**States of Matter PhET Lab Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Date: \_\_\_\_\_\_\_ Period: \_\_**

**Learning Goals:**

Using the kinetic molecular theory, describe and contrast the properties of gases, liquids, and solids.

Explain, at the molecular level, the behavior of matter as it undergoes phase transitions.



**States**

**Pre-lab:**

1. Draw a diagram below showing what you think the

molecules will look like for each state of matter, solid, liquid, and gas. Write a sentence below each diagram predicting what the motion of the molecules will be like.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Solid** | **Liquid** | **Gas** |
| Diagram of molecules |  |  |  |
| Sentence explaining how molecules will be moving |  |  |  |

1. If you start with a substance as a solid, what will happen to the molecules as you add thermal energy (heat)?

**ONCE YOU HAVE COMPLETED THIS PAGE, YOU MAY BEGIN THE SIMULATION.**

**Procedure:**

* **Go to** <http://msrobbinspnhs.weebly.com/> **and Click on the Chemistry Notes Page.**
* **Scroll down to Unit 10 and download the States of Matter simulation or click the link to PhET.**
* **Open the simulation and select “Run Now”**

**Investigate:**

3. Use the menu on the right side of the program to select Water and Solid. Draw and describe what you see in the space below.

|  |  |
| --- | --- |
| **Diagram** | **Description** |
|  |  |

4. Now, use the slider on the bottom of the program to Add Heat. Notice the thermometer at the top of the program. What temperature scale is this thermometer showing?

5. What happens to the water as you increase the temperature?

6. What is the melting/freezing point of water in Kelvin?

7. Add heat until the temperature is just below and then just above the melting point of water. How is water different below its melting point and above it?

8. Draw and describe what water looks like as a liquid.

|  |  |
| --- | --- |
| **Diagram** | **Description** |
|  |  |

9. What is the boiling/condensation point of water in Kelvin?

10. Continue to add heat until you are just below and then just above the boiling point of water. How is water different below its boiling point and above it?

11. Draw and describe what water looks like as a gas.

|  |  |
| --- | --- |
| **Diagram** | **Description** |
|  |  |

12. Choose one of the other three substances listed in the menu on the right. Investigate what happens when you add and remove heat from this substance. Use the buttons on the right to see this substance as a solid, liquid, and gas. Draw and describe its properties in the table below.

Substance Selected:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Solid** | **Liquid** | **Gas** |
| Diagram of molecules |  |  |  |
| Sentence explaining how molecules are moving |  |  |  |

**Analyze:**

13. How was this substance similar to water in each state of matter? How was it different?

14. Were your predictions (see p. 1) correct or incorrect? Explain.

**BONUS: Optional, worth up to 10 points added to the lab’s final grade**

15. Choose a substance other than water from the menu on the right side of the program. Use the slider to add and remove heat. Based on what the molecules do, figure out the approximate temperatures of the melting point and boiling point of this substance. (Hint: The temperatures given when you click solid, liquid, and gas is NOT the melting and boiling points.)

Substance:

Melting Point:

How did you figure it out?

Boiling Point:

How did you figure it out?