

Module 1 - Matter and its Properties

Matter - has mass and occupies space.

3 States of Matter

State	Definition	Examples
Solid	rigid; has a fixed shape and volume	ice cube, diamond, iron bar
Liquid	has a definite volume but takes the shape of its container	gasoline, water, blood
Gas	has no fixed volume or shape; takes the shape of its container	air, helium, oxygen

Phase Changes of Matter

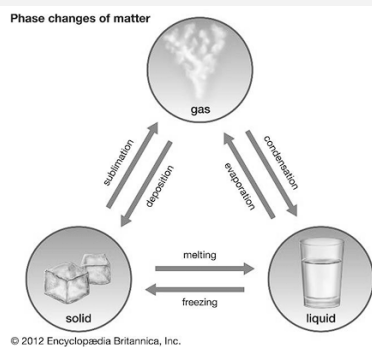


Figure 1.1. Phase Changes of Matter

Elements and Compounds

Elements	cannot be broken down into other substances by chemical means	iron, aluminum, oxygen, and hydrogen
Compound	substances that have the same composition no matter where we find them; can be broken down into elements	Water (H ₂ O), Salt (NaCl), Ammonia (NH ₃)

Physical and Chemical Properties and Changes

Physical Properties	odor, color, volume, state (gas, liquid, or solid), density, melting point, boiling point
Chemical Properties	burning, digestion, fermentation, rusting, electrolysis

Other Properties

Extensive	changes when the amount of material changes	mass, length, volume, shape
Intensive	does not depend on the size of the material	temperature, odor, color, hardness, density

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Mixture and Pure Substances

Mixture	has variable composition
Homogeneous	also called a solution; does not vary in composition from one region to another
Heterogeneous	contains regions that have different properties from those of other regions
Pure Substance	always have the same composition; either elements or compounds

Types of bonds

Ionic	when one atom shifts or transfers an electron to another atom; metals + nonmetals	Na ⁺ (1A) and Cl ⁻ (7A) creates a stable bond (octet rule)
Covalent	atoms share electrons; nonmetals	O ₂ -(6A) and 2 atoms of H+(1A) = H ₂ O
Metallic	a metal shares an electron with another metal; positively charged ions in electrons	

Module 2 - Isotopes, Compounds, Empirical Formula

Atoms have a constant or fixed number of protons

Atomic Number - gives the protons in the nucleus of an atom;
represented as **Z**

Neutral Atom - number of protons is equal to the number of electrons

$Z = \text{nuclear charge} = \text{number of protons} = \text{number of electrons in neutral form}$

Mass Number - sum of the number of protons and neutrons; represented by **A**

An atom can be represented by the nuclear symbol ${}^A_Z\text{E}$

Nucleons - protons + neutrons

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