**Heating Curve Lab Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Introduction:**When heat is added to ice, it will melt to liquid water. As water is heated, its temperature rises. Eventually, the water will boil and change into gaseous steam. The substance has now gone through two phase changes. The temperatures at which these phase changes occur are important characteristic properties. The relationship between heat energy and the behavior of the substance is also important in understanding the difference between heat and temperature. In this lab, you will be discovering the relationship between heat energy and phase changes.

**Hypothesis:** Sketch what you think the graph will look like if we add **constant heat** to ice water over time:

Temperature (oC)

 Time (min)

**Materials:**

250mL beaker Bunsen Burner Ring Stand Ice Iron Ring Liquid Water Stirring Rod Thermometer Test Tube Clamp Wire Gauze

**Procedure:**

1. Obtain and wear goggles. Collect materials listed above.
2. Fill a 250 mL beaker with ice. Add water to cover the ice.
3. Place the beaker on a wire gauze on a ring stand. Use a test tube clamp to hold a thermometer so that it is below the water line. *Do not let the thermometer rest on the bottom or side of the beaker.***For the next steps, keep in mind that you will need to stir the water solution THE ENTIRE TIME.**
4. Stir carefully around the beaker with a stirring rod until the temperature stabilizes at or below 0.0 degrees Celsius. Begin to record the temperature at 30 second intervals in the **data** section.
5. After two minutes of consistent readings, warm the ice water over a Bunsen burner. Note the time elapsed at the start of heating in the **data** section. *NOTE: Once the Bunsen burner is set, leave it at this setting and make no adjustments to the flame. Stir continuously while heating.*
6. After the water begins to boil, continue to heat it for at least three minutes. Record the temperature at 30 second intervals in the **data** section.
7. After the water has boiled for three minutes, turn off the burner and note the time elapsed in the **data** section.

**Data Analysis:**

1. Graph your data from the experiment. Remember to include a title and axis label, utilizing the entire space provided. If necessary, use a ruler for straight lines.
2. On you graph, clearly mark the beginning and end times where melting was occurring (when *both* solid and liquid are present) and when boiling was occurring (*both* liquid and gas present).

 **Data**

|  |  |  |  |
| --- | --- | --- | --- |
| **Time Elapsed****(minutes : seconds)** | **Beaker Temperature****(ᵒC)** | **Time Elapsed****(minutes : seconds)** | **Beaker Temperature****(ᵒC)** |
| **0:00** |  | **12:00** |  |
| **0:30** |  | **12:30** |  |
| **1:00** |  | **13:00** |  |
| **1:30** |  | **13:30** |  |
| **2:00** |  | **14:00** |  |
| **2:30** |  | **14:30** |  |
| **3:00** |  | **15:00** |  |
| **3:30** |  | **15:30** |  |
| **4:00** |  | **16:00** |  |
| **4:30** |  | **16:30** |  |
| **5:00** |  | **17:00** |  |
| **5:30** |  | **17:30** |  |
| **6:00** |  | **18:00** |  |
| **6:30** |  | **18:30** |  |
| **7:00** |  | **19:00** |  |
| **7:30** |  | **19:30** |  |
| **8:00** |  | **20:00** |  |
| **8:30** |  | **20:30** |  |
| **9:00** |  | **21:00** |  |
| **9:30** |  | **21:30** |  |
| **10:00** |  | **22:00** |  |
| **10:30** |  | **22:30** |  |
| **11:00** |  | **23:00** |  |
| **11:30** |  | **23:30** |  |

**Heating Start Time: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Ice Melting Time: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
Heating End Time: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Water Boiling Time: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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**Questions:**

1. What was happening to the H2O when the lines on the graphs were mostly flat? What kind energy was being added to the system?
2. What was happening to the H2O when the lines on the graph were mostly sloped? What kind of energy was being added to the system?
3. Was the energy flow into the beaker constant? How did you know? Can you make a useful heating curve if the energy flow is not constant? Why not?
4. Did this activity involve a chemical change? Explain how you know.

**Conclusion**

Based on your heating curve, determine the melting and boiling points of water. Does this match the accepted values (0ᵒC for melting and 100ᵒC for boiling)? What sources of error (2+) are there in the experiment that may keep you from having the perfect melting and boiling points?