**Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_**

**Comparing States of Matter**

**Learning Goal:** Students will compare various states of matter through illustrations and descriptions which include:

* How the molecules in a solid, liquid and gas compare to each other.
* How temperature relates to the kinetic energy of molecules.

**Procedure:**

* Open the internet browser and enter the address: <http://phet.colorado.edu>
* Click on “Play with Sims” and select “Chemistry” from the menu on the left.
* Open the “States of Matter” Simulation and select “Run Now”

**Investigation:**

1. Show what the molecules of a solid, liquid and gas look like by sketching them in the boxes below.

Solid Liquid Gas

1. Complete the table below by exploring the “Solid, Liquid, Gas” tab in the simulation. **Test**your predictions and record your observations by recording the temperature and illustrations of each substance in the three states of matter.

|  |  |  |  |
| --- | --- | --- | --- |
| **Substances** | **Observations** | | |
|  | **Solid** | **Liquid** | **Gas** |
| **Argon** | Temperature:  Illustration: | Temperature:  Illustration: | Temperature:  Illustration: |
| **Oxygen** | Temperature:  Illustration: | Temperature:  Illustration: | Temperature:  Illustration: |
| **Water** | Temperature:  Illustration: | Temperature:  Illustration: | Temperature:  Illustration: |

1. Explain 2 similarities and 2 differences in comparing the substances above.
2. Kelvin may be a unit you have not used before. Use your book or the computer to find the conversion **from** Kelvin (K) **to** Celsius (°C) and Celsius **to** Kelvin. Record these conversions here. **NOTE: Every calculation involving the temperature of GASES must use Kelvin.**
3. Use the heat control below the container to heat solid oxygen. Notice when the particles begin to behave as a liquid and record the temperature in °C and K. Show your work and include the correct units. Do the same for water.
4. Which substance, oxygen or water requires more energy to transition from a solid to a liquid? Explain why you think this.
5. What happens to the movement of the gas molecules (kinetic energy) as temperature increases?
6. a. Sketch a graph of Kinetic Energy vs. Temperature. FYI: You will not find this graph on the Phet site.

b. Use this graph to describe the relationship between the two variables.

9.Use the phase diagram at the right to answer the questions below.

1. Label the solid, liquid, and gas regions on the graph.
2. Determine the temperature and the pressure of the triple   
   point (A).
3. Identify the phase of the substance when the temperature   
   is 75°C and pressure is 0.75 atm.
4. Name the phase change that occurs when the substance goes from C to D.
5. Identify the letters that show when the substance is freezing. \_\_\_\_\_\_ to \_\_\_\_\_
6. Explain whether or not this could be a phase diagram for water.

