

## States of Matter – An Introduction

**Chemistry** is frequently defined as the study of **matter** and the reactions that matter undergoes. Matter is defined as that which occupies space and possesses **mass**. The three states of matter are the three distinct physical forms that matter can take in most environments: solid, liquid, and gas.

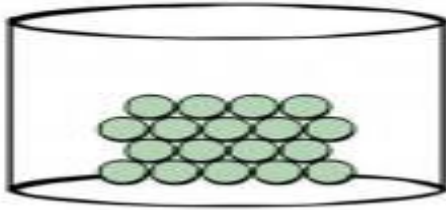
A solid's **particles** are packed closely together. The forces between the particles are strong enough that the particles cannot move freely. As a result, a solid has a stable, definite shape and a definite volume. Solids can only change shape under force, as when broken or cut. A solid can transform into a liquid through **melting**, and a liquid can transform into a solid through **freezing**. A solid can also change directly into a gas through a process called **sublimation**.

**Liquids** or fluids have a definite **volume**, but **not** a definite shape. Instead, they take the shape of their **container**, such as a **beaker** or a cupped hand. If not contained by a vessel, the shape is determined by other internal and external forces, such as **intermolecular forces** and gravity. The **molecules** are close, but not as close as a solid. When a solid is **heated** above its **melting point**, it becomes liquid. **The highest temperature at which a particular liquid can exist is called its critical temperature.** A **liquid** can be converted to a gas through heating at constant pressure to its **boiling point**. This process of a liquid changing to a **gas** is called **evaporation**.

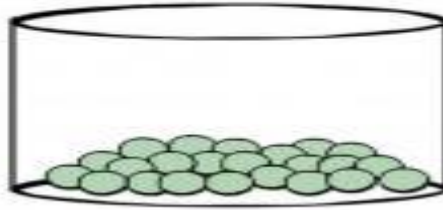
Gases have **no definite** volume and **no definite shape**. They expand to fill the size and shape of their container. The oxygen that we inhale and the carbon dioxide that we exhale are both examples of gases. The molecules are **very far apart in a gas**, and there are minimal intermolecular forces. Each **atom is free to move in any direction**. Gases undergo effusion and diffusion. **Effusion** occurs when a gas seeps through a small hole, and **diffusion** occurs when a gas spreads out across a room. If someone leaves a bottle of ammonia on a desk, and there is a hole in it, eventually the entire room will reek of ammonia gas, due to these properties. A gas can be transformed to a fluid through a process known as **condensation**.

In other words, matter can exist in one of three main states: solid, liquid, or gas. Solid matter is composed of tightly packed particles. A solid will retain its shape, since the particles are not free to move around. Liquid matter is made of more loosely packed particles. It will take the shape of its container. The gaseous matter is composed of particles packed so loosely that it has neither a defined shape nor a definite volume.

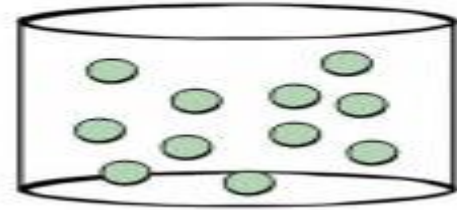
# States of Matter



Solid



Liquid



Gas

## Text exploration – Before reading:

- 1- According to you, what is the text about?
- 2- How many paragraphs does the text consist of?
- 3- Circle the letter that corresponds to the right answer:  
The text is:      a. Argumentative                      b. Narrative                      c. Expository  
The text is:      a. A speech                                      b. A web article                      c. A letter

## Text exploration – While reading:

- 4- Read the text slowly and silently.
- 5- Extract the difficult words from each paragraph.
- 6- Using your dictionary, find the words you have extracted in addition to the words that are underlined in each paragraph.

## Text exploration – After reading:

- 7- What is the main idea of the text?
- 8- Find in the text words that have the same meaning as:  
a. Fluid                      b. Transform                      c. Tightly
- 9- Are these statements: true, false, or not mentioned?
  - a) Chemists study matter and its reactions.
  - b) Solids and liquids have a stable and definite shape.
  - c) The beaker is a generally cylindrical container with a flat bottom.
  - d) Carbon dioxide is a fluid substance.
  - e) The process through which gaseous matter is liquefied is known as condensation.
- 10- Answer the following questions according to the text:
  - What is the difference between a *Melting Point* and a *Boiling Point*?
  - What would happen if a place is filled with ammonia gas?
  - Why do solids have definite shapes on the contrary of liquids and gases?

## **Pronunciation practice**

11- Read the following words aloud: Chemistry – Liquid – Container – Boil – Molecule – Beaker

## **Homework:**

- 1- What are the new things that you've learned from the text?  
Mention at least four new words and two important ideas.
- 2- Find another definition for chemistry.