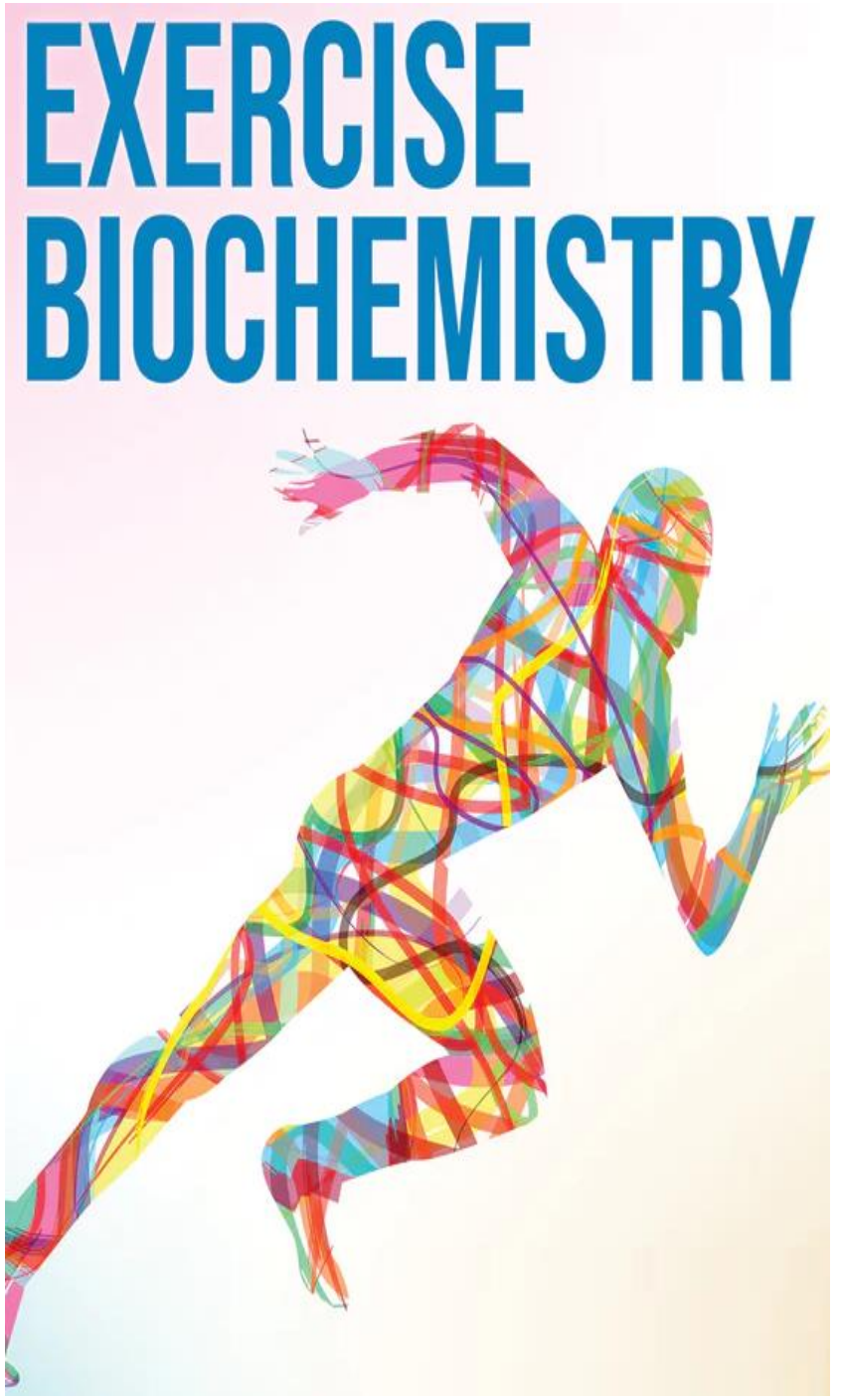
Tishk International University

TISHK INTERNATIONAL UNIVERSITY
FACULTY OF APPLIED SCIENCE
Physiotherapy Department

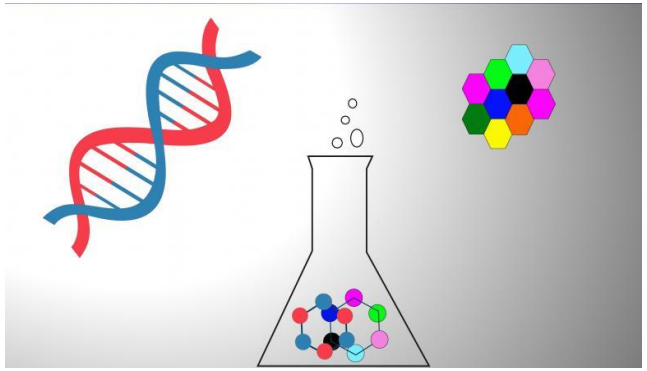
Introduction:

