

Buzzing hornets

Overview: Energy isn't just found in the sunlight or power plants that provide us with electricity, but in the molecules that vibrate as sound waves.

What to Learn: This lesson will show us how different materials transfer energy.

Materials

- 2 index cards
- Popsicle stick (larger, like a tongue-depressor size)
- Rubber band
- Scissors
- String or yarn
- Hot glue gun

Lab Time

1. Cut two of the corners off the popsicle stick. Use hot glue to attach the index card to the stick quickly along the uncut side. If the index card is longer than your popsicle stick, trim it with the scissors.
2. Cut the second index card in half along its width (hamburger style). Now fold each piece of the index card in half a total of three times, so that you are left with a small, folded rectangle.
3. Use hot glue to sandwich the folded paper over one of the sides of the popsicle stick.
4. Take the remaining folded index card half and tie the string around it, making one tie on its opposite side. Your result should look something like a string-tied package, but looser. Attach the card to the other side of the popsicle stick, sandwiching it with hot glue.
5. Allow the glue to dry. Take the large rubber band and wrap it around the index card so that it covers both sides and both index card sandwiches.
6. Test your hornet by whipping it around your head quickly until it makes a sound.
7. Try spinning your hornet at different speeds: slow, medium, and fast. Note the sound difference. Record your observations and data on the worksheet below.

Buzzing Hornets Data

Speed of spin	Sound
Slow	
Medium	
Fast	

Here is the principle at work behind the buzzing hornet: When you sling the hornet around, wind zips over the rubber band and causes it to vibrate like a guitar string, and the sound is focused (slightly) by the card. The card really helps keep the contraption at the correct angle to the wind so it continues to make the sound.

Troubleshooting: Most kids forget to put on the rubber band, as they get so excited about finishing this project that they grab the string and start slinging it around, and then they wonder why it's so quiet. Make sure they have a large rubber band (about 3.5" x ¼ " – or larger) or you won't get a sound.

Reading

Sound is everywhere. It can travel through solids, liquids, and gases, but it does so at different speeds. It can rustle through trees at 770 mph (miles per hour), echo through the ocean at 3,270 mph, and resonate through solid rock at 8,600 mph.

Sound is made by things vibrating back and forth, whether it's a guitar string, drum head, or clarinet. The back and forth motion of an object (like the drum head) creates a sound wave in the air that looks a lot like a ripple in a pond after you throw a rock in. It radiates outward, vibrating its neighboring air molecules until they are moving around, too. This chain reaction keeps happening until it reaches your ears, where your "sound detectors" pick up the vibration and works with your brain to turn it into sound.

This is one example of energy being transferred through matter. Just as electricity and sunlight also transfer energy (as ions and radiation, respectively) so too does sound. Although sound does it more indirectly, because the sound waves communicate the rippling or vibration of the molecules in space! Instead of electrons flowing or photons blasting at you, you're on the other end of a slinky from whatever made the sound! *Tip: Use a slinky to show compression waves as a demonstration. This is the type of wave that forms when you snap one side and allow the bunched coils to travel to the other side.*

Exercises Answer the questions below:

1. Which of the following best describes how sound gets to us?
 - a. Chemical electricity
 - b. Solar radiation
 - c. Heat conduction
 - d. Vibrating molecules

2. Name two ways energy is transferred:

a.

b.

3. True or false: A loud noise represents molecules that vibrate violently.

a. True

b. False

Answers to Exercises : Buzzing Hornets

1. Which of the following best describes how sound gets to us? (vibrations in molecules)
2. Name two ways energy is transferred: (radiation, electricity)
3. True or false: A loud noise represents molecules that vibrate violently. (true)