

## Heat vs. Temperature Lab

*Write on a separate sheet of paper!*

The law of conservation of energy states that energy may be converted from one form into another, but it is not created or destroyed in the process. Energy can take various forms, but can basically be lumped into two categories – potential energy and kinetic energy. Potential energy is stored energy, whereas kinetic energy is energy form of motion. In this lab we will explore the relationship between heat energy, a form of kinetic energy, and changes in temperature that result from it.

### Pre-lab:

Define the following terms on your binder paper:

1. chemical potential energy
2. heat
3. calorie
4. joule
5. specific heat capacity

### Procedure: Part 1

1. Put the test tube into the test tube clamp on the ring stand and then add 5 ml of water into the test tube.
2. Using the thermometer clamp, carefully insert the thermometer into the water in the test tube. Make sure the thermometer isn't touching the bottom or sides of the test tube.
3. Wait 30 seconds and then record the starting temperature of the water.
4. Stick a pin into a match taken from a book of matches.
5. Light the match and hold it under the test tube by holding onto the pin.
6. Record the final temperature of the water after the entire match burns.
7. Calculate the change in temperature and record.
8. Repeat with 10 ml of water.

**Data Table: Copy on your binder paper and fill in with your data!**

Amount of Water	Starting Temp.	Final Temp.	Change in Temp ( $\Delta T$ )
5 mL			
10 mL			

### Part 1 Questions:

**Answer in complete sentences on your binder paper!**

1. What type of chemical reaction was the source of the heat?
2. What happened to the change in temperature as the amount of water increases? Explain why.
3. Did the amount of heat energy that you added differ for the two test conditions? Explain.
4. Contrast heat energy with temperature. How are these closely related terms different?

**Turn Over for Part 2 →**

**Procedure: Part 2**

1. Add 10 ml of water to a test tube. Record the temperature of the water after 30 seconds.
2. Add 1 gram of lithium chloride to the water.
3. Very carefully stir the mixture with the thermometer. Be gentle so you don't have to pay for a broken thermometer!
4. Measure and record the water's final temperature.
5. Repeat the procedure using 20 ml of water.

**Data Table: Copy on your binder paper and fill in with your data!**

Amount of Water	Starting Temp.	Final Temp.	Change in Temp ( $\Delta T$ )
10 mL			
20 mL			

**Part 2 Questions:**

**Answer in complete sentences on your binder paper!**

1. What chemical process was the source of the heat?
2. Explain the why there was a difference in the observed temperature change when the amount of water was increased from 10 mL to 20 mL? Include the equation for heat,  $q=mc\Delta T$  in your answer. (*Hint: remember that water has a density of 1 g/ mL!*)
3. Did the amount of heat energy that you added change with each trial? Explain.
4. Although the amount of heat added was the same, why was there a difference in the change in temperature for the two amounts of water? Include the equation for heat,  $q=mc\Delta T$  in your answer.