

CHAPTER 1, MATTER AND CHANGE

Section 1, Chemistry Is a Physical Science

Chemistry is the study of the composition, structure, and properties of matter, the process that matter undergoes, and the energy changes that accompany these processes.

Six branches of chemistry: organic chemistry, inorganic chemistry, physical chemistry, analytical chemistry, biochemistry, and theoretical chemistry.

A chemical is any substance that has a definite composition.

Section 2, Matter and Its Properties

Mass is a measure of the amount of matter. (Use a balance.)

Matter is anything that has mass and takes up space.

Basic building blocks of matter:

- An atom is the smallest unit of an element that maintains the chemical identity of that element.
- An element is a pure substance that cannot be broken down into simpler, stable substances and is made of one type of atom. (Example: hydrogen)
- A compound is a substance that can be broken down into simple stable substances. Each compound is made from the atoms of two or more elements that are chemically bonded. (Example: hydrogen peroxide, H₂O₂)

Properties and changes in matter:

- Extensive properties depend on the amount of matter that is present. (Examples: volume, mass, amount of energy in a substance)
- Intensive properties do not depend on the amount of matter present. (Examples: melting point, boiling point, density, ability to conduct electricity and to transfer energy as heat)
- A physical property is a characteristic that can be observed or measured without changing the identity of the substance. Physical properties describe the substance, not how it can change into other substances. (Examples: melting point, boiling point)
- A physical change does not involve a change in identity of the substance. (Examples: changes from grinding, cutting, melting, boiling)
- A change of state is a physical change of a substance from one state to another.
- States of matter:
 - Matter in the solid state has definite volume and definite shape.
 - Matter in the liquid state has definite volume but an indefinite shape; a liquid assumes the shape of its container.

- Matter in the gas state has neither definite volume nor definite shape.
- Plasma is a high-temperature physical state of matter in which atoms lose most of their electrons, particles that make up atoms. (Plasma is found in fluorescent bulbs)
- A chemical property relates to a substance's ability undergo changes that transform it into different substances.
- A chemical change or chemical reaction is a change in which one or more substances are converted into different substances.
- The reactant is the substance(s) that reacts in a chemical change.
- The product is the substance(s) that is formed by the chemical change.

When physical or chemical changes occur, energy is always involved.

Classification of matter:

- A mixture is a blend of two or more kinds of matter, each of which retains its own identity and properties.
 - A homogeneous mixture or solution is a mixture with uniform composition. (Example: salt-water solution)
 - A heterogeneous mixture is a mixture without uniform composition. (Example: sand and water)
- A pure substance has a fixed composition and differs from a mixture in the following ways:
 1. Every sample of a given pure substance has exactly the same characteristics properties.
 2. Every sample of given pure substance has exactly the same composition.(Examples: compounds and elements)

Section 3, Elements

The periodic table

- Groups or families are the vertical columns of the periodic table.
- Periods are the horizontal rows of elements in the periodic table.

Types of elements

- A metal is an element that is a good electrical conductor and a good heat conductor. At room temperature, most metals are solids. Most metals are malleable (ability to be hammered or rolled into thin sheets). Most metals are ductile (ability to be drawn into a fine wire).
- A nonmetal is an element that is a poor conductor of heat and electricity.
- A metalloid is an element that has some characteristics of metals and some characteristics of nonmetals. All metalloids are solids at room temperature.