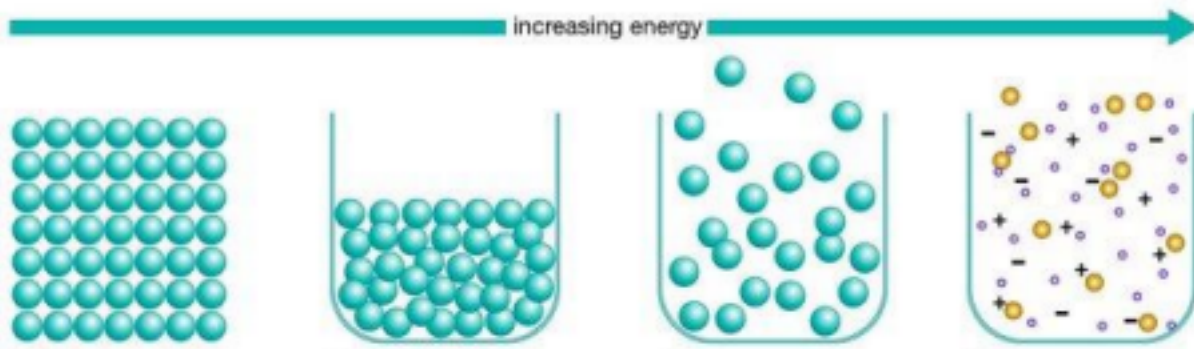


Unit 1: Matter and Measurement
Composition and States of Matter

At its core, matter refers to the substance that makes up everything around us. Matter is anything that takes up space and has a mass. It is composed of atoms, which are the smallest units of matter. These atoms combine to form molecules, creating a diverse array of substances with distinct properties. Chemistry delves into the interactions and transformations of matter, providing insights into the fundamental nature of our world. Matter is often composed into different “phases.” These phases include liquid, solid, gas, aqueous and plasma.

Physical states

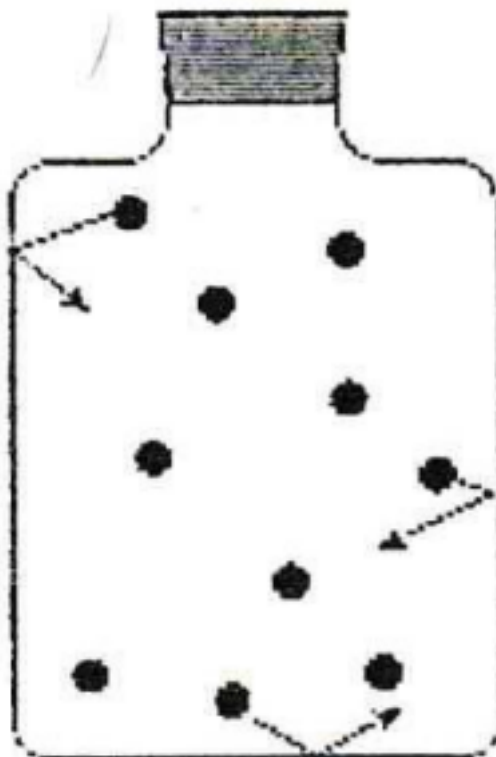
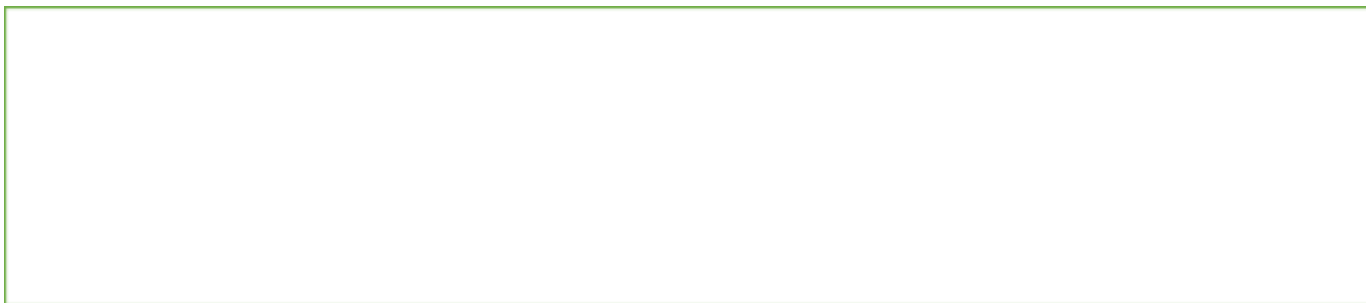


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1. Chemistry is all about the scientific examination of the properties of various substances and matter.
 - a. What is matter?
 - b. What is the smallest unit of matter? What is so significant about these small units of matter?

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2. The periodic table is a collection of the known elements known to man. Some are synthetic (man-made) while others can be found abundantly throughout the universe. It is laid out with regards to element properties.
 - a. Why is it important for the periodic table to have an organized layout of matter?
 - b. How did the periodic table help assist in identifying new elements?
 - c. What role does the periodic table play in education and research?



3. Certain phases often have different properties and energy levels.
 - a. Which phase do you believe has the lowest energy level? What about the highest energy level?
 - b. In the diagram above, which phase are the molecules in?



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- c. If the molecules in the diagram above were to have lower energy, what would their properties be?

4. An aqueous solution is a homogeneous mixture where a substance (solute) is dissolved in water (solvent), resulting in a single-phase liquid with uniformly distributed particles.
- Is lemonade an aqueous solution?
 - Why is an aqueous solution considered homogeneous?
 - What happens when you add more solute to an aqueous solution than it can dissolve?

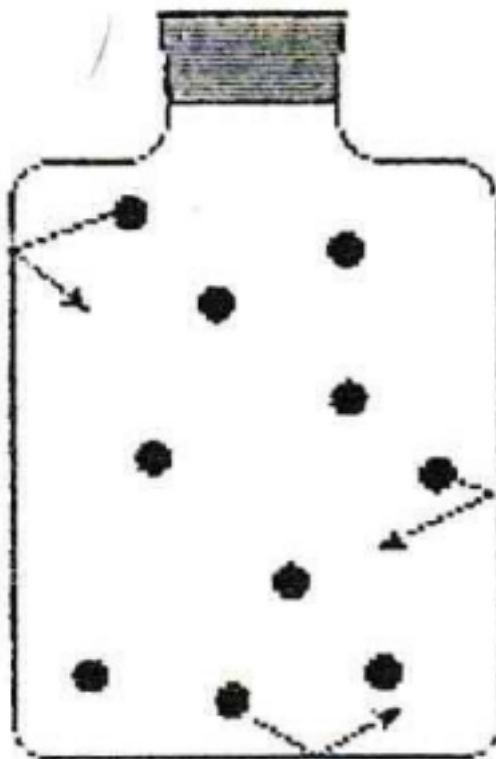
ANSWER KEY

1. Chemistry is all about the scientific examination of the properties of various substances and matter.
 - a. What is matter?
 - b. What is the smallest unit of matter? What is so significant about these small units of matter?

- a) Matter is something that fills space and has mass. Matter is able to take on many different phases including: liquid, solid, gas, and plasma.
- b) The smallest unit of matter is an atom. Atoms are significant because they each have a unique property, which can change when combined with other atoms.

2. The periodic table is a collection of the known elements known to man. Some are synthetic (man-made) while others can be found abundantly throughout the universe. It is laid out with regards to element properties.
 - a. Why is it important for the periodic table to have an organized layout of matter?
 - b. How did the periodic table help assist in identifying new elements?
 - c. What role does the periodic table play in education and research?

- a) The table's arrangement highlights trends in properties like atomic size, electronegativity, and reactivity, revealing underlying patterns.
- b) Gaps in the table suggest undiscovered elements and guide scientists in predicting their properties based on surrounding elements.
- c) It's a foundational tool in teaching chemistry and driving research, fostering deeper insights into matter's behavior and leading to breakthroughs.



3. Certain phases often have different properties and energy levels.
- Which phase do you believe has the lowest energy level? What about the highest energy level?
 - In the diagram above, which phase are the molecules in?
 - If the molecules in the diagram above were to have lower energy, what would their properties be?

- The phase with the lowest energy is the solid phase, where particles are closely packed and don't move much. The highest energy phase is plasma, which results in heating gas and contains excited ions and electrons
- In the diagram, the particles are in a gas phase, as they occupy the volume and shape of their container.
- If the molecules had lower energy levels, it would be a liquid, and would take only the shape of the container, but would have a fixed volume. However, if the molecules had even lower energy, it would become a solid, with a fixed shape and volume.

4. An aqueous solution is a homogeneous mixture where a substance (solute) is dissolved in water (solvent), resulting in a single-phase liquid with uniformly distributed particles.
- Is lemonade an aqueous solution?
 - Why is an aqueous solution considered homogeneous?
 - What happens when you add more solute to an aqueous solution than it can dissolve?

- Lemonade is considered an aqueous solution as it contains dissolved sugar, lemon juice, and other substances in water homogeneously.
- It is homogeneous because the composition is the same throughout the solution; there are no major differences in concentration between different parts of the solution.
- If the solution is saturated, any excess solute will not dissolve and will settle at the bottom. Think of pouring too much salt into water; some salt will remain undissolved and sink to the bottom.