

Phase Changes for Water Lab  
Honors **Integrated** Science

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Per. \_\_\_\_\_

**Purpose** Statement:

**Hypothesis:**

Materials:

Safety:

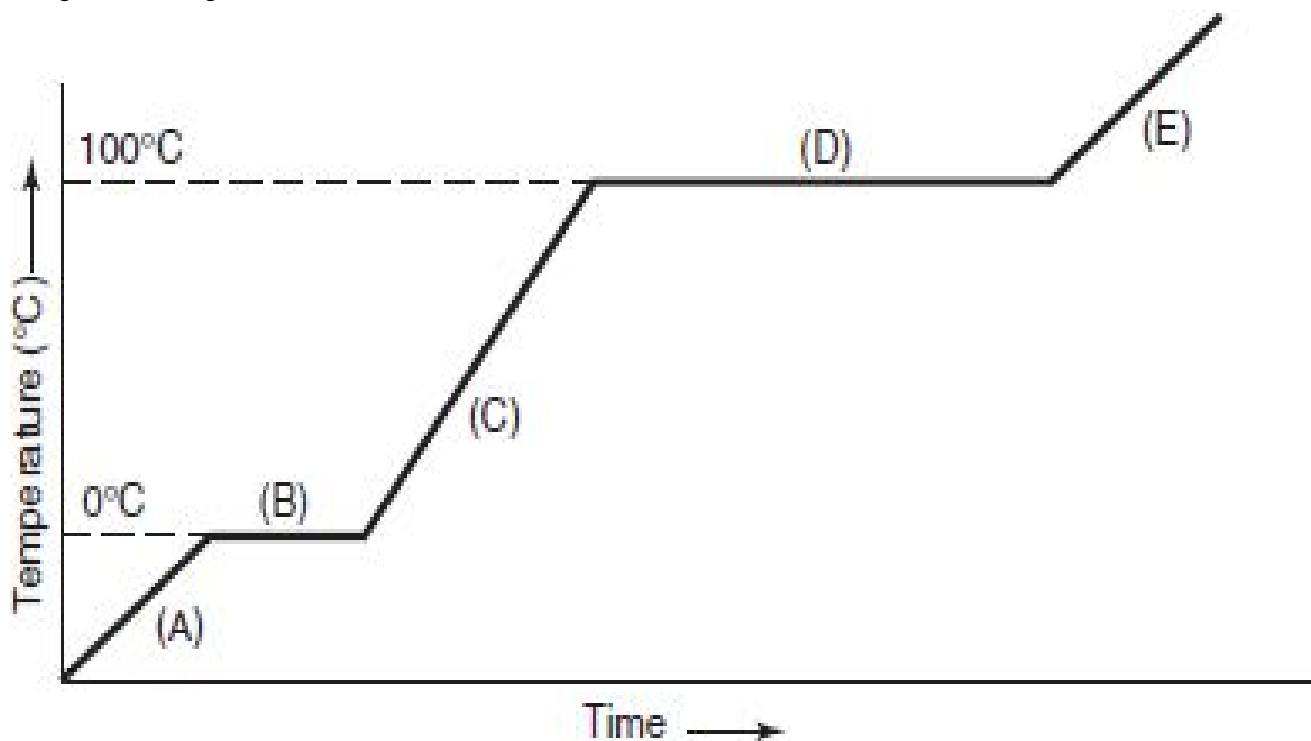
Summary of **Procedure:**

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**Prelab Assignment:** Answer the following questions in complete sentences and thoughts. You must show work for all math questions, including appropriate units and significant figures in order to receive **FULL** credit.

On the time vs. temperature graph below, label each of the following regions: **solid (s)**, **liquid (l)**, **gas (g)**, **melting point (MP)**, **boiling point (BP)**. Use arrows to show the phase transitions: **freezing**, **melting**, **condensation**, **vaporization**. Answer the following questions using the heating curve below..



|          |  |
|----------|--|
| <b>A</b> |  |
| <b>B</b> |  |
| <b>C</b> |  |
| <b>D</b> |  |
| <b>E</b> |  |

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1. What are we assuming when we use time as a measure of energy added? \_\_\_\_\_
  
2. What is the freezing point of the substance? \_\_\_\_\_
3. What is the boiling point of the substance? \_\_\_\_\_
4. What is the melting point of the substance? \_\_\_\_\_
5. What is the condensation point of the substance? \_\_\_\_\_
6. What letter represents the range where solid and liquid exist together? \_\_\_\_\_
7. What letter represents the range where liquid and vapor exist together? \_\_\_\_\_
8. What letter represents the range where the solid is being warmed? \_\_\_\_\_
9. What letter represents the range where the liquid is being warmed? \_\_\_\_\_
10. What letter represents the range where the vapor is being warmed? \_\_\_\_\_
11. What letter represents the melting of the solid? \_\_\_\_\_
12. What letter represents the vaporization of the liquid? \_\_\_\_\_
13. What letters show a change in potential energy? \_\_\_\_\_
14. What letters show a change in kinetic energy? \_\_\_\_\_
15. What letter represents condensation? \_\_\_\_\_
16. What letter represents crystallization? \_\_\_\_\_

Data **Table** 1: Heating Times for Water

| Heating start time: | Heating End time: | Ice <b>Melting</b> time: | Water <b>boiling</b> time: |
|---------------------|-------------------|--------------------------|----------------------------|
|                     |                   |                          |                            |

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**Data Table 2:** Time and Temperature data for water

[illegible]

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**Data Table 2:** Time and Temperature data for water

[illegible]

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**Analysis Questions: ON a SEPARATE SHEET OF PAPER!!!!** Answer the following questions in complete sentences and thoughts. You must show work for all math questions, including appropriate units and significant figures in order to receive **FULL** credit.

Use **EXCEL** to create a graph of Time vs. Temperature data for your phase change for water. Time is on the x-axis and temperature on the y-axis.

1. What is temperature?
2. What temperature did your ice melt at? Explain how you know.
3. What temperature did your water boil at? Explain how you know.
4. Were the phase changes you observed today exothermic or endothermic? Explain your answer.
5. Was the energy flow into the beaker constant? How did you know?
6. Can you make a useful heating curve if the energy flow is not constant? Why or why not?
7. Did this activity involve a chemical change or a physical change? Explain
8. If you were adding thermal energy the whole time, why did you have periods where your temperature did not change much? What was the thermal energy doing during those time periods?
9. What was happening to the H<sub>2</sub>O when the lines on the graph were mostly flat? Explain what is happening in each flat area of your graph. What kind of energy was being added to the system?
10. Explain how you know what was happening to the H<sub>2</sub>O when the lines on the graph were mostly sloped? Explain what is happening in each sloped area of your graph. What kind of energy was being added to the system?

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11. If you put water into the freezer and recorded its temperature as it froze, would the water be absorbing or releasing heat? Explain your answer.
12. Explain what is happening to the kinetic energy of the molecules as the temperature rises?
13. Explain what would happen to the kinetic energy of the molecules if the temperature would be lowered?
14. How does this lab relate to kinetic molecular theory?
15. What do you think would happen to the temperature of the water if heating at the boiling point continued for an additional 5 min?
16. Predict which data would change and which data would stay the same if a less intense heat source was used?
17. Recall the different states of matter (Solid, Liquid, Gas). How do the water molecules differ in the liquid and gas states? Explain or draw.