Particle Motion Mystery

Compare how particle motion affects the properties of matter.

6.6.A "compare solids, liquids, and gases in terms of their structure, shape, volume, and kinetic energy of atoms and molecules;"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline details about particle structure, circle each detail about shape or volume, and number the solid, liquid, and gas descriptions 1, 2, and 3 from lowest to highest kinetic energy.

Water in Three States

1. Picture water moving through a closed container in a science lab. In its solid form, ice, the water molecules are packed close together in an orderly pattern. They vibrate in place but do not slide past one another easily. Because of this structure, ice keeps its own shape and its own volume. Scientists often call atoms and molecules particles. Adding heat raises the molecules' kinetic energy, which is energy of motion. If enough energy is added, the orderly solid structure can change.

2. When ice melts, it becomes liquid water. Liquid molecules remain close together, but they are not locked into a pattern. Their greater kinetic energy lets them move and slide around each other. Liquid water has a definite volume, so a measured amount takes up the same space. It does not have a definite shape. In a cup it matches the cup's shape, while in a bottle it matches the bottle's shape. The particles' freedom to move explains this difference.

3. Water vapor is a gas. Its molecules are much farther apart than molecules in a liquid or solid, with large spaces between them. Gas molecules have more kinetic energy and move quickly in many directions. A gas has neither a definite shape nor a definite volume. It spreads out to fill all available space, whether that space is a jar or a large room. Comparing the three states shows a pattern: as particle motion increases, particles become less fixed, and shape and volume become less restricted.

2 ANSWER WITH EVIDENCE

Use the passage

1. How is the structure of ice different from the structure of liquid water, and how does this affect how the molecules move?

2. Compare liquid water and water vapor in terms of shape and volume.

3. Why does ice keep its own shape while liquid water takes the shape of a cup?

4. Which state of water has the highest kinetic energy? State its shape and volume properties.

3 YOUR TURN

Your own words

Choose oxygen as a substance different from water. Complete the table to compare solid, liquid, and gaseous oxygen by particle structure and motion, relative kinetic energy, shape, and volume.

STATE OF OXYGEN	PARTICLE STRUCTURE AND MOTION	RELATIVE KINETIC ENERGY	SHAPE AND VOLUME

ANSWER KEY

Particle Motion Mystery

GRADE 6 · TEKS 6.6.A

PART 1 · READ AND MARK

Underline details about particle structure, circle each detail about shape or volume, and number the solid, liquid, and gas descriptions 1, 2, and 3 from lowest to highest kinetic energy. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How is the structure of ice different from the structure of liquid water, and how does this affect how the molecules move?	**Ice molecules are packed in an orderly pattern and mainly vibrate in place. Liquid molecules are close together but not locked in a pattern, so they can slide around each other.**
2	Compare liquid water and water vapor in terms of shape and volume.	**Liquid water has a definite volume but takes the shape of its container. Water vapor has neither a definite shape nor a definite volume and fills available space.**
3	Why does ice keep its own shape while liquid water takes the shape of a cup?	**Ice molecules are held in an orderly structure and cannot slide past one another easily. Liquid molecules are freer to move and slide around each other.**
4	Which state of water has the highest kinetic energy? State its shape and volume properties.	**Water vapor, the gas, has the highest kinetic energy. It has neither a definite shape nor a definite volume.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

STATE OF OXYGEN	PARTICLE STRUCTURE AND MOTION	RELATIVE KINETIC ENERGY	SHAPE AND VOLUME
Solid oxygen	Molecules are close together in an orderly arrangement and vibrate in place.	Lowest	Definite shape and definite volume
Liquid oxygen	Molecules are close together but can slide past one another.	Higher than solid, lower than gas	No definite shape, but definite volume
Gaseous oxygen	Molecules are far apart and move quickly in many directions.	Highest	No definite shape and no definite volume

Accept equivalent descriptions of particles as atoms or molecules. For the table, accept accurate comparisons showing that particle motion and kinetic energy increase from solid to liquid to gas, while shape and volume become less fixed.