

States of Matter Simulation Lab

Before you open the simulation:

PREDICT

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			

2. 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 THE PRECEDING TWO QUESTIONS, YOU MAY BEGIN THE SIMULATION.

Open the simulation. Go to the following URL: <http://phet.colorado.edu/en/simulation/states-of-matter>

INVESTIGATE: *“You will be accessing the tab “Solid, Liquid, Gas”*

3. Use the menus 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 the 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 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 happened 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: _____

	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 page 1) correct or incorrect? Explain.

TRY OUT ONE MORE SUBSTANCE

15. Choose a substance other than water (and **other than the one you chose in #12**) 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 are **NOT** the melting and boiling points.)

Substance: _____ Melting point: _____

How did you figure it out? _____

Boiling point: _____ How did you figure it out? _____

Go to the Tab "Phase Changes"

16. What do you notice about the phase change diagram when you select the different substances Ne, Ar, Oxygen and Water? _____

17. Select water and "play around" with temperature and pressure to see if you can direct the red bouncing ball along each of the equilibrium curves. What general conditions of temperature and pressure allow you to accomplish this feat?
