



# Organization of matter

CHAPTER 1

# Organization of Matter

- ▶ Matter is anything that has volume and mass.
- ▶ The particle model is a scientific model based on the idea that matter is made up of small particles.

# Phases of matter

- ▶ Solid phase: The particles are very close together. Definite volume and shape.
- ▶ Liquid phase: The particles are bound by forces weaker than those in solids.
- ▶ Gaseous phase: The particles are very far apart. Do not have definite shape or volume.

# Atoms, molecules, mixtures, and pure substances

- ▶ The smallest particle of matter. It cannot be separated by chemical means.
- ▶ Molecule: A group of two or more atoms held together by chemical bonds.
- ▶ Mixture: At least two different substances. Contains at least two types of particles.
- ▶ Pure substance: One substance. Contains only one type of particle.

# Mixtures

- ▶ **HETEROGENOUS MIXTURE:** Made up of at least two substances that can be distinguished with the naked eye.
- ▶ **HOMOGENOUS MIXTURE:** Made up of at least two substances that cannot be distinguished with the naked eye.
- ▶ **COLLOID:** Is a homogenous mixture in which at least two different substances can be distinguished under a magnifying instrument.
- ▶ **SOLUTION:** Is a homogenous mixture in which it is impossible to distinguish its constituent parts, even under magnifying instruments.
- ▶ **SOLUTE:** Is a substance that dissolves in another substance.
- ▶ **SOLVENT:** Is a substance that can dissolve a solute.

# Concentration

- ▶ Formula  $\rightarrow c = m/v$
- ▶ Corresponds to the quantity of dissolved solute in a given quantity of solvent.

# Dilution

- ▶ Dilution is a laboratory technique that involves decreasing the concentration of solution by adding solvent.
- ▶ Formula  $\rightarrow c_1 \times v_1 = c_2 \times v_2$
- ▶ Solubility is the maximum amount of solute that can be dissolved in a given amount of solvent.
- ▶ A saturated solution contains exactly the maximum amount of solute that can be dissolved in it.

# Separation of mixtures

- ▶ **DECANTATION:** When a mixture's constituents have different densities they separate into different layers. Each layer can be poured out individually.
- ▶
- ▶ **CENTRIFUGATION:** Accelerates the decantation process using a centrifuge, which is an instrument that can spin a mixture at high speeds.
- ▶
- ▶ **FILTRATION:** Passing a solid-liquid mixture or solid-gas mixture through a filter. The solids stay on the surface of the filter.
- ▶
- ▶ **EVAPORATION:** Collect a solid that has dissolved. The liquid in the solid-liquid mixture evaporates.



# Separation of mixtures

- ▶ **DISTILLATION:** Based on the different boiling points of a mixture's constituents. When heated, they boil off and condense at different temperatures.
- ▶ **CHROMATOGRAPHY:** Separates a mixture into its various constituents using porous paper and a solvent. The differences in the rates with which the constituents travel along the paper lead to their separation.

# Element vs Compound

- ▶ **ELEMENT:** Pure substance that contains only one type of atom. Impossible to separate using chemical separation techniques.
- ▶ **COMPOUND:** Pure substance that contains at least two types of atoms. Can be separated using chemical separation techniques.

# Characteristic properties

- ▶ **CHARACTERISTIC PROPERTIES:** Help us identify a pure substance or a group of to which the pure substance belongs
- ▶ **PHYSICAL CHARACTERISTIC PROPERTIES:**  
Melting point, boiling point, density and solubility
- ▶ **CHEMICAL CHARACTERISTIC PROPERTIES**  
Reaction to litmus paper, reaction to cobalt chloride paper, reaction to limewater, reaction of a glowing wood splint, reaction to a burning wood splint and reaction to an open flame