American High School Chemistry
Unit 3 - Virtual Lab

STATES OF MATTER

INTRODUCTION: There are more states of matter than just three. One such example is plasma, present in your plasma TV, or in the stars, and it is the most common state of matter in the universe. In Chemistry, however, we are mainly concerned with the most common states of matter on planet Earth: Solids (s), Liquids (l), and Gases (g).

LAB OBJECTIVES: Students will be able to:

1) Identify the familiar states of matter using atomic and molecular pictures
2) Interpret the unusual properties of water using atomic and molecular pictures
3) Predict how varying the temperature changes the behavior of the atoms or molecules.

PRE-LAB (Complete Prior to Using the Simulation):

PREDICT - 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			
Explanation of How Molecules will be Moving			

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

_____

_____

American High School Chemistry
Unit 3 - Virtual Lab

Once you have completed the Pre-Lab, you may begin the simulation, and the development of your data (observations) and responses to the reflective, analytical questions to include within your lab report.

PROCEDURE: In order to complete the Virtual Lab, interact with the online simulation provided to you (**Virtual Lab: States of Matter**):

Answer the following Virtual Lab questions in complete sentences, and include all diagrams, analysis (concepts and responses to the lab questions) within a properly formatted lab report document (THIS GUIDE IS **NOT** YOUR LAB REPORT, yet a means for you to properly compile data [both quantitative and qualitative] and analytical responses to incorporate within your formal lab report).

Make sure that your lab report submission includes all of the proper components (introduction/objective, hypothesis, materials, procedure, data/results [images], analysis, and conclusion [what you've learned about particle behavior based on your activities within the simulation]).

DATA and ANALYSIS:

1) Use the menu on the right side of the interactive program to select the variables Water and Solid. Use the slider on the bottom of the interactive program to add thermal energy (heat); note, the thermometer is located at the top of the simulation.

What temperature scale is showing? Why is that temperature scale being used?

_____
_____

2) Illustrate and describe in words your qualitative observations regarding *solid* water below:

DIAGRAM	OBSERVATIONS (DESCRIPTION)
MELTING/FREEZING POINT OF WATER (include appropriate temperature unit)	

American High School Chemistry
Unit 3 - Virtual Lab

3) What happens to the water molecules as you increase the temperature? What is water's melting/freezing points?

_____

_____

4) Add heat until the temperature is just below and just above the melting point of water. How are water molecules different below its melting point and above it?

_____

_____

5) Illustrate and describe in words what water looks like as a *liquid*:

DIAGRAM	**OBSERVATIONS (DESCRIPTION)**
BOILING/CONDENSATION POINT OF WATER (include appropriate temperature unit)	

6) Add heat until the temperature is just below and just above the boiling point of water. How are water molecules different below its boiling point and above it?

_____

_____

7) Illustrate and describe in words what water looks like as a *gas*:

DIAGRAM	**OBSERVATIONS (DESCRIPTION)**

American High School Chemistry
Unit 3 - Virtual Lab

8) Now that you've completed the simulation concerning particle behavior of water, were your predictions from the Pre-Lab correct or incorrect? Explain.

_____
_____
_____

10) 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 observe this substance as a solid, liquid, and gas. Illustrate and describe its properties in the table below:

CHOSEN SUBSTANCE: _____			
	SOLID	**LIQUID**	**GAS**
Diagram of Molecules			
Explanation of How Molecules will be Moving			

11) Compare and contrast this substance's physical behaviors to that observed in water.

_____
_____
_____
_____
_____

American High School Chemistry
Unit 3 - Virtual Lab

CONCLUSION:

Offer a scientific explanation regarding WHY the particle behavior observed between the various states of matter occurred. Be sure to use appropriate scientific vocabulary (thermal energy, kinetic energy, intermolecular forces, etc.) in the correct context to justify your response to the prompt.