

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

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

Safety: non-toxic

Procedure:

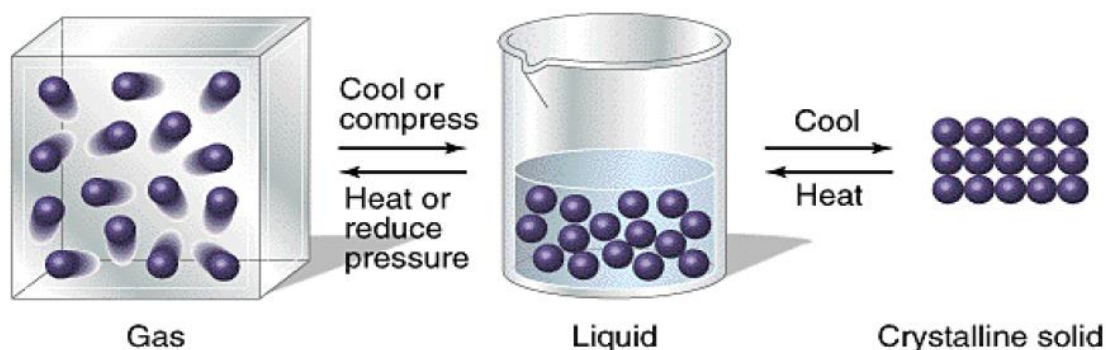
Part I-Ooze

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?

Model 1 Representation of Atoms in Different Phases



1. What are the key characteristics of atoms and molecules in gases, liquids and solids? In table 1 below, 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			

- In which phase of matter is there the least spacing between particles?
- In which phase of matter is there the most potential for movement?
- Which phase of matter does not have a definite shape yet the particles will not fill the container?
- 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 Postulates of the Kinetic Molecular Theory

Model:

1. Gases consist of tiny particles (atoms or molecules).
2. These particles are so small, compared with the distances between them that the volume (size) of the individual particles can be assumed to be negligible (zero).
3. The particles are in constant random motion, colliding with the walls of the container. These collisions with the walls cause the pressure exerted by the gas.
4. The particles are assumed to not attract nor repel each other.
5. The average kinetic energy of the gas particles is directly proportional to the Kelvin temperature of the gas.

1. What causes a gas to exert pressure when confined in a container?

2. How does the total volume of gas particles compare to the volume of the space between the gas particles?

3. As the temperature of a gas decreases, what change occurs in the amount of the kinetic energy?

4. What property of gases is measured by temperature?

5. What is the relationship between temperature and molecular motion?

6. In terms of kinetic molecular theory of gases, how can an increase in temperature of a gas confined in a rigid container cause an increase in the pressure of the gas?

1. 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)