

What is a State of Matter?

Worksheet

The states of matter are the distinct physical forms substances exist in - solid (fixed shape and volume), liquid (fixed volume, no fixed shape), gas (no fixed shape or volume), and plasma (ionized gas) - determined by particle spacing, arrangement, and energy.

Questions

1. Which state of matter has a fixed volume but no fixed shape?
 - A) Solid
 - B) Liquid
 - C) Gas
 - D) Plasma
2. During melting, what happens to the temperature of a pure substance?
 - A) It rises steadily
 - B) It falls steadily
 - C) It stays constant until melting finishes
 - D) It fluctuates randomly
3. Which state is described as an ionized gas that conducts electricity?
 - A) Solid
 - B) Liquid
 - C) Gas
 - D) Plasma
4. Dry ice turning straight into CO gas without melting is an example of
 - A) Condensation
 - B) Sublimation
 - C) Deposition
 - D) Fusion
5. Classify ice, liquid water, and steam by state and explain why each has its shape and volume behavior.
6. A block of solid CO (dry ice) disappears at room temperature without becoming a puddle. What process is this and why?
7. Explain, at the particle level, why a gas can be compressed easily but a liquid almost cannot.
8. Define: What are the four common states of matter?
9. Define: Why does a solid keep its shape?
10. Define: What happens to temperature during a phase change like melting?

Answer Key

1. B) Liquid - Liquids flow to fit their container's shape but keep a constant volume.
2. C) It stays constant until melting finishes - Energy added during a phase change breaks intermolecular bonds rather than raising kinetic energy, so temperature plateaus.
3. D) Plasma - Plasma consists of free ions and electrons, giving it electrical conductivity unlike ordinary gas.
4. B) Sublimation - Sublimation is the direct solid-to-gas transition, which dry ice undergoes at normal atmospheric pressure.
5. Ice: solid - particles locked in a rigid lattice, fixed shape and fixed volume. Liquid water: liquid - particles close together but free to flow, fixed volume, takes container's shape. Steam: gas - particles far apart and moving freely, no fixed shape or volume, expands to fill the container.
6. Dry ice goes directly from solid to gas without a liquid stage - this process is called sublimation. At normal atmospheric pressure, CO's solid-liquid-gas triple point lies above 1 atm, so liquid CO can't exist at everyday pressure. Heat energy from the room is enough to break the solid lattice directly into gas particles.
7. In a gas, particles are far apart with mostly empty space between them, so pushing them closer together is easy. In a liquid, particles are already almost touching, so there is very little empty space left to remove. This is why gases are compressible and liquids (like in hydraulic systems) are treated as nearly incompressible.
8. Solid, liquid, gas, and plasma - distinguished by particle spacing, arrangement, and energy.
9. Its particles are locked in fixed positions by strong attractive forces, only vibrating in place.
10. It stays constant - added energy breaks intermolecular forces instead of raising temperature, until the change is complete.

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