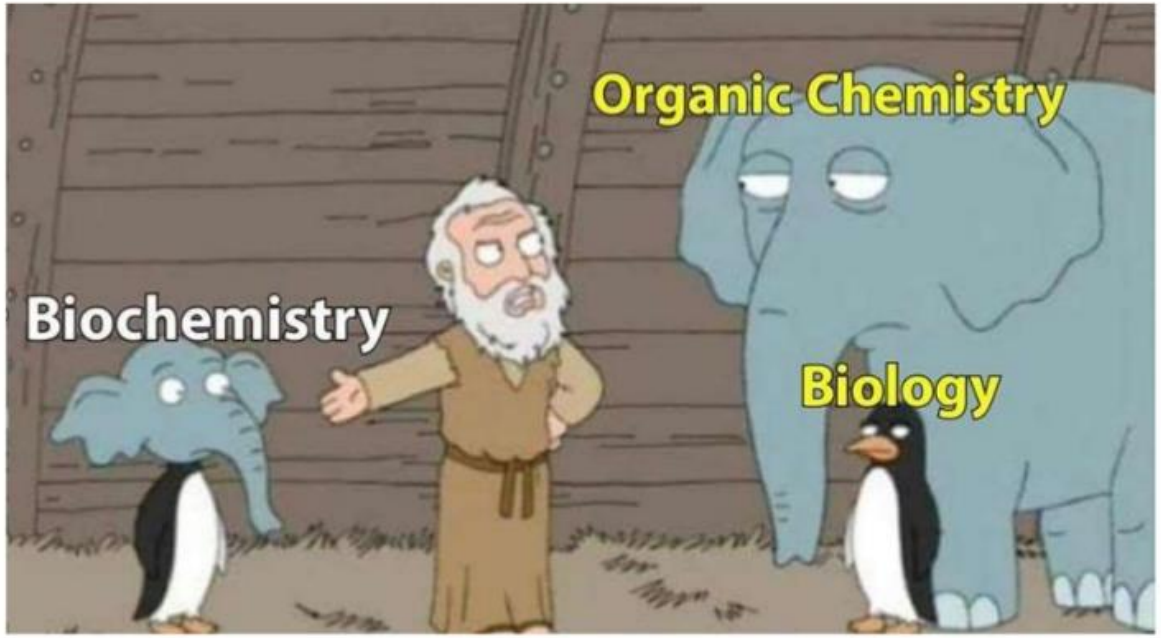
Autumn Semester 2023-2024
Course Name : **Biochemistry (Theory)**
Stage : 2 Lecture 1: Introduction
Lecture: Dr. Soma Majedi / Ph.D. in Organic Chemistry



Biochemistry

- A **special branch** of **Organic Chemistry** that deals with matter inside the living cell and chemical processes within and relating to living organisms.

