# Answers to Unit 1, Chapter 2, Lesson 1 Questions: U1Ch2L1

## Essential Question

1. How can we differentiate between pure substances and mixtures and between the various forms of matter?  
 - Pure substances have a uniform and definite composition, such as elements (e.g., oxygen) and compounds (e.g., water). Mixtures are combinations of two or more substances that retain their individual properties (e.g., air, seawater). Matter can also be classified into solid, liquid, gas, or plasma based on particle arrangement and behavior.

## Progress Check 1

2. What causes liquids to flow, and how does this differ from the movement of particles in gases?  
 - Liquids flow because their particles are loosely packed and can move past one another, though they are still held together by weak attractive forces. In gases, particles are far apart with minimal attractive forces, allowing them to move freely and quickly in all directions.

3. Describe how matter is classified into solid, liquid, gas, or plasma. Why is this classification system useful in understanding the properties of matter?  
 - Matter is classified based on particle arrangement and energy levels:  
 - Solid: Fixed shape and volume; particles vibrate in place.  
 - Liquid: Fixed volume but no fixed shape; particles move freely within a confined space.  
 - Gas: No fixed shape or volume; particles move freely and fill the container.  
 - Plasma: High-energy state with charged particles; neither fixed shape nor volume.  
 - This classification helps explain physical properties and predict behavior under varying conditions.

## Progress Check 2

4. Define mass. How is it different from weight?  
 - Mass is the amount of matter in an object, measured in grams (g) or kilograms (kg). Weight is the force exerted by gravity on an object, which depends on its mass and the gravitational field. Mass remains constant regardless of location, while weight varies depending on gravity.

5. How can the physical properties of matter be observed in everyday life? Discuss with classmates.  
 - Physical properties such as mass, volume, and density can be observed daily:  
 - Mass is used to weigh ingredients while cooking.  
 - Volume is used to measure liquids in containers.  
 - Density explains why some objects float (e.g., wood) while others sink (e.g., metal).

## Power Up

6. Reflect on the following prompts to think critically about the content:  
 - The arrangement and movement of particles in solids, liquids, gases, and plasmas affect their physical properties and behavior.  
 - A brick’s mass remains constant on Earth and the Moon, but its weight differs due to varying gravitational forces.

## Lesson Check

7. Classify the given substances (water, oxygen, iron, and neon) based on their physical states at room pressure and temperature. Explain the criteria you used for classification:  
 - Water: Liquid (fixed volume, no fixed shape).  
 - Oxygen: Gas (no fixed volume or shape).  
 - Iron: Solid (fixed volume and shape).  
 - Neon: Gas (no fixed volume or shape).

8. Calculate the density of an object with a mass of 50 grams and a volume of 5 cubic centimeters. After calculating, explain what this density indicates about the object's properties:  
 - Formula: Density = Mass ÷ Volume = 50 g ÷ 5 cm³ = 10 g/cm³.  
 - A density of 10 g/cm³ suggests the object is relatively dense and compact, indicating it may be made of a solid material like metal.

9. Explain the physical properties of matter. Give suitable examples of three different materials for each property:  
 - Mass: Brick (heavy), balloon (light).  
 - Volume: Water in a container (takes container's shape), rock (fixed shape).  
 - Density: Oil (less dense than water, floats), metal (sinks in water due to higher density).

10. Plasma is the fourth state of matter. What are its unique properties? What is one example of plasma in everyday life?  
 - Plasma consists of high-energy, charged particles (ions and electrons). It exhibits unique properties like conducting electricity and emitting light. Example: Lightning is a natural form of plasma.

11. Identify and explain how you determined the state of matter of each common item: ice, juice, air, and a light bulb. How do the physical properties of the items help in your identification?  
 - Ice: Solid; fixed shape and volume.  
 - Juice: Liquid; no fixed shape, fixed volume.  
 - Air: Gas; no fixed shape or volume.  
 - Light bulb plasma: Plasma; emits light due to ionized particles.

12. When water boils and changes from a liquid to a gas, what happens to the motion of its particles?  
 - Correct answer: B) The particles move faster and spread farther apart.

13. What state of matter is represented by the steam rising from the sea under the sunlight?  
 - Correct answer: B) Gas.

14. What physical property of water allows it to take the shape of the shoreline but maintain its volume?  
 - Correct answer: A) Volume.

15. What is the relationship between the mass and volume of seawater?  
 - Correct answer: A) It determines the density.

## Beyond the Lesson

16. How do physical properties of matter, such as density, mass, and volume, impact everyday life and industries like construction, pharmaceuticals, healthcare, or technology?  
 - These properties are critical for material selection and application:  
 - Construction: High-density materials like concrete for durability.  
 - Pharmaceuticals: Measuring precise volumes for liquid medicines.  
 - Healthcare: Calculating patient body mass for medical dosages.  
 - Technology: Using lightweight materials like carbon fiber for efficiency.