

ALMUSTAQBAL UNIVERSITY COLLEGE

Biomedical Engineering Department

Stage : Second year students

Subject : General chemistry - Lecture 1

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General Chemistry - Introduction

Chemistry

Chemistry is the study of matter, its chemical and physical properties, the chemical and physical changes it undergoes, and the energy changes that accompany those processes.

Major Areas of Chemistry

Chemistry is a broad area of study that includes:

1. ORGANIC CHEMISTRY

Involves the study of the structure, properties, and preparation of chemical compounds of diverse substances such as plastics, drugs, solvents, industrial chemicals that **consist primarily of carbon and hydrogen.**

Organic chemistry overlaps with many areas including:

a. Medicinal chemistry—the design, development, and synthesis of medicinal drugs.

b. Organometallic chemistry — the study of chemical compounds containing bonds between Carbon and a Metal.

c. Polymer chemistry — the study of the chemistry of Macromolecules.

2. INORGANIC CHEMISTRY

Is the study of the properties and behavior of inorganic compounds. It covers all chemical compounds except organic compounds. It study things such as crystal structures, minerals, metals, catalysts, and most elements in the Periodic Table.

Branches of inorganic chemistry include:

- a. **Bioinorganic chemistry** — the study of the interaction of metal ions with living tissue, mainly through their direct effect on enzyme activity.
- b. **Geochemistry** — the study of the chemical composition and changes in rocks, minerals, and atmosphere of the earth.
- c. **Nuclear chemistry** — the study of radioactive substances.

3. ANALYTICAL CHEMISTRY

Involves the Qualitative and Quantitative analysis of matter to determine its composition and the quantity of its components through volumetric, gravimetric or instrumental methods.

Examples of areas using analytical chemistry include:

- a. **Forensic chemistry** — the application of chemical principles, techniques, and methods to the investigation of crime.
- b. **Environmental chemistry** —the study of the chemical and biochemical phenomena that occur in the environment. It relies heavily on analytical chemistry and includes atmospheric, aquatic, and soil chemistry.
- c. **Bioanalytical Chemistry** — the examination of biological materials such as blood, urine, hair, saliva, and sweat to detect the presence of specific drugs.

4. PHYSICAL CHEMISTRY

Deals with the study of the effect of chemical structure on the physical properties of a substance, the rate of a chemical reaction, the interaction of molecules with radiation, and the calculation of structures and properties.

Sub-branches of physical chemistry are:

- a. **Photochemistry** — the study of the chemical changes caused by light.

b. Surface chemistry — the study of chemical reactions at surfaces of substances. like adsorption, heterogeneous catalysis, corrosion, electrode processes, and chromatography.

c. Chemical kinetics — the study of the rates of chemical reactions, the factors affecting those rates, and the mechanism by which the reactions proceed.

d. Quantum chemistry — the mathematical description and interaction of subatomic particles and their relationship to chemical processes.

e. Spectroscopy — the use of the absorption, emission, or scattering of electromagnetic radiation by matters.

5. BIOCHEMISTRY

Is related to the study of chemical reactions that take place in living things (animals, plants and microorganisms). It tries to explain them in chemical terms. Biochemical research includes cancer and stem cell biology, infectious disease, cell membrane and structural biology.

It spans molecular biology, genetics, pharmacology, clinical biochemistry, and agricultural biochemistry.

a. Molecular biology — the study of the interactions between the various systems of the cell, such as the different types of DNA, RNA, and protein biosynthesis.

b. Genetics — the study of genes, heredity, and variation in living organisms.

c. Pharmacology — the study of mechanisms of drug action and the influence of drugs on an organism.

d. Toxicology — a sub-branch of pharmacology that studies the effects of poisons on living organisms.

d. Clinical biochemistry — the study of the changes that disease causes in the chemical composition and biochemical processes of the body.

f. Agricultural biochemistry — the study of the chemistry that occurs in plants.

Thus, although there are FIVE main branches of chemistry, there are many sub-branches. There is a huge overlap between Chemistry and Engineering, Biology, Medicine, Physics, Geology, and many other disciplines.

Chemistry really is a CENTRAL SCIENCE.