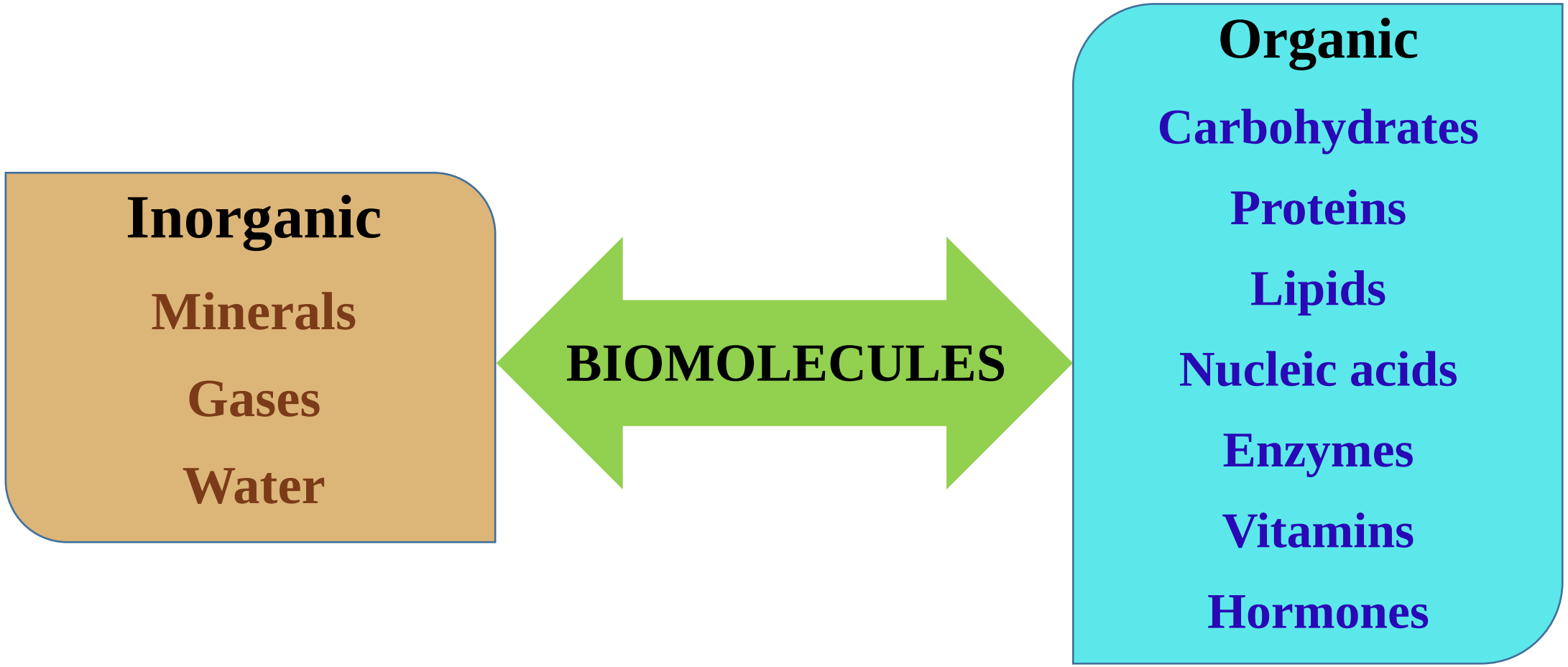




- Application of chemistry to the study of **biological processes** at the cellular and molecular level.
- Combined Chemistry, Physiology, and Biology to investigate the chemistry of living systems.

Biomolecules:

- also called as **biological molecules**.
- produced by **cells** and **living organisms**.
- present in **living organisms** that are essential to one or more typically biological processes.

