

Ms. Randall

Regents Chemistry

Lab Activity: What's the Matter?(adapted from KMT Pogil Linda Padwa)

Background: The kinetic molecular theory is a model or mental image of how particles of matter behave. Knowledge of the kinetic molecular theory allows us to predict the action of solids, liquids and gases and understand how the changes of state occur.

Objective:

- To identify the basic differences between particle behavior in the solid liquid and gaseous phases.
- To develop an understanding of the postulates of the kinetic molecular theory
- To relate temperature to the kinetic energy of molecules.

Materials: Unknown ooze, Bowls, Paper towels, Aluminum tray, Spoons, Popsicle sticks

Safety: non-toxic

Procedure:

Part I-Ooze

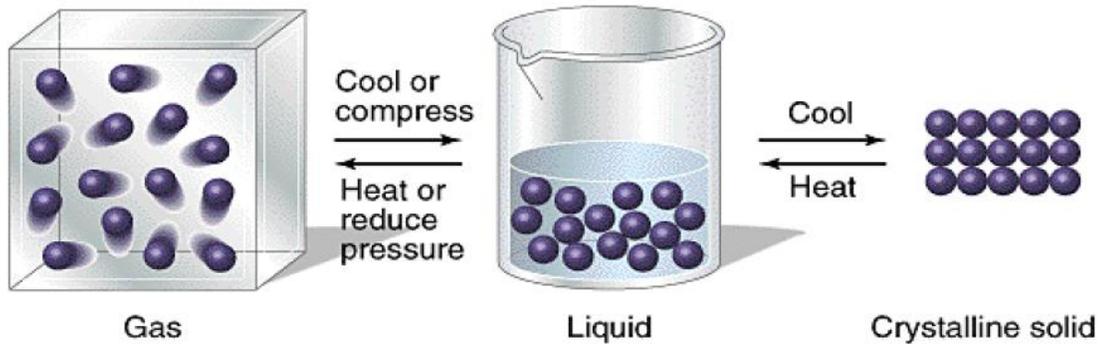
1. Pick up a handful of ooze and squeeze it. What does it feel like?
2. After squeezing it let go. What happens to the ooze?
3. Tap the surface of the ooze with your finger. Tap it with a spoon. What does it feel and look like?
4. How is this different than if you tapped water?
5. Pick up a handful and roll between your hands. Stop rolling and observe. What happens?
6. Push your fingers slowly through until you touch the bottom of the bowl. What do you observe?
7. Try to quickly punch your fingers through until you touch the bottom of the bowl. What do you observe?
8. How is this mystery substance different from a typical liquid?

Analysis:

1. Describe ways the ooze acted like a solid.
2. Describe ways the ooze acted like a liquid.
3. Is it more like a solid or a liquid? Why?

Part II Phases of Matter

Model 1 Representation of Atoms in Different Phases



1. What are the key characteristics of atoms and molecules in gases, liquids and solids? Create a table and describe the characteristics of particles for each phase of matter based on Model 1 above. Be specific with regard to spacing, potential of particles for movement, and whether or not the particles will fill the container.

Table 1. Characteristics of the Phases of Matter

	SOLID	LIQUID	GAS
SPACING			
POTENTIAL FOR MOVEMENT			
FILLING A CONTAINER			

2. In which phase of matter is there the least spacing between particles?
3. In which phase of matter is there the most potential for movement?
4. Which phase of matter does not have a definite shape yet the particles will not fill the container?
5. In terms of spacing, what would be necessary to change from a solid to liquid? What is the process called and how is it accomplished?
6. In terms of spacing, what would be necessary to change a liquid to a gas? What is this process called and how is it accomplished?
7. In terms of spacing, what would be necessary to change a liquid to a solid? What is the process called and how is it accomplished?

Part III PhET Simulation

Procedure:

- Open the internet browser and enter the address: <https://phet.colorado.edu/en/simulation/states-of-matter>
- Open the “States of Matter” Simulation

Investigation:

1. Predict what the molecules of a solid, liquid and gas look like. Illustrate your prediction with a drawing.

Solid

Liquid

Gas

2. Complete the table in your lab notebook 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
Neon	Temperature: Illustration:	Temperature: Illustration:	Temperature: Illustration:
Argon	Temperature: Illustration:	Temperature: Illustration:	Temperature: Illustration:
Oxygen	Temperature: Illustration:	Temperature: Illustration:	Temperature: Illustration:
Water	Temperature: Illustration:	Temperature: Illustration:	Temperature: Illustration:

3. Sketch a graph of Kinetic Energy vs. Temperature. Use this graph to describe the relationship between the two concepts.

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Lab conclusion: What's the Matter? (adapted from KMT Pogil Linda Padwa)

1. Write a paragraph summarizing what you have learned about the scientific concept of the lab from doing the lab. Back up your statement with details from your lab experience.

2. Which grouping of the three phases of bromine is listed in order from left to right for increasing distance between bromine molecules?

A) gas, liquid, solid

B) liquid, solid, gas

C) solid, gas, liquid

D) solid, liquid, gas

3. Which statement correctly describes a sample of gas confined in a sealed container?

A) It always has a definite volume, and it takes the shape of the container.

B) It takes the shape and the volume of any container in which it is confined.

C) It has a crystalline structure.

D) It consists of particles arranged in a regular geometric pattern.

4. Which statement best describes the molecules of H₂O in the solid phase?

A) They move slowly in straight lines.

B) They move rapidly in straight lines.

C) They are arranged in a regular geometric pattern.

D) They are arranged in a random pattern.

5. Which substance has a definite shape and a definite volume at STP?

A) NaCl(aq)

B) Cl₂(g)

C) CCl₄(l)

D) AlCl₃(s)