States of Matter

Use this key to check answers and read the explanations.

1. Which sample keeps its own shape when moved intact from one bowl to another?
   - A. A solid cube of wax
   - B. A cupful of juice
   - C. The air inside a balloon
   - D. Liquid food coloring

   Correct answer: A. A solid cube of wax
   Under ordinary conditions a solid keeps a definite shape and volume.

2. What changes when you pour the same amount of syrup into a wider bowl without spilling any?
   - A. Its total mass
   - B. Its volume
   - C. Its shape in the bowl
   - D. Its state of matter

   Correct answer: C. Its shape in the bowl
   The liquid takes a new shape. The amount and volume stay essentially the same.

3. Which sample expands to occupy all the space available inside a larger closed container?
   - A. A marble
   - B. A sample of helium gas
   - C. A piece of chalk
   - D. A spoonful of olive oil

   Correct answer: B. A sample of helium gas
   A gas has no fixed volume and spreads throughout its accessible container.

4. A candle in a warm room forms a puddle of wax. What change took place in the wax that became liquid?
   - A. Deposition
   - B. Freezing
   - C. Condensation
   - D. Melting

   Correct answer: D. Melting
   Melting changes solid wax into liquid wax.

5. What change occurs when liquid juice becomes a solid ice pop?

A. Vaporization
B. Freezing
C. Sublimation
D. Condensation

Correct answer: B. Freezing
Freezing is the change from liquid to solid.

6. What process produces liquid droplets on the outside of a cold glass on a humid day?

A. Water vapor in the air condenses.
B. The glass changes from solid to liquid.
C. Water vapor inside the glass freezes.
D. Liquid water passes through the glass.

Correct answer: A. Water vapor in the air condenses.
Water vapor near the cold surface can cool enough to form liquid droplets.

7. A shallow puddle shrinks on a mild day even though the water never boils. Which process explains this?

A. Deposition from the air
B. Solidification below its surface
C. Boiling throughout the liquid
D. Evaporation from its surface

Correct answer: D. Evaporation from its surface
Water can enter the gas phase at the surface below its boiling point.

8. Dry ice goes directly from solid carbon dioxide to carbon dioxide gas in an open room. What is this called?

A. Freezing
B. Deposition
C. Sublimation
D. Condensation

Correct answer: C. Sublimation
A direct solid-to-gas change is sublimation.

9. Water vapor forms ice crystals directly on a freezer surface. Which phase change is this?

A. Deposition
B. Fusion
C. Sublimation
D. Evaporation

Correct answer: A. Deposition
Deposition changes gas directly to solid.

10. Which sample typically has the largest average gaps between its molecules under ordinary conditions?

A. All three have about the same gaps.
B. Ice
C. Liquid water
D. Water vapor

Correct answer: D. Water vapor
Gas molecules occupy a much smaller fraction of the volume than molecules in solids or liquids.

11. Why is a sealed syringe full of air generally easier to compress than one full of liquid water?

A. Liquid water always freezes under the plunger.
B. Air molecules can be destroyed by gentle pressure.
C. Gas molecules have much more space between them.
D. Gases are made of particles that shrink when pushed.

Correct answer: C. Gas molecules have much more space between them.
The gas molecules can occupy a smaller overall volume because the spaces between them are large.

12. Which observation distinguishes boiling in a pot from ordinary evaporation at the surface?

A. Some molecules leave the liquid.
B. Vapor bubbles form within the liquid.
C. The amount of liquid decreases.
D. The vapor is made of the same substance.

Correct answer: B. Vapor bubbles form within the liquid.
Boiling includes vapor formation within the liquid. Ordinary evaporation occurs at the surface.

13. Which process releases energy to the surroundings as it occurs?

A. Solid carbon dioxide sublimating
B. Ice melting into liquid water
C. Liquid water evaporating
D. Water vapor condensing into liquid water

Correct answer: D. Water vapor condensing into liquid water
Condensation releases the energy absorbed during vaporization.

14. At fixed pressure a pure solid is heated while solid and liquid both remain present at its melting point. What happens to its temperature during the change?

A. It stays at the melting point.
B. It immediately jumps to the boiling point.
C. It falls steadily as liquid forms.
D. It must increase at the same rate as before.

Correct answer: A. It stays at the melting point.
During equilibrium melting, the added energy converts more solid to liquid while the temperature stays at the melting point.

15. At higher elevation, water in an uncovered pot typically boils at a lower temperature. Why?

A. Water molecules become heavier with elevation.
B. A larger surrounding pressure makes the room absorb more heat.
C. Water vapor pressure reaches the lower surrounding pressure sooner as the pot warms.
D. Boiling begins only when the pot runs out of dissolved air.

Correct answer: C. Water vapor pressure reaches the lower surrounding pressure sooner as the pot warms.
Boiling starts when the liquid’s vapor pressure reaches the surrounding pressure. A lower surrounding pressure is reached at a lower temperature.