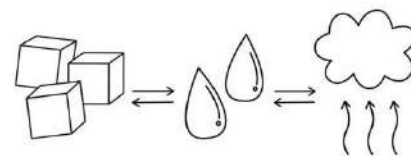


Name _____ Date _____



KINETIC THEORY OF MATTER QUIZ - Answer Key

1. What is the kinetic theory of matter?

Theory used to understand the behavior of matter, especially with respect to the motion of its constituent particles. According to the theory, matter is composed of particles that are in a continuous state of motion.

2. What does kinetic theory state about matter?

- **Matter is made of particles**
- **The particles are continuously moving**
- **Heating increases the kinetic energy of particles**

3. Using kinetic theory, explain the main physical differences between solids, liquids, and gases.

- **In solids, the particles are close to each other and are held together by strong attractive forces. Particles only vibrate in fixed positions**
- **In liquids, the particles are further apart as compared to solids. Particles are free to move about but cannot break away because they are still attracted to one another.**
- **In gases, particles are very far apart from one another and move independently in all directions at great speeds**

4. How does increasing and decreasing temperature affect the kinetic energy of particles in the three states of matter (solids, liquids, and gases)?

Increasing temperature increases kinetic energy and vice versa

5. State whether energy needs to be added or removed for each of the following transitions of state to occur.

- Condensation: **removed**
- Melting: **added**
- Vaporization: **added**
- Deposition: **removed**
- Freezing: **removed**

6. Explain the following changes of state based on kinetic theory:
- a. Melting
Occurs when particles in a solid gain more energy to overcome the force of attraction between them, causing them to break away from the solid structure.
 - b. Boiling
Occurs when particles in the liquid gain more kinetic energy to completely neutralize the force of attraction between them
 - c. Condensation
Occurs when the particles of a gas lose kinetic energy, which in turn increases the force of attraction between the particles, making them to come close to one another.
 - d. Freezing
Occurs when the kinetic energy of the particles in a liquid decreases, which in turn increases forces of attraction, making them to come close to one another until they are no longer free to move but vibrate in fixed positions.
7. Kinetic theory can be used to explain the physical properties of matter. Use the theory to explain the following:
- a. solids expand upon heating
Their constituent particles gain kinetic energy, making them to vibrate more vigorously
 - b. Liquids flow but solids do not
Particles in liquids are not as closely packed and not as strongly attracted to one another as in solids. They slide past each other (flow). Particles in solids are very closely packed and more strongly attracted to each other. They are fixed in position and can only vibrate thus solids cannot flow
 - c. Gases can be compressed easily

Particles in gases are widely spaced. Repulsive forces are negligible due to the large space between the particles. Particles in solids are closely packed and hence cannot be compressed.

d. Liquids don't have definite shapes but have definite volumes

Particles in liquids are free to move about but cannot break away because they are still attracted to one another. So, they can flow and conform to the shape of the container. But since they cannot break away, liquids maintain fixed volumes.

8. Based on kinetic theory, explain why iodine sublimates and goes from the solid state directly into the gaseous state without passing through the liquid state.

The force of attraction between iodine particles is considerably weak. So, as soon their particles absorb heat energy, they gain a sufficiently high kinetic energy, which causes them to break away from their solid structures into gaseous states.

9. The temperature at which condensation occurs is usually the boiling point of the substance. Explain.

The temperature at which a liquid transitions into a gas is the same temperature at which the gas transitions back to liquid when cooled.

10. Consider evaporation and boiling.

a. How are they similar?

Both involve a change of state from liquid to gas

b. What are the two main differences between them?

- **Boiling takes place at a specific temperature while evaporation takes place even at lower temperatures—sometimes far below the boiling point.**

- Boiling occurs because all particles have attained enough kinetic energy to overcome the forces that hold them together. Evaporation, on the other hand, occurs because some particles with high kinetic energy come to the surface and break away from the rest and escape into gaseous state.

NOTE: For more comprehensive explanation of any of the above answer, check here: <https://chemtribe.com/the-kinetic-theory-of-matter/>