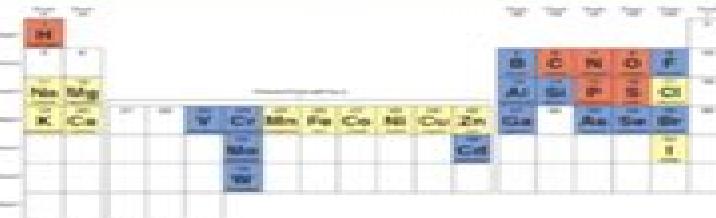


BIOCHEMISTRY LECTURE: MODULE 1

UNIT 1: CHEMICAL COMPOSITION OF LIVING ORGANISMS AND THEIR CHARACTERISTICS



Elements in red are present in bulk form in living cells and are essential for life. Elements in yellow are trace elements that are very likely essential. Elements in blue are present in some organisms and may be essential.

Macromolecule- first coined in the 1920s by Nobel Laureate Hermann Staudinger who was first to propose that many large biological molecules are built by covalently linking smaller biological molecules together.

ATTRIBUTES OF BIOMOLECULES

Biomolecules are either **BIOMACROMOLECULES** (proteins, nucleic acids) or **LOW MOLECULAR WEIGHT MOLECULES**

- All biomolecules are produced in living cells under mild chemical conditions of temperature, pressure and pH
- Biomacromolecules are built up from simple building block molecules by covalent bond forms usually with the elimination of water
- Biomolecules are continuously synthesized and degraded in cells in a highly regulated manner
- Many biomolecules are sensitive to extremes of temperatures and pH

INTRAMOLECULAR AND INTERMOLECULAR FORCES OF ATTRACTION

Intramolecular Forces	Intramolecular Forces
Electrostatic Interaction- dependent on the charges of atoms	Covalent Bond- strongest intramolecular force, sharing of electron
Hydrogen Bonding- most common; weaker attraction	Ionic Bond- transfer of electron
Van der Waals- dependent on the distribution of electric charges	Metallic Bond- exhibits high electricity

FUNCTIONAL GROUPS

Functional Group- particular atom/bond in a particular bonding arrangement

1. Hydroxyl Group (OH-)

- Can form hydrogen bonds. Due to the presence of OH-, alcohols can form hydrogen bond, which leads to higher boiling points compared to their parent alkanes.
- Polar in nature. This is attributed to the difference in electronegativity between the carbon and the oxygen atoms.
- Protonation & Deprotonation. Alcohols cannot leave the molecule on their own; they often become protonated to water or deprotonated in the presence of a strong base.

2. Ether (R-O-R)

- Low boiling point. This is due to their inability to form hydrogen bonds with each other.
- Slightly Polar. Due to the electronegativity difference between the oxygen and carbon atoms.
- Low Reactivity. Two lone pairs of electrons on the oxygen make it slightly reactive.
- Lewis Base. Subject to reacting with strong acids.

3. Ketones and Aldehydes (RC=OR and RCO=OH)

- Carbonyl Group. Ketones contain the carbonyl inside the compound and aldehydes contain the carbonyl at the end of the organic compound.
- Tautomerism, Keto-enol tautomerism is an equilibrium between an aldehyde or ketone and a structural isomer, called the enol form. The interconversion of the two forms involves the movement of a proton and the shifting of bonding electrons. This equilibrium affords the compounds more reactivity.

Keto-Enol Tautomerism



Molecules In Living Systems A Biochemistry Module

Teachers Guide

**Leslie W. Trowbridge, Rodger W.
Bybee, Janet Carlson-Powell**

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In an electronic digital era where connections and knowledge reign supreme, the enchanting power of language has been more apparent than ever. Its capability to stir emotions, provoke thought, and instigate transformation is actually remarkable. This extraordinary book, aptly titled "**Molecules In Living Systems A Biochemistry Module Teachers Guide**," compiled by a highly acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound affect on our existence. Throughout this critique, we shall delve into the book's central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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