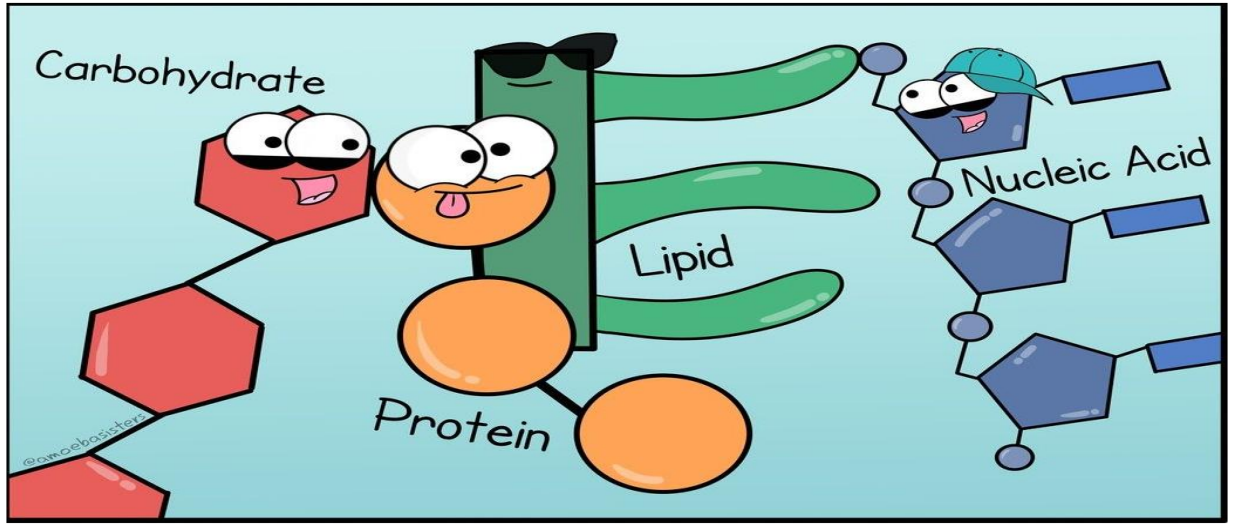


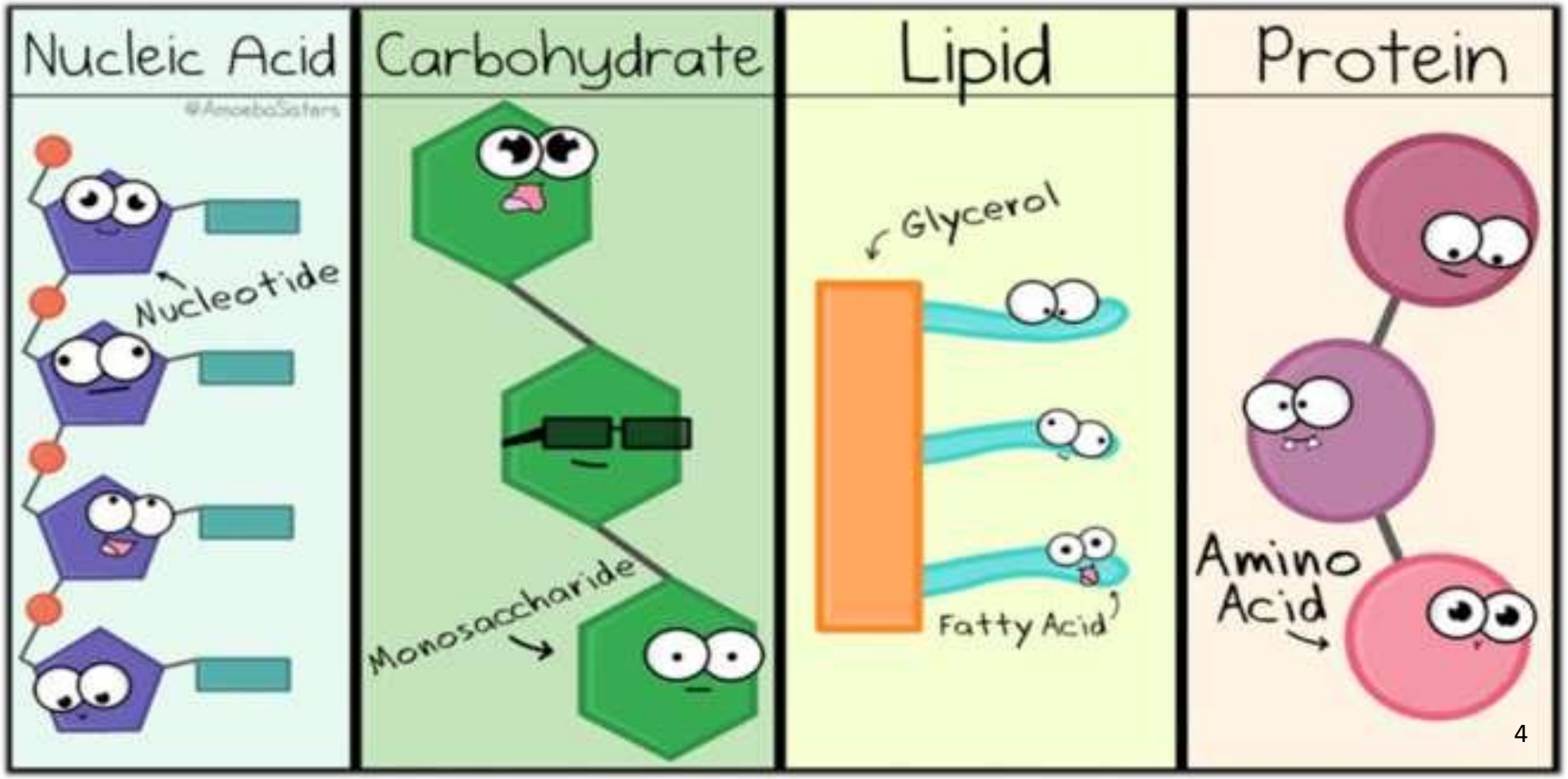
Four Major Types of Organic Biomolecules:

- Carbohydrates
- Proteins
- Lipids
- Nucleic Acid

Other Compounds such as:

- ✓ Water
- ✓ Vitamins
- ✓ Ions
- ✓ Enzymes
- ✓ Hormons





Biomolecules → Organelles → Cells → Tissues → Organs → Living organism

The major complex biomolecules of cells

Biomolecule	Building block	Major functions
Polysaccharide	Monosaccharide	Storage form of energy
Protein	Amino acid	Basic structure and function of cell
Lipids	Fatty acids & glycerol	Storage form of energy to meet long term demands
DNA	Deoxyribonucleotide	Hereditary information
RNA	Ribonucleotide	Protein synthesis

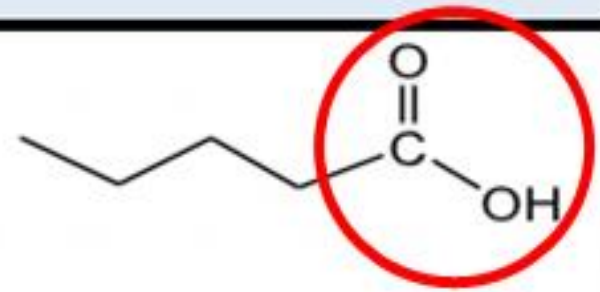
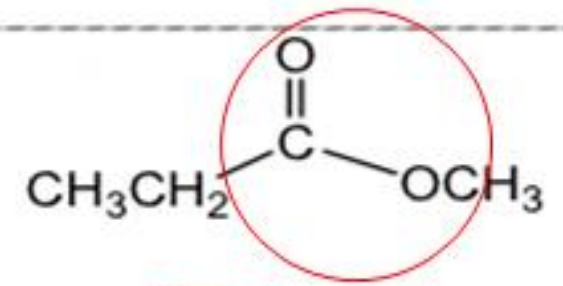
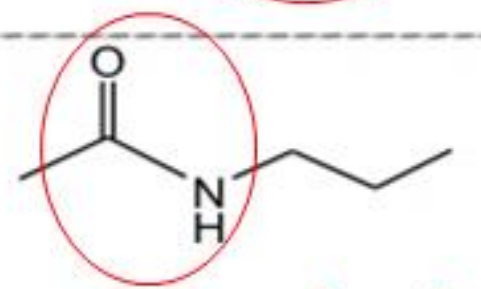
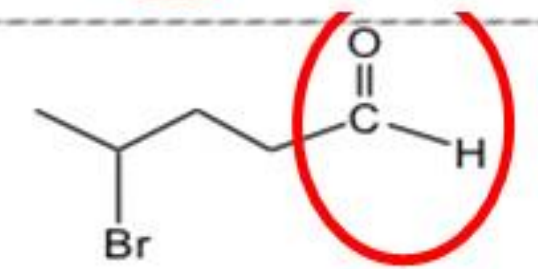


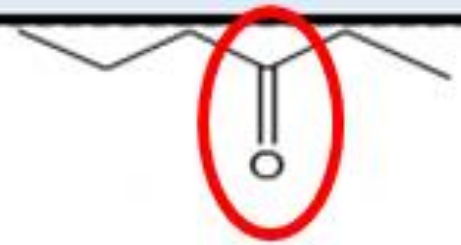
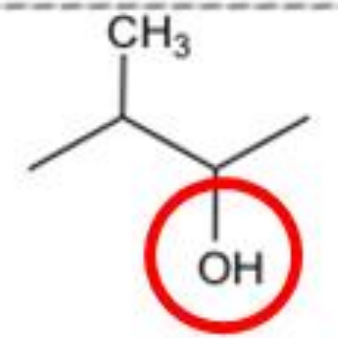
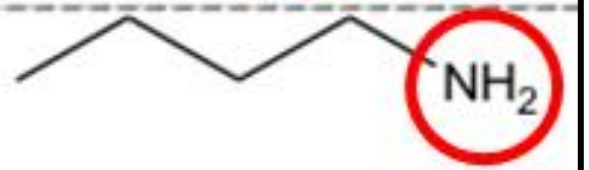
Organic Chemistry:

