Particle Motion Map

Use particle models to track changes caused by thermal energy.

S8P1.b "Develop and use models to describe the movement of particles in solids, liquids, gases, and plasma states when thermal energy is added or removed."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline words that describe particle spacing or motion, and circle phrases that tell whether thermal energy is added or removed.

Matter in Motion

1 Scientists use particle models to represent matter that is too small to see. In a model, dots stand for particles, and arrows show their motion. A solid such as ice has particles packed in fixed positions. They vibrate, but they do not trade places. When thermal energy is added, the vibrations become stronger. If enough energy is added, the ordered solid can melt. During melting, particles gain freedom to slide past nearby particles, creating a liquid.

2 Liquid water particles remain close together, so a liquid keeps nearly the same volume. However, they move around one another, so liquid can flow and take the shape of its container. Add more thermal energy, and some particles move fast enough to escape the liquid. In a gas, particles are far apart and travel freely in all directions. Removing thermal energy reverses this trend. Gas particles slow down, move closer together, and may condense into a liquid.

3 With still more energy, a gas can become plasma. Plasma contains charged particles, including free electrons and positive ions, that move rapidly. Unlike an ordinary gas, plasma can respond strongly to electric and magnetic fields. Lightning and the glowing material in many stars are plasma. A particle model can show each state without showing every real particle. Use spacing, motion arrows, and charge marks to explain what changes when energy is added or removed. The model should show movement, not just name the state.

2 ANSWER WITH EVIDENCE

Use the passage

1. A solid melts after thermal energy is added. What two changes should a particle model show?

2. Compare the spacing and movement of particles in a liquid and in a gas.

3. Use the passage to describe what happens to gas particles when thermal energy is removed.

4. How can a particle model show that plasma is different from an ordinary gas? Include two model features.

3 YOUR TURN

Your own words

Create a three-panel particle model showing a substance as a liquid, then a gas, then plasma as thermal energy is added. Use dots, spacing, motion arrows, and charge marks where needed, then write one sentence explaining the overall change.

ANSWER KEY

Particle Motion Map

GRADE 8 · S8P1.b

PART 1 · READ AND MARK

Underline words that describe particle spacing or motion, and circle phrases that tell whether thermal energy is added or removed. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	A solid melts after thermal energy is added. What two changes should a particle model show?	**Show stronger particle motion and a change from particles vibrating in fixed positions to particles sliding past one another.**
2	Compare the spacing and movement of particles in a liquid and in a gas.	**Liquid particles stay close together and move around one another. Gas particles are far apart and travel freely in all directions.**
3	Use the passage to describe what happens to gas particles when thermal energy is removed.	**The particles slow down, move closer together, and may condense into a liquid.**
4	How can a particle model show that plasma is different from an ordinary gas? Include two model features.	**It can show rapidly moving particles with motion arrows and charged particles, including free electrons and positive ions, with charge marks.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Panel 1: Liquid particles are close together, uncharged, and have arrows showing that they slide past one another. Panel 2: Gas particles are far apart, uncharged, and have longer arrows showing free motion. Panel 3: Plasma has far-apart positive ions and free electrons, with long arrows and charge marks. As thermal energy is added, particles move faster, spread farther apart, and eventually form charged particles in plasma.

Accept equivalent descriptions or models that accurately show particle spacing, motion, and the effect of adding or removing thermal energy. For plasma, students should show charged particles, such as positive ions and free electrons, as well as rapid motion.