Baggie Mittens

Humans create their own body heat by eating and then converting food and body fat into other forms of energy, including heat energy. Our bodies are also affected by the temperature of our surroundings. In a process called *conduction*, heat always travels from a warmer area to a cooler area. Sometimes our body is the warmer area; sometimes it is the cooler area.

This effect of the external temperature explains why we wear different types and amounts of clothing in different seasons. To minimize the loss of heat from our bodies during the winter, we wear warm clothes and lots of layers. To help us eliminate heat from our bodies in hot weather, we wear clothes made of light, thin material.

Insulators minimize the flow of heat from warmer areas to cooler ones. The better the insulator, the less the temperature will change over a certain time period because it takes longer for the heat to be conducted through the insulator.

OBJECTIVES

In this activity, you will

- Compare mittens made of plastic baggies containing different types of insulation.
- Determine how long would it take for a person's hand to get cold wearing different kinds of mittens
- Use graphs to get information about the different materials' performance.

MATERIALS

computer with Logger Lite software installed
Go!Temp temperature probe
2 different baggie mittens
ice pack
paper towels or rags to clean up spills

PREDECTION

Look at the kinds of insulation your teacher has provided and choose two baggie mittens made out of different materials. Decide which material you think will best hold in the heat, or, in other words, would be the best insulator. Write down the name of the material in the first space of the Insulator column. Write down the type of material of the other baggie mitten in the second space in the Insulator column.

Data Table			Room temperature _____°C		
Prediction rank	**Insulator**	**Minimum temperature**	**Maximum temperature**	**Change in temperature**	**Actual rank**
1		**°C**	**°C**	**°C**	
2		**°C**	**°C**	**°C**	

PROCEDURE

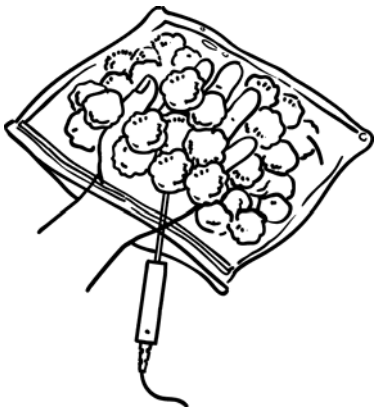
1. Make sure the Go!Temp is connected to the computer. Don't touch it until you're told to do so in a later step.

2. Start Logger Lite on your computer.

3. Open the file for this activity by doing the following:
   a. Click the Open button, .
   b. Open the folder called "Elementary Science."
   c. Open the file called "03 Baggie Mittens."

4. Do the following to find the temperature of the room:
   a. Make sure the Go!Temp is still on the table and hasn't been touched.
   b. Look at the temperature displayed in the digital meter on the screen.
   c. The temperature readings should be constant: that is, they should stay just about the same as you read the meter. This temperature is important because the Go!Temp must be at room temperature before each test you do with the mitten.
   d. Record the temperature as the room temperature in the Data Table, above.

5. Now you will follow these steps to collect data for your first baggie mitten:
   a. Get one of the baggie mittens and place your left hand inside it.
   b. Now, put the Go!Temp in the bag so the tip of the probe is touching your palm.
   c. Watch the temperature in the digital meter and keep the probe in the same position until the temperature stays the same for about 5 seconds. (This will take about a minute.)



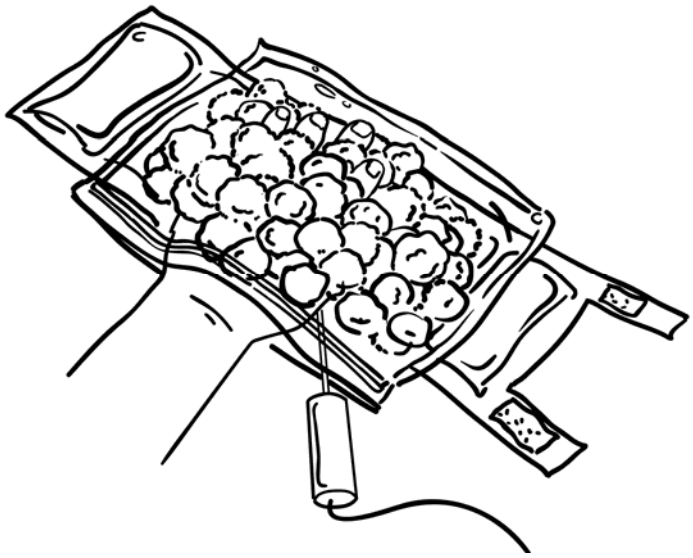
6. When the temperature of the probe is constant (stays the same), collect data by doing the following:

   a. Get an ice pack from your teacher and place it on the table.

   b. Have a teammate click ▸Collect to start data collection.

   c. With your hand still in the bag and the tip of the Go!Temp touching your palm, put your hand, palm down, on the ice.

   d. During data collection, keep your hand in the same place, with the tip of the probe touching your palm.



7. When data collection ends, do the following to find the change in temperature during data collection:

   a. Click the Statistics button, , and the Statistics box will appear.

   b. Find the Minimum (min) temperature and the Maximum (max) temperature of your data and record these values in the Data Table above, on the line for the type of baggie you were using.

   c. Subtract the Minimum value from the Maximum value to find the change in temperature.

   d. From the Data menu, choose Clear All Data.

8. Now follow these steps to collect data for your other baggie mitten:

   a. Make sure the Go!Temp is at the temperature of the room.

   b. Get the next baggie mitten and place your right hand inside it. You are changing hands so that when you collect data this time, your beginning hand temperature will be the same temperature as it was in the first run.

   c. Now, put the Go!Temp in the bag so the tip of it is touching your palm.

   d. Keep your hand in the bag until the temperature in the meter stops changing very much.

   e. Click ▸Collect to collect data.

   f. Put your hand, palm down, on the ice.

9. When data collection ends, do the following to find the change in temperature during data collection:
   a. Click the Statistics button,  , and the Statistics box will appear.
   b. Find the Minimum (min) temperature and the Maximum (max) temperature of your data and record these values in the Data Table above, on the line for the type of baggie you were using.
   c. Subtract the Minimum value from the Maximum value to find the change in temperature.

ANALYZE YOUR DATA

1. What insulation material did you predict would be the one that would hold the heat the longest? What reasoning was behind your choice? What might help you make a better prediction?

2. Which insulation material actually did retain the heat the longest? Why do you think this was?

3. Which of the materials that you tested surprised you the most? Why?

Good job!!