Functional Groups

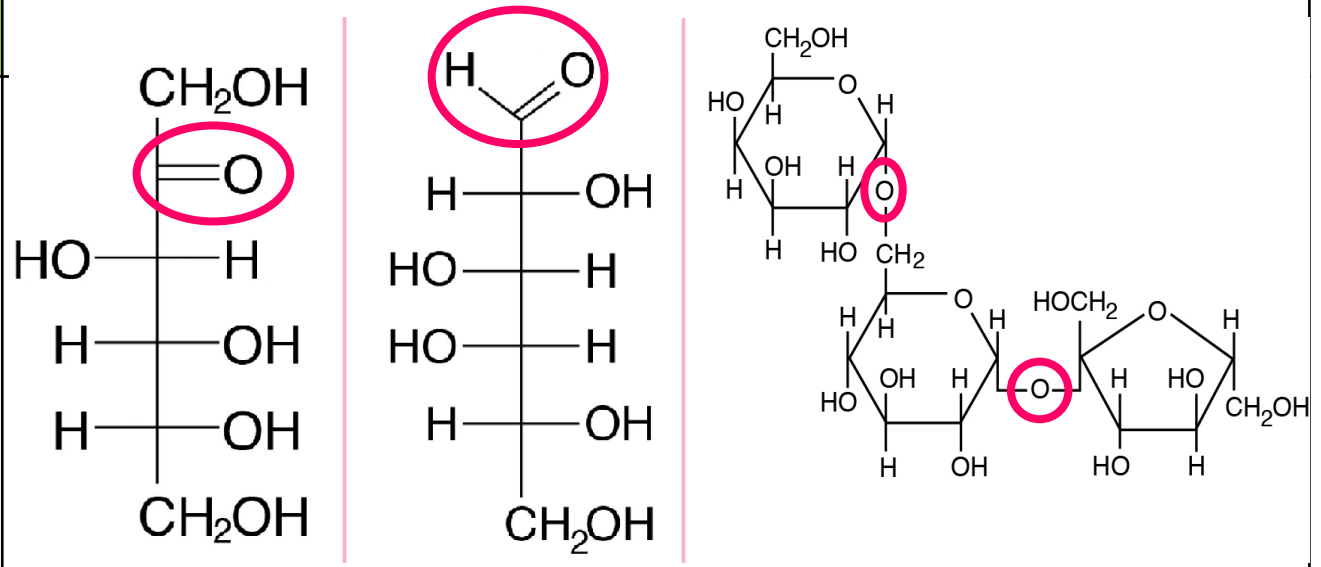
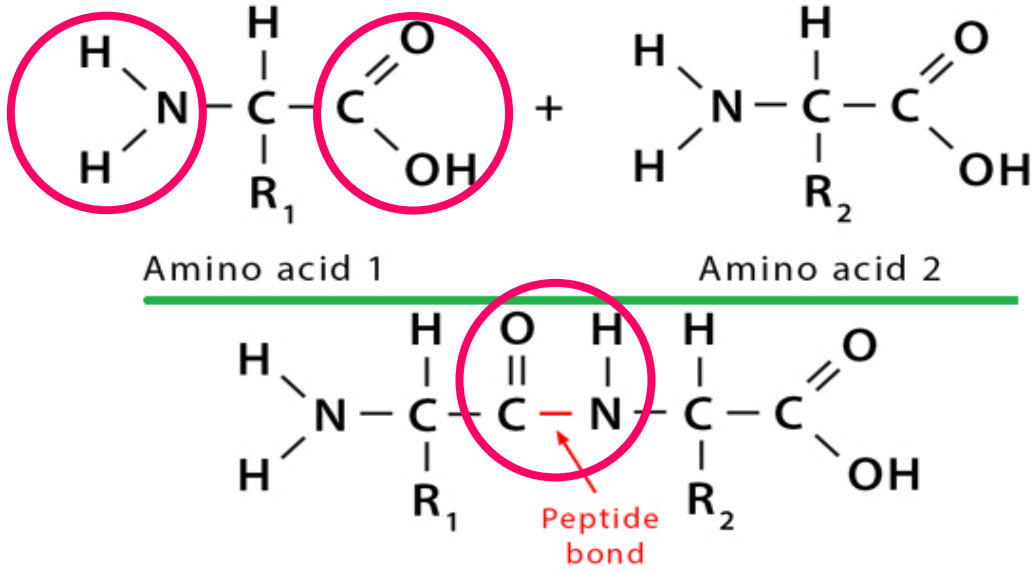

Functional Group:

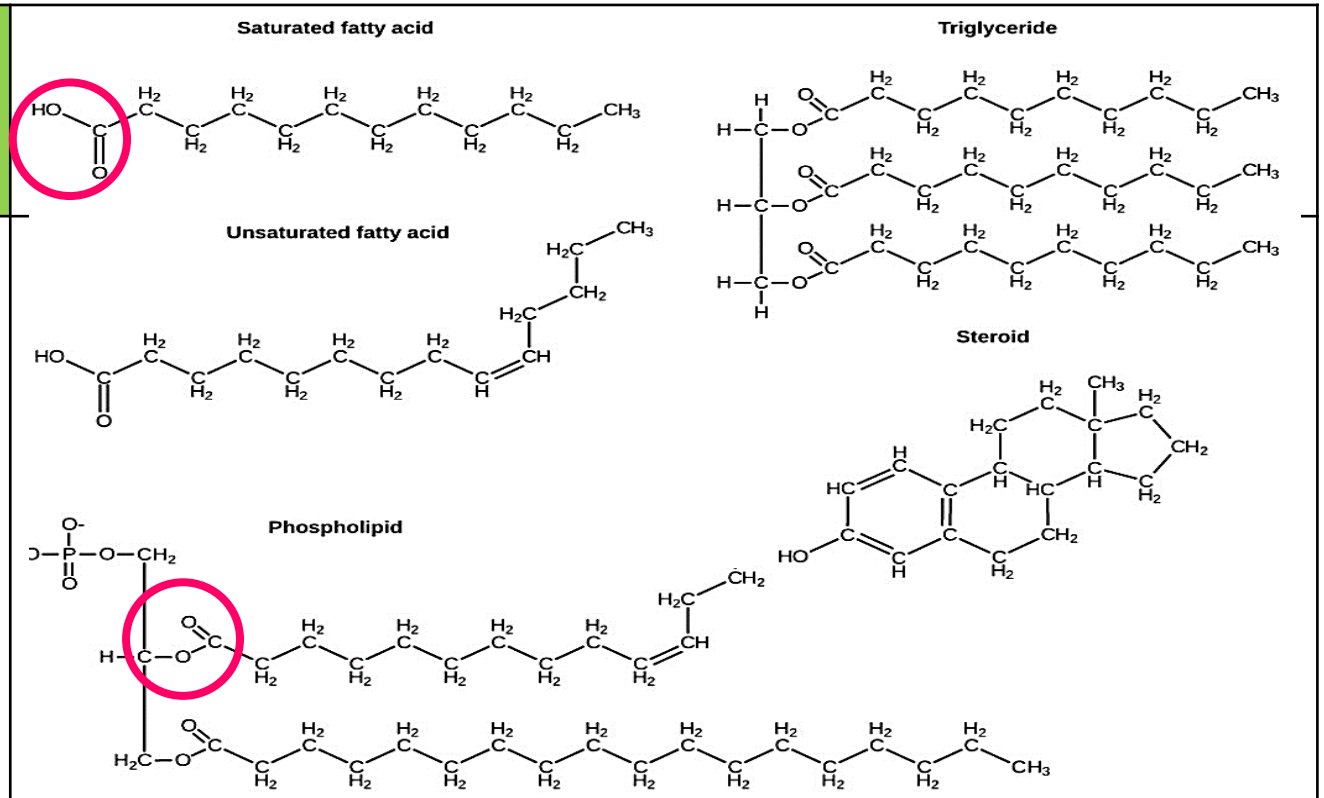
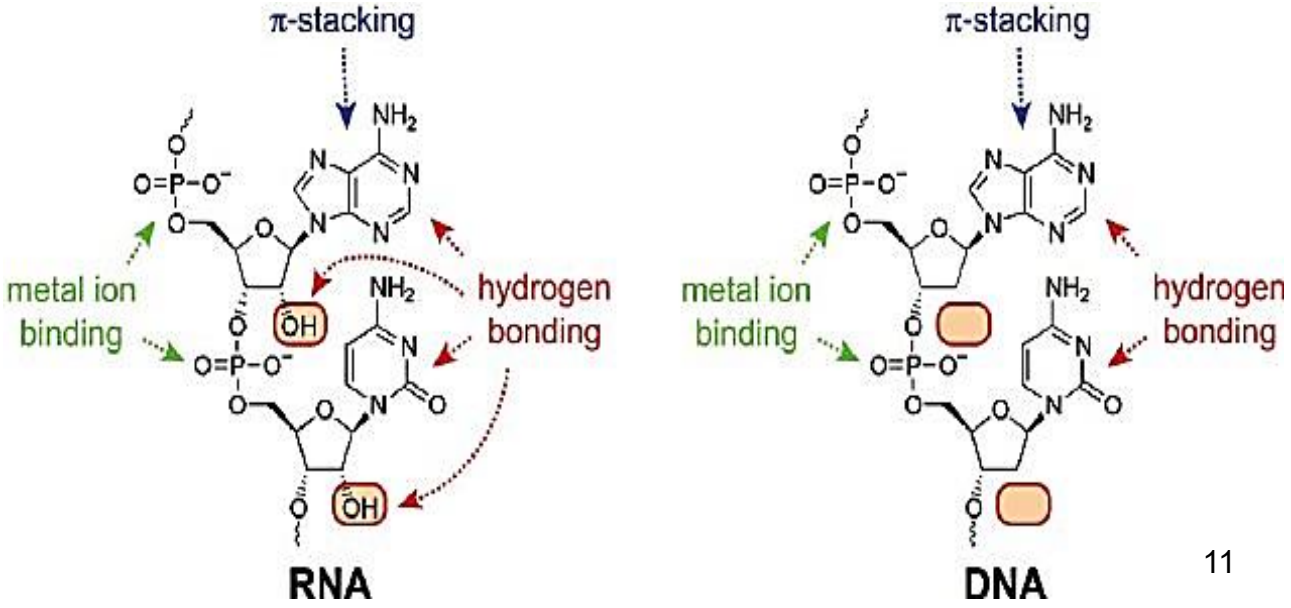
A group of atoms *responsible* for the *characteristic reactions* of a particular compound.

Functional group	Suffix	Examples	Name of Example
carboxylic acid	–oic acid –carboxylic acid		pentanoic acid
carboxylic ester	–oate –carboxylate		methyl propanoate
amide	–amide –carboxamide		N-propylethanamide
aldehyde	–al –carbaldehyde		4-bromo-pentanal

Functional group	Prefix	Suffix	Examples
ketone	oxo	–one	
alcohol	hydroxy	–ol	
amine	amino	–amine	
ether	oxy	ether	R–O–R

Functional Groups of Organic Compounds In Bioorganic Compounds

Functional Group (F.G.)	Biomolecules	
-OH -O- -COH, -CO-	Carbohydrates	
-NH2 -COOH -CONH-	Proteins	

Functional Group (F.G.)	Biomolecules	
-COOH -COO-	Lipids	
-OH -O- -NH2, -NH-, -N- -CO-N- -PO-O-	Nucleic Acids (RNA, DNA)	

Importance of Biochemistry:

- Understanding all **biological processes**.
- Explanations for the **causes** of many **diseases** in humans, animals, and plants.
- Suggest ways to **treat** or **cure** the diseases.
- Unravel the **complex chemical reactions** that occur in a wide variety of life forms.
- Provides practical advances in **Medicine**, **Veterinary**, **Agriculture**, **Biotechnology**, **Molecular Genetics**, **Pharmacology** and **Bioengineering**.

The Importance of Biochemistry in Physiotherapy

Chemistry plays an important role in **physiotherapy** as it helps to understand the underlying **physiological processes** and **chemical reactions** involved in the human body.

Physiotherapists use this knowledge to **diagnose**, **treat** and **prevent physical impairments** and **disabilities**.

Some of the ways in which chemistry is used in physiotherapy:

- **Understanding anatomy and physiology:**

Physiotherapists use their knowledge of chemistry to understand the **structure** and **function** of the human body, including the chemical and physical processes that occur in cells and tissues.

- **Diagnosing and treating conditions:**

Physiotherapists use their knowledge of chemistry to **diagnose** conditions based on chemical imbalances and to **treat** these conditions by influencing chemical reactions.

The Importance of Biochemistry in Physiotherapy

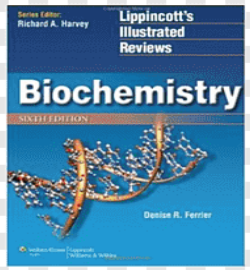
➢ Medication management:

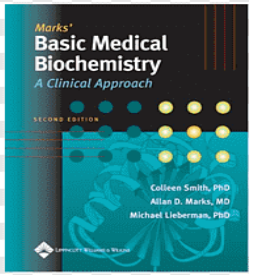
Physiotherapists work with patients who are taking medications, and they use their knowledge of chemistry to understand the **mechanisms of action**, **side effects**, and **interactions** of **different medications**.

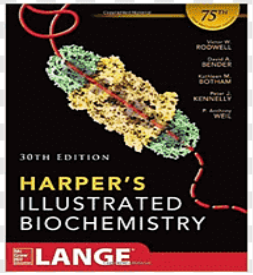
➢ Pain management:

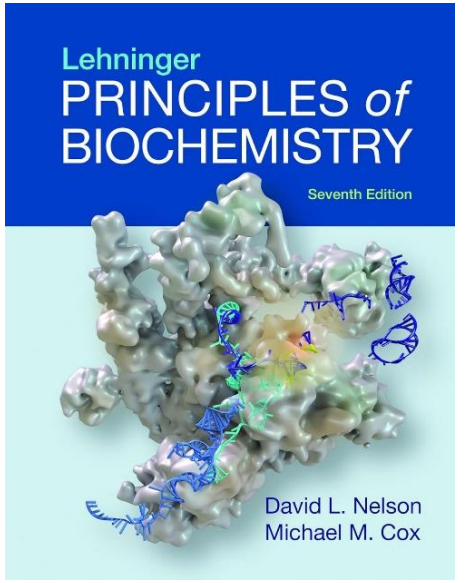
Physiotherapists use their knowledge of chemistry to **understand** the underlying causes of pain and to **design** treatments that target these causes, including the use of **heat** and **cold** therapies, **electrical** stimulation, and massage.

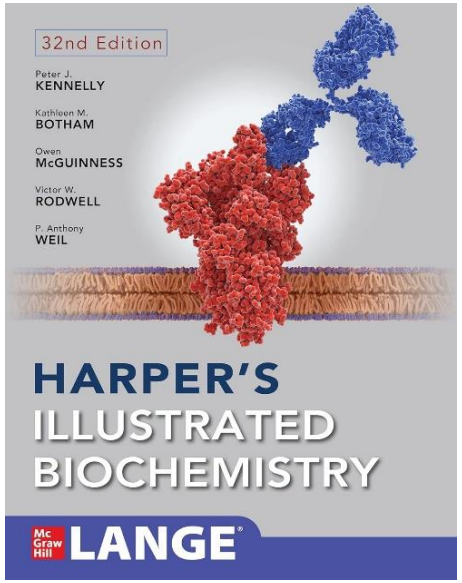
In conclusion, it is important for physiotherapists to have a basic understanding of chemistry as it helps them to **diagnose** and **treat** conditions effectively and to work in **collaboration** with other healthcare professionals.











References

- Lehninger Principles of Biochemistry
- Harper's Illustrated Biochemistry