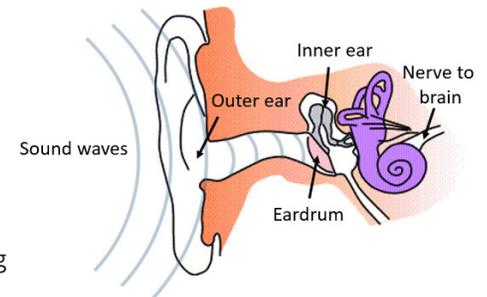


Image Source: <https://www.sciencebuddies.org/teacher-resources/lesson-plans/sound-vibrating-sprinkles>

Show off your eardrum model! Email us at
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