

Lab: Heat vs. Temperature

Name _____

Developed by John-Henry Cottrell

Purpose: Which would you rather have spilled on you - A cup full of hot water, or a bathtub full of hot water? Why? The difference between the two illustrates a fundamental difference in the concepts of heat and temperature. Even if both containers (the cup and the bathtub) are at the same temperature the bathtub has more heat stored in it because there is more mass.

When you study energy, and the types of energy, you learn that heat is one of the forms of energy. It is possible to use heat energy to do work. For example, you can use heat energy to make a hot air balloon rise, or make water boil, or even when you are cooking in the oven, to produce a chemical change in the food, like what happens when you bake a cake.

In this lab, we are going to examine the difference between heat and temperature.

PROCEDURE

Part 1:

1. Use a student table for this experiment. Use the metal of the table leg and the “wooden” tabletop. At the same time, do the following procedure: With one hand, touch the metal leg. With the other hand, touch the wood. How do they feel?
2. Note observation on answer sheet.
3. Obtain an infrared thermometer. Examine both, record the starting temperature in the table on the answer sheet.
4. Ensure the thermometer is set at “Celsius.” Record the temperatures in the table. Calculate the difference in temperature.
5. Answer question in answer sheet.

Part 2:

1. Put on your goggles.
2. Obtain the beaker, 25 ml of isopropyl alcohol and a glass thermometer.
3. Place the thermometer into the alcohol, wait 2 minutes. Record the temperature in the table below.
4. Remove the thermometer from the alcohol and hold it above the beaker. Begin to watch the temperature reading on the thermometer.
5. After the temperature has stopped changing, record the temperature in the table below.
6. Repeat steps 3-5 two more times.
7. Note observation on answer sheet.
8. Return the alcohol to the container designated by the teacher, and clean the beaker, thermometer and your lab station.

Part 3:

1. When Part 1 and Part 2 are completed, sit back at your desk and wait for the teacher to give instructions. While waiting answer Conclude and Apply questions.
2. Obtain an infrared thermometer and answer sheet.
3. Write in time on sheet to return to classroom as designated by **ME**.
4. When verified by your teacher, walk around campus in groups designated by me. **DO NOT LEAVE CAMPUS GROUNDS!**
5. Examine items on the answer sheet with the infrared thermometer.

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6. Ensure the thermometer is set at "Celsius." Record the temperatures in the table. Calculate the difference in temperature.
7. Be sure to take turns taking temperatures.
8. Find items on campus, not listed already, and compare those temperatures in the blank areas of the table.
9. Answer question in answer sheet.

ANALYZE

Part I

1. Observations of how the metal and wood feel and prediction of temperature:

Object	Ending Temperature (degrees Celsius)	Difference (degrees Celsius)
Wood or plastic		
Metal		

2. What happened to the temperatures? Is this what you expected would happen?

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Part 2

Trial	Starting Temperature (degrees Celsius)	Ending Temperature (degrees Celsius)	Difference (degrees Celsius)
1			
2			
3			

1. What is happening to the temperature on the thermometer?

Part 1

Time to return to classroom:

<u>Object</u> Temperature (°C)	<u>Object</u> Temperature (°C)	Difference (°C)
Asphalt	Concrete	
Concrete	Grass	
Plastic	Glass	
Painted Metal	Plastic Coated Metal	
Dark Painted Metal	Light Painted Metal	
Painted Stucco	Concrete Block	

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1. What happened to the temperatures? Is this what you expected would happen?

CONCLUDE AND APPLY

1. What happens when you return the thermometer to the alcohol? Is this what you expected? **Explain.**

2. Why does metal feel cold even though the thermometer readings don't indicate the metal is actually colder than the wood?

3. Is the alcohol cold? Give **evidence** to explain your answer.

4. What is happening to make the temperature change when the thermometer is removed from the alcohol and held in the air?

5. How is heat different from temperature?

6. Which object had the highest albedo? Explain why.

7. Which object had the lowest albedo? Explain why.
