



Energy Transfer and Heat Loss

Annotation

This activity is designed to introduce the concept of energy transfer as it relates to heat loss. Students will observe and compare the transfer of heat energy from containers made of different types of materials.

Primary Learning Outcome

What causes differences in heat loss? Why are some materials better conductors and/or insulators than other materials?

Assessed Georgia Performance Standards

SCSh2. Students will use standard safety practices for all classroom laboratory and field investigations.

SCSh3. Students will identify and investigate problems scientifically.

SCSh4. Students will use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

SCSh5. Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.

SCSh6. Students will communicate scientific investigations and information clearly.

SCSh7. Students will analyze how scientific knowledge is developed.

SCSh8. Students will understand important features of the process of scientific inquiry.

SPS7. Students will relate transformations and flow of energy within a system.

Materials (per group):

4 Thermometers	250 mL glass beaker
Heat resistant gloves	250 mL Styrofoam cup
Cardboard circles with hole in center	250 mL aluminum can
Tap water	250 mL plastic beaker or cup
500 mL beaker	



Procedures/Activities – 1 hour 15 minutes

1. Line up each of the four containers to be tested in a row in front of you on the tabletop.
2. Boil 500mL of water in the large beaker.
3. Using the heat resistant gloves, carefully pour 100mL of boiling water into each of the containers, (each container should have a 100mL mark) and quickly cover each container with the cardboard cover.
4. Immediately insert a thermometer into each container and take the temperature of the water. ***Be careful, the containers will tip over very easily!!*** Record this temperature in the Data Table as the initial temperature.
5. Continue to record the temperature of each container each minute for 15 minutes.
6. After 15 minutes, record the temperature of each container every 5 minutes and record on the data table.

Heat Loss Data Table

Temperature (°C)	Glass Beaker	Styrofoam Cup	Aluminum Can	Plastic Beaker
Initial Temp				
1 min				
2 min				
3 min				
4 min				
5 min				
6 min				
7 min				
8 min				
9 min				
10 min				
11 min				
12 min				
13 min				
14 min				
15 min				
20 min				
25 min				
30 min				
35 min				
40 min				
45 min				
50 min				
55 min				
60 min				

Discussion Questions

1. Draw a line graph of the temperature change in each can. Plot the Time on the X axis and the Temperature on the Y axis. Use a different colored pencil to plot each of the containers on the same graph. From your results answer the following questions.
2. Which can cools faster?
3. Which can loses energy faster? How do you know?
4. Which can retains the most heat energy? How do you know?
5. Which type material would you use to make a container to retain the heat in a cup of hot chocolate?
6. Which type of material would be best suited for insulating a house?
7. Make a guess what would happen if you wrapped one of the containers in some type of material like cotton or cloth. Would this have any effect on the rate of heat loss?

Assessment

Students will be assessed on the completion of the discussion questions and via testing with questions covering the concepts of energy transfer and heat loss.

Extension:

Use flexible thermometers (like used on a forehead) to attach to the outside of each container. Take the temperature of the outside of each container at regular intervals and compare to the temperature of the water inside the container.

Teacher notes

1. Cut the cardboard circles prior to class. Make sure the circles fit over the containers and will not fall into the container.
2. Make the hole in the cardboard circle prior to class. Reinforce the hole with masking tape for strength and stability of the thermometer.
3. Prior to class, measure 100mL of water into each of the containers. Using a permanent marker, clearly mark the 100mL point on each container to increase accuracy of measurements and to increase speed of pouring.
4. Cups fall over easily!! Warn students to be careful not to tip over cups and pour out water.
5. Remind students to record readings every minute for 15 minutes. Students want to take readings at the wrong time.