

# CHY 2026: General Biochemistry

## Unit 1: Introduction

# FYI

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# Biochemistry

- Biochemistry is the science concerned with the chemical nature or chemical behaviour of living matter

- Metabolic reactions

E.g. digestion, excretion, respiration etc.

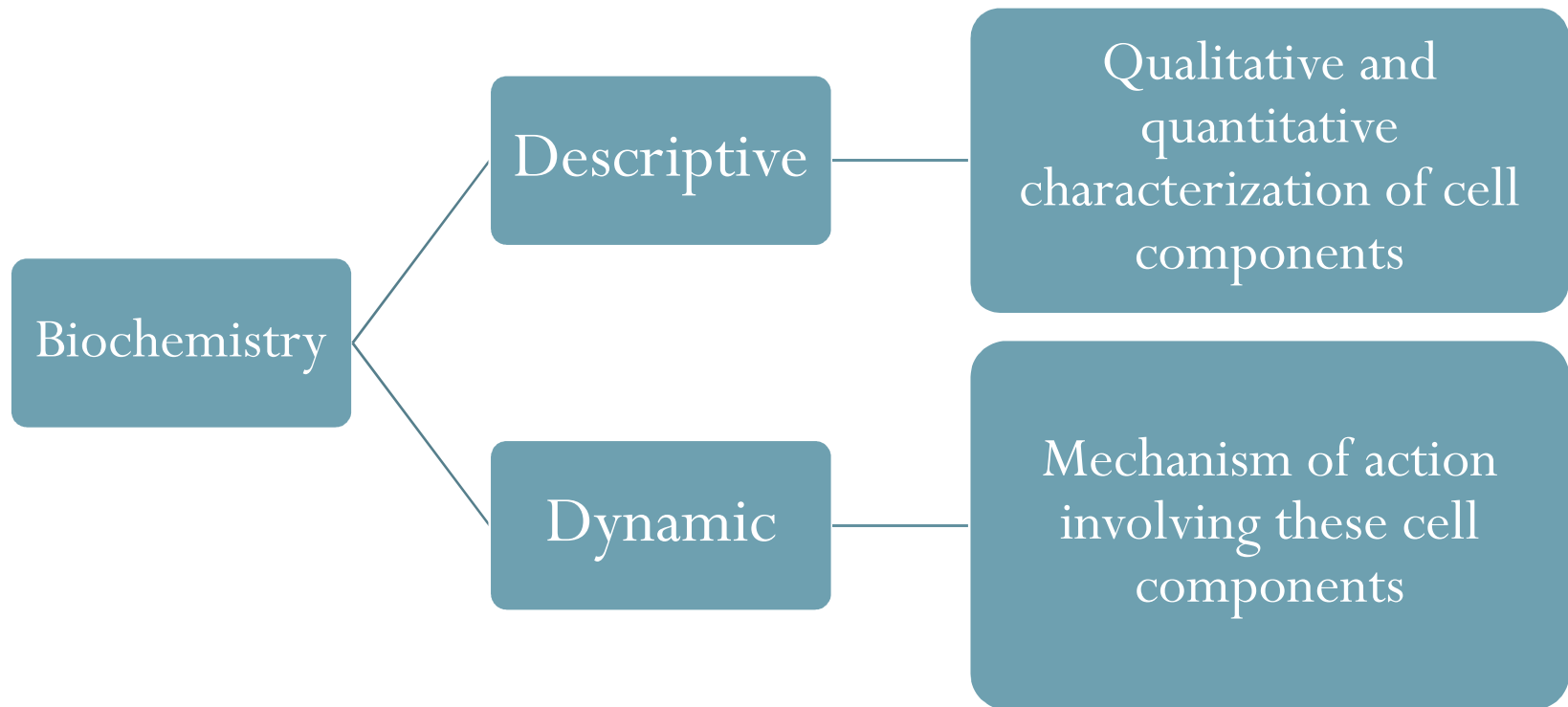
- Analysis of biomolecules

- Characterization of cell components

Biological phenomena are analyzed in terms of Chemistry

- The Term was first introduced by Carl Neuberg (German Chemist) in 1903...early writing date back to 1500s

# Branches of Biochemistry



# Newer Disciplines

- Enzymology
- Endocrinology
- Clinical Biochemistry
- Molecular Biology
- Biotechnology
- Pharmacological Biochemistry
- Nutrition
- Fermentation Technology
- Etc.

# Importance of Biochemistry

1. Understanding the cause of diseases
2. Composition of living cells and molecules present
3. Location of biomolecules in the cell and structure of the cells
4. Function of biomolecules and relationship between structure and function
5. Source of biochemicals in cells

Nutrients

Cellular biosynthesis

# Importance of Biochemistry

6. Relationship between function of biomolecules, biosynthesis and biodegradation of cells
7. Maintaining the concentration of cellular molecules in pathways and metabolic reactions

# Overview of Chemical Composition of the Body

- ❖ Carbon compounds are very versatile and can polymerize into large complex structures called macromolecules
- ❖ **Macromolecules** are usually in the form of polymers
- ❖ **Polymers** – joining together of smaller organic molecules (**monomers**) via **condensation** (removal of water molecule)
- ❖ Macromolecules have properties that are different from their constituent monomers
- ❖ E.g. Glucose (carbohydrate monomer) is more soluble and sweeter than starch (carbohydrate polymer)



# Biological Macromolecules

❖ The four major organic macromolecules are

- Carbohydrates
- Proteins
- Lipids
- Nucleic Acids

Macromolecules	Monomers
Carbohydrates	monosaccharides
Proteins	amino acids
Lipids	fatty acids and glycerols
Nucleic acids	nucleotides

# Carbohydrates

- ❖ Referred to as sugars (**saccharides**)
- ❖ The molecule is comprised of carbon (C), hydrogen (H) and oxygen (O)
- ❖ They occur as **starch** (provides energy) and **cellulose** (mechanical strength) in plants and, **starch** and **glycogen** (stored form of energy in liver and muscles) in animals

# Carbohydrates

- ❖ Plants (30%) contain a significantly higher percentage of carbohydrate than animals (1%)
- ❖ They are an important source of energy
  - Brain can only use glucose for energy
- ❖ They are a source of C for metabolic reactions
- ❖ They form part of the structural framework for RNA and DNA causing flexibility of the rings and allowing for storage and expression of these genetic molecules
- ❖ They help in maintaining the structure of cell wall of bacteria and plants

# Carbohydrates

- ❖ They are linked to proteins (**glycoprotein**) and lipids (**glycolipid**) which helps in cell to cell recognition, e.g. The sperm cell is able to search find and bind to an egg for fertilization to take place
- ❖ Fibres – Increase bowel movement

# Proteins

- ❖ They are the most abundant intracellular macromolecule – most of the protein mass is found in the skeletal muscle
- ❖ The molecule is comprised of the elements carbon (C), hydrogen (H), oxygen (O), nitrogen (N) and small quantities of sulphur (S) – **CHONs**
- ❖ Proteins found in animal contains 0.5 -2.0% sulphur except for insulin which contains 3.4%
- ❖ They are biological catalysts – **enzymes**
- ❖ They act as carrier molecules transporting small molecules and ions e.g. haemoglobin (protein) transports oxygen in the erythrocytes

# Proteins

- ❖ They are responsible for the high tensile strength of the skin and bone
- ❖ They are responsible for immunoregulation
- ❖ Receptor proteins help in the transmission of nerve impulses
- ❖ They are a major component of muscle

# Lipids

- ❖ They are a heterogeneous group of compounds which includes fats, oils and waxes
- ❖ They have high energy value and are an important constituent of the diet
- ❖ The molecule is comprised of the elements carbon (C), hydrogen (H), and oxygen (O)
- ❖ They are insoluble in water and are thus **hydrophobic**
- ❖ They act as energy stores
- ❖ They are stored under the skin and help to keep the body warm



# Lipids

- ❖ They are the structural components of cells forming membranes
- ❖ They are used as hormones which are important in the regulation of metabolic processes

# Nucleic Acids

- ❖ They are found in the nucleus and cytoplasm of the cell
- ❖ They are made up of the elements, carbon (C), hydrogen (H), oxygen (O), nitrogen (N) and phosphorus (P)
- ❖ There exists two kinds
  - Ribonucleic acid (RNA)
  - Deoxyribonucleic acid (DNA)
- ❖ They are found in animals, plants and viruses. However unlike plants and animals, viruses have either DNA or RNA

# Nucleic Acids

❖ Nucleic acids are important

They contain genetic information

They transfer genetic information

They are implicated in protein synthesis

They form co-enzymes needed for metabolic reactions