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Subject Code: STEM08	Subject Title: General Chemistry 2
Module No: 1	Topic: Kinetic Molecular Model of Solids and Liquids

IV. WE'RE ON OUR WAY

Quiz 1.1 TRUE OR FALSE (10 POINTS)

Directions: Read each statement carefully. Write TRUE if the statement is correct and FALSE if it is incorrect.

FALSE 1. Solids have no definite shape.

TRUE 2. Intermolecular forces attractive forces between neighboring particles of one substance.

TRUE 3. Solids strongly attracted to each other.

TRUE 4. Kinetic Molecular Model explains the properties of solids and liquids in terms of the intermolecular forces of attraction and the kinetic energy of the individual particles.

FALSE 5. Matter is made of particles that are constantly in motion. This energy in motion is called geothermal energy.

V. HOW FAR HAVE WE GONE?

Quiz 1.2 Describe Me (20 POINTS)

Directions: Compare the properties of solids and liquids by completing the table based on the kinetic molecular model. Provide a short description of each characteristic for the given state of matter.

CHARACTERISTIC	SOLID	LIQUID
Intermolecular force	Strong forces holding particles	Weaker forces compared to solids, allowing particles to move past each other
Shape	Definite shape, rigid structure	Takes the shape of the container, no definite shape
Volume	Definite volume	Takes the volume of the container, no definite volume
Density	Generally high	Usually lower than solids
Compressibility	Low	Higher than solids
Arrangement of Particles	Closely packed, ordered	Close, but less ordered than solids
Motion of Molecules	Vibrational motion in fixed	Freer movement with particles sliding past each other
Fluidity	Not fluid, maintains its shape	can flow and take the shape of the container

VI. WALKING THE EXTRA MILES (PERFORMANCE CHECK)

Be a Science Detective! (15 POINTS)

Directions: Investigate and analyze the given situation. Explain the phenomenon.

Based on the kinetic molecular model, solids usually have higher densities compared to liquids. However, ice, a solid form of H₂O floats on liquid water which means ice is less dense than water. What do you think is the reason for this observation? What is the biological significance of this concept? Write your answer in not less than 10 sentences.

The phenomenon of ice floating on water, despite solids typically having higher densities than liquids, can be explained by the unique behavior of water molecules and their arrangement in the solid state.

In the solid state, water molecules in ice form a hexagonal lattice structure with relatively open spaces. This arrangement leads to a lower packing efficiency compared to the more closely packed arrangement of water molecules in the liquid state. The open structure in ice creates a situation where there is more space between the molecules, making it less dense than liquid water.

This anomaly is primarily due to hydrogen bonding, a strong intermolecular force present in water. Hydrogen bonds cause water molecules to form an open and hexagonal lattice structure in the solid state, with each water molecule hydrogen-bonded to four neighboring water molecules. This unique structure creates a situation where the open spaces between molecules increase the volume, resulting in lower density compared to liquid water.

Biologically, the fact that ice floats on water is crucial for aquatic ecosystems and living organisms. When a water body freezes, ice forms on the surface rather than sinking to the bottom. This floating ice layer insulates the underlying liquid water, preventing it from freezing completely. This is vital for the survival of aquatic life in cold climates as it allows organisms to thrive beneath the ice-covered surface.

Additionally, the floating ice phenomenon is also important for the distribution of nutrients in bodies of water. If ice were denser than liquid water and sank, it would take nutrients with it, potentially limiting the availability of essential compounds for aquatic organisms. The ability of ice to float ensures a more even distribution of nutrients throughout the liquid water beneath, supporting the health of ecosystems.

In summary, the anomaly of ice floating on water is a result of the unique structure formed by hydrogen bonding in the solid state. This phenomenon has significant biological implications, ensuring the survival and thriving of aquatic life in cold environments and facilitating the distribution of nutrients in bodies of water.