

Name: _____ Date: _____

Answer Key: Wrangle Culinary Chemistry: 5th Grade States of Matter Quiz

Evaluate how molecular energy shifts during 10 kitchen-based scenarios, from caramelizing sugar to cooling lava cakes with dry ice.

1. A chef is using a 'syphon' to turn fruit juice into a foam by adding pressurized Nitrous Oxide gas. Which statement best explains how the gas particles behave compared to the liquid juice particles?

Answer: B) They have more kinetic energy and fill the entire container.

Gas particles possess high kinetic energy, allowing them to overcome attractive forces and expand to fill any available space in a container.

2. When making 'mirror glaze' for a cake, a baker cools a hot liquid mixture until it thickens into a gel-like state. This process of removing thermal energy to change a liquid to a solid is called _____.

Answer: C) Freezing

Freezing (or solidification) is the phase change that occurs when thermal energy is removed from a liquid, causing particles to slow down into a fixed structure.

3. True or False: In a high-pressure pressure cooker, liquid water can reach temperatures above 100°C without turning into steam because the added pressure forces the particles to stay closer together.

Answer: A) True

Pressure influences phase changes; by increasing pressure, you can keep water in a liquid state at higher temperatures before it transitions to a gas.

4. Imagine you are observing a block of solid gallium metal melting in a scientist's hand. What is happening to the particles at the molecular level during this transition?

Answer: C) The particles gain enough energy to slide past one another.

Melting occurs when thermal energy allows particles in a rigid solid lattice to vibrate fast enough to break free and move fluidly as a liquid.

5. If a lab technician puts 'dry ice' (solid carbon dioxide) on a table, it transitions directly into a gas without becoming a liquid. Scientists categorize this specific phase change as _____.

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Answer: B) Sublimation

Sublimation is the rare transition where a substance skips the liquid phase and moves directly from solid to gas.

6. True or False: When water vapor in the air touches a cold soda can and turns into liquid droplets, it is releasing energy into the surroundings.

Answer: A) True

Condensation is an exothermic process, meaning gas particles must lose (release) energy to slow down and become a liquid.

7. A balloon filled with air is placed in a freezer. After an hour, the balloon looks partially deflated. Why did this happen?

Answer: C) The particles lost energy, moved slower, and moved closer together.

As gases cool, their kinetic energy decreases, causing the particles to collide less forcefully and occupy less volume (Charles's Law).

8. Molten glass is stirred by an artisan. Although it glows like a fire, it behaves as a liquid because its particles can _____, unlike the particles in the finished, cold glass vase.

Answer: B) Slide past each other

The defining characteristic of a liquid's fluidity is that the particles have enough energy to remain in contact but flow past one another.

9. True or False: If you increase the temperature of a sealed container of gas, the pressure inside decreases because the particles have more room to move.

Answer: B) False

Increasing temperature increases particle speed, leading to more frequent and forceful collisions with the walls, which increases pressure.

10. In the 'water cycle' of a self-contained terrarium, you see 'mist' forming on the glass. What sequence of phase changes is occurring to move water from the soil to the glass walls?

Answer: C) Evaporation then Condensation

Water evaporates from the moist soil into a gas (water vapor) and then cools upon hitting the surface to condense back into liquid droplets.

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