

Teachers, please copy both sides of this page for your students to take home.

Dear Students and Parents,

We hope you enjoyed your recent day of science exploration and investigation with Pacific Science Center's *Physics on Wheels* van. The Science On Wheels program, which began operating in 1974, is an interactive outreach program that travels to schools across the state of Washington.

The *Physics on Wheels* van provides students with hands-on science experiences. Students participate in a lively assembly, explore an interactive exhibit area and receive a 45-minute hands-on lesson. Our goal is to foster an interest in science, technology and mathematics.

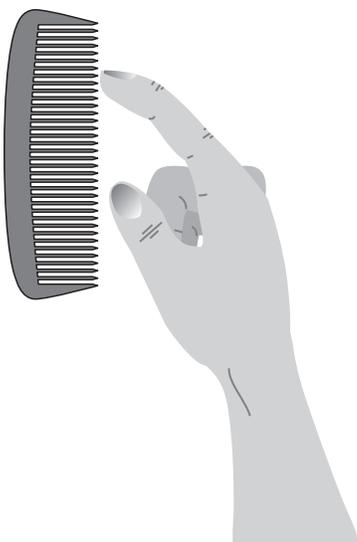
We encourage you to talk about our visit and investigate the activities below. They require few materials and are easy to do. Remember, your child and his or her friends will become our next physicists. We hope you enjoy doing these activities together!

~Science On Wheels Teachers

Sound Amplifiers

Materials

- a comb
- different objects around your house to test (nothing fragile or breakable)



The speakers on a radio or stereo help to make sound louder, or amplify it. They carry the vibrations of the music or voices so that they are easier for you to hear. Many objects around your house can amplify sounds. Try this next activity to see what types of objects make the best amplifiers.

Procedure

- Hold the comb in one hand and use your other hand to rub your fingernails along the teeth of the comb. Listen to the sound your fingernails make as they rub the teeth of the comb. Is it very loud?
- Next, hold one end of the comb against a table top or cupboard and rub the teeth with your fingernails again. Is the sound louder?
- Try this several more times, holding the comb against different surfaces (try a door, an empty box, the seat of a chair, etc.). What types of objects make the sound the loudest?

What's going on?

All sound is caused by vibrations. Objects, like a comb, a drum or a person's vocal cords, vibrate and those vibrations make the air around us vibrate as well. The vibrations travel through the air until they reach our ears and make the various parts of our ears vibrate. Finally, the signal reaches our brain.

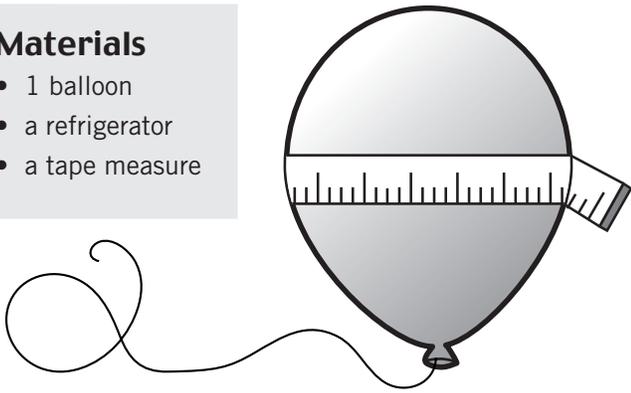
When you held the comb against the table top and rubbed it, the vibrations were going into the table and making it vibrate too. Since the table top is a larger object than just the comb, you were sending more vibrations out into the air. This made the sound louder to your ears because the table became an amplifier for the sound of the comb.

Shrinking Air

Learn first hand that air changes due to temperature.

Materials

- 1 balloon
- a refrigerator
- a tape measure



Procedure

- Blow up the balloon and tie it tightly.
- Measure the widest part of the balloon with the tape measure and record the measurement.
- Put the balloon in the freezer for one hour.
- Remove the balloon from the freezer and measure it again. Did it change size?
- Let the balloon stay at room temperature for another hour and measure it again.

What's going on?

As the air in the balloon cools, the molecules in the air move closer together, causing the balloon to contract.

Spoon Mirror And Glass Lens

Learn some physics concepts with a spoon and a glass of water.

Procedure

Pick up a spoon and look at your reflection on the front and back of it. Compare the images.

What's going on?

The back of the spoon curves outward producing a smaller image. The front of the spoon curves inward and produces a larger image that is upside-down. This works just like a parabolic mirror.

Procedure

- Fill the glass half full of water.
- Put the spoon into the water. Does it look different?

What's going on?

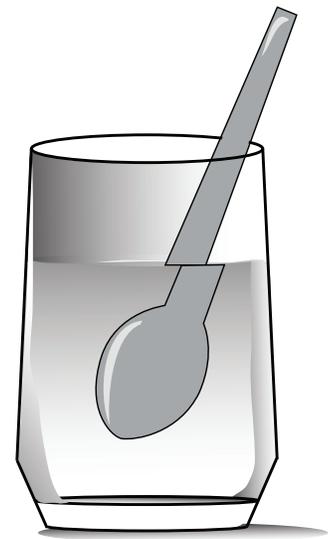
When the spoon is placed in the glass of water, it looks bigger, or magnified. This is because the glass is curved outward and filled with water, which acts like a lens. A lens and a curved mirror have the opposite effect on the apparent size of an object. A mirror that is curved out will make an object look smaller, a lens that is curved out will make it look bigger. This all happens because of the different way light rays are bent or reflected before they enter your eyes.

Challenges

- Look for other curved, shiny objects and observe the way they reflect images.
- Look for a lens that makes an object look smaller.
- Go to the library and look for books that have experiments using light.

Materials

- 1 spoon
- 1 clear drinking glass
- water



Resources

Find these books at your local library or bookstore:

101 Physics Tricks, by Terry Cash, 1991

175 More Science Experiments to Amuse and Amaze your Friends, by Terry Cash, Steve Parker and Barbara Taylor, 1989

200 Illustrated Science Experiments for Children, by Robert J. Brown, 1987

Physics for Every Kid, by Janice VanCleave, 1991

Physics for Kids: 49 Easy Experiments with Acoustics, by Robert W. Wood, 1991

Credits

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