

## Heat Insulation Lab

### Investigative Question:

Which form of insulation will have the smallest value of thermal conductivity, thus being the best insulator for a house?

### **Hypothesis: (If, then, because.)**

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### **Materials:**

4 plastic water bottles, hot tap water, thermometer, newspaper, wool sock, aluminum foil, rubber bands, stopwatch

### **Procedure:**

- 1) Fill the four water bottles to within 1cm of the top with hot water.
- 2) Obtain the insulating materials. Carefully and completely wrap the water bottles with the insulation. Make sure you wrap the bottle tops, but leave a small hole above the opening for the thermometer. Hold the insulation in place with rubber bands. Be careful not to spill any water on the insulation when wrapping the bottles.
- 3) Leave the fourth bottle unwrapped.
- 4) Insert the thermometers through the insulation and opening into the bottles. Adjust the rubber bands so that they do not touch any part of the cans.
- 5) Label the first three columns in Data Table 1 with the kinds of insulation you are using.
- 6) Read and record in Data Table 1 the temperature of the water in each can.
- 7) Continue to record the water temperature in each can every minute for 10 minutes.
- 8) Create a graph for this experiment, plotting the data for each of the four water bottles. This step can be accomplished in between minute intervals.

**Questions: (Answer on your own sheet of paper and attach to the lab.)**

- 1) What general conclusion can you draw from the graphs?
- 2) What was the total change in temperature for each can?
- 3) Why did you use the fourth can in this activity?
- 4) Of the materials you tested, which material was better at keeping heat in? How do you know?
- 5) Compare your results with those obtained by the rest of the class. Which material would best insulate against heat loss (keep the heat in)?
- 6) Based on your results, list the materials in order, from smallest to largest, based on their thermal conductivity (k). (The better it insulates, the lower its k value.)
- 7) How do each of these materials prevent heat loss through the process of conduction, convection, and radiation? Address all three materials.

**Data Table**

<u>Time</u> <u>minutes</u>	<u>Temperature (C)</u>			
	<u>1st Can</u> Insulating Material	<u>2nd Can</u> Insulating Material	<u>3rd Can</u> Insulating Material	<u>4th Can</u> No insulation
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				