A Look at Laboratory Types

Heat Insulators Laboratory — Traditional Version

Guiding Question:
What materials make the best heat insulators?

Purpose:
To investigate the heat-insulating ability of different materials.

Materials:
1. Collect these materials:
   - Marking pen or prepared label
   - 3 cups with lids
   - 3 larger coffee cups to hold your smaller cups with lids
   - Graduated cylinder
   - Hot water
   - 3 thermometers

2. Select two of the insulating materials on the table to surround two of the cups.

3. Label the cup without any material as cup A. It will be your control. You will compare your results to what happens in this cup. Label the other cups B and C.

Prediction:
On a separate sheet of paper, write down a prediction of what you think will happen to the hot water in cup A compared to the water in cup B and cup C.

Observation:
On the same paper as your prediction, draw the data table shown below. Make it large enough to collect data for at least 20 minutes.
Temperature Readings in Degrees Celsius

<table>
<thead>
<tr>
<th>Time (min.)</th>
<th>Cup A</th>
<th>Cup B</th>
<th>Cup C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Procedure:

1. Place each small labeled cup inside a larger coffee cup.
2. Wrap the insulating material you have selected around cups B and C, or pack it into the space between the small inside cup containing the water and the larger outside cup.
3. Put the lids on all three cups. Carefully make a hole in each cup lid just large enough for the thermometer to fit into the cup.
4. Remove the lids and pour 200 mL of hot water into each of the labeled cups.
5. Take a starting temperature reading for all cups. Record it in the appropriate location on the data table you have prepared.
6. Continue to take temperature readings in each cup every two minutes for 20 minutes.
7. Pour out the water and clean up your lab station.

Data Display:

Using graph paper, construct a line graph of your data for each of the cups. Place the time in minutes on the horizontal axis and the temperature in degrees Celsius on the vertical axis. Make a key to explain what symbols are used for each of the three cups.
Analysis Questions:
Analyze your data. Answer each of these questions on the same paper as your data chart.

1. In which cup was the ending temperature of the water hottest?

2. Which material was surrounding this cup?

3. Calculate the change in temperature for each cup
   - Cup A ________
   - Cup B ________
   - Cup C ________

4. What can you infer about the insulating abilities of the materials used in cups B and C?

Conclusion:
Write a short paragraph to summarize your findings about the insulating abilities of the materials you used. Put it on the same paper as your data chart.