States of Matter Simulation Lab Name:

Date: Period :

**States of Matter Simulation Lab**

Go to: <https://phet.colorado.edu/en/simulation/states-of-matter>

**Part 1:** Before starting the lab,predict the particle arrangement and movement of the

samples. Record your predictions in the chart below.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Solid** | **Liquid** | **Gas** |
| **Model of particle arrangement and movement** |  |  |  |
| **Write a description of the particle arrangement and movement.** |  |  |  |

**Part 2: Investigating States of Matter**

1. *Click* on States
2. *Click* on the thermometer and change it to Celsius.
3. *Click* on **neon** in the black box
4. *Click* on the solid, liquid and gas buttons to and determine if neon can form a solid, liquid and a gas and the temperatures required for the change.
5. Repeat the process for argon, oxygen and water.

|  |  |  |  |
| --- | --- | --- | --- |
| Substance | **Can it form a solid? If so, what temperature is needed for it to form a solid?** | **Can it form a liquid? If so, what temperature is needed for it to form a liquid?** | **Can it form a gas? If so, what temperature is needed for it to form a gas?** |
| Neon |  |  |  |
| Argon |  |  |  |
| Oxygen |  |  |  |
| Water |  |  |  |

**Part 2 Analysis Questions**

1. How did your predictions for the particle arrangement and movement match the actual arrangement and movement in the samples? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

B. Did all substances exist at the three states of matter at the same temperatures? \_\_\_\_\_

Why or why not? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

C. Compare the particle arrangement of solid water with the other solid samples. Draw a

model below.

other samples

Solid Water

Why do you think the particle arrangement for water is different than the other samples? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part 3: Investigating Phase Changes**

1. *Click* on the phase change icon at the bottom of the screen
2. *Click* on the thermometer and change it to Celsius.
3. Experiment the effects of increasing and decreasing the temperature of neon, argon, oxygen and water by moving the lever on the bucket
4. Answer the questions as your experiment.
5. **Change neon, argon, oxygen and water from a solid to a liquid to a gas.**
6. What did you have to do to change the samples from a solid to a liquid and then into a gas? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. What happened to the temperature as you changed the samples from a solid to a liquid to a gas? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. What happened to the pressure as you changed the samples from a solid to a liquid to a gas? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
9. **Change neon, argon, oxygen and water from a gas to a liquid to a solid.**
10. What did you have to do to change the samples from a gas to a liquid and then into a solid? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
11. What happened to the temperature as you changed the samples from a gas to a liquid to a solid? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
12. What happened to the pressure as you changed the samples from a gas to a liquid to a solid? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part 3: Analysis questions**

1. Explain how the addition of thermal energy (heat) to matter affects its particles.

2. Explain how the removal of thermal energy (heat) from matter affects its particles.

3. Explain why a balloon can change in size when the temperature increases or

decreases.