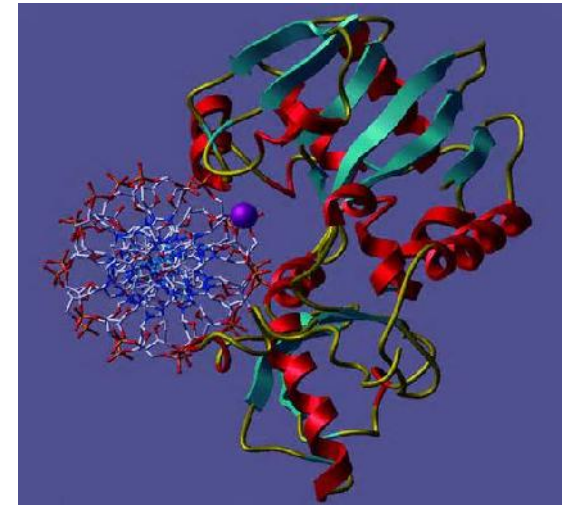


Biochem-700

3(3-0)

INTRODUCTION TO BIOCHEMISTRY



Assessment	Marks	Sessional	Mid	Final	Total
	Criteria Theory	Assignments	Paper	Paper	
		6 (10%)	18	36	60 (100%)
	Result		Total: 60 Marks		

CONTENTS

- Introduction: Scope and importance of biochemistry in life sciences.
- Brief introduction of prokaryotic and eukaryotic cells. General Phenomena: Law of mass action, dissociation of water and pH value, buffers, transport mechanisms across bio-membranes and osmosis.
- Enzymes: Nature and functions, Characteristics; mode of action, factors affecting enzyme activity, specificity and inhibition, isozymes, ribozymes, coenzymes and prosthetic groups, Classification and nomenclature of enzymes.
- Carbohydrates: Introduction to carbohydrates. Metabolism of carbohydrates; glycolysis, citric acid cycle and its amphibolic role. Photosynthesis; Light and dark reactions, Photorespiration and C₄ plants.

Proteins: Classification of proteins, biochemical functions, amino acids; structure, classification and acid base behavior of amino acids, peptide linkage and polypeptides. Primary, secondary, tertiary and quaternary structures of proteins. Hydrolysis of protein and reactions of amino acids. Nitrogen excretion, urea cycle and its regulation.

Lipids: Occurrence and functions. Classification of lipids; Triacylglycerol, waxes, phospholipids, sphingolipids and sterols. Structures, characteristics and classification of fatty acids and triglycerides. Metabolism of fats. β -oxidation of fatty acids and its energy yield.

Nucleic acids: Biosynthesis and degradation of Purines and pyrimidines. Central dogma of molecular biology; replication, transcription and translation. Introduction to genetic engineering.

SUGGESTED READINGS

- Ahmad, M. 2006. Essentials of Medical Biochemistry. Vol. I. Merit Publishers, Lahore.
- Champe, P.C., R.A. Harvey and D.R. Ferrier. 2008. Biochemistry: Lippincott's Illustrated Reviews. 4th ed. Lippincott Williams and Wilkins. U.S.A.
- Nelson, D.L and M.M. Cox. 2008. Lehninger Principles of Biochemistry. 5th ed. Worth Publishers, NY.
- Voet, D. J.G. Voet and C. W. Pratt. 2006. Fundamentals of Biochemistry. 2nd ed. John Wiley and Sons. Inc. NY.



INTRODUCTION

- Biochemistry can be defined as the science concerned with the chemical basis of life (Gk bios "life")
- Cell is the structural unit of living systems
- Thus, biochemistry can also be described as the science concerned with the chemical constituents of living cells and with the reactions and processes they undergo

- By this definition, biochemistry encompasses large areas of cell biology, molecular biology, molecular genetics
- SCOPE -wherever there is life, there is biochemistry
- **Aim of Biochemistry Is to Describe & Explain, in Molecular Terms, All Chemical Processes of Living Cells**

Major objective of biochemistry

- Complete understanding, at the molecular level, of all of the chemical processes associated with living cells
- To achieve this objective, biochemists have sought to isolate the numerous molecules found in cells, determine their structures, and analyze how they function

- **FOUR MAJOR** Biomolecules
Carbohydrates, proteins (enzymes), lipids,
nucleic acids
- **FOUR MAJOR** elements
C, H, O, N

BIO + CHEMISTRY

CHEMICAL LOGIC OF LIFE

- These relationships are not surprising
- LIFE depends on biochemical reactions and processes
- Old barriers among the life sciences are breaking down, & biochemistry is increasingly becoming their common language

- Interplay among chemical components of a living organism is **dynamic**
- Changes in 1 component cause coordinating or compensating changes in another, with the whole ensemble displaying a character beyond that of its individual parts

- All elements obey laws of physics & chemistry
- BUT when present in biomolecules; give extraordinary attribute called LIFE
- The collection of molecules carries out a program, the end result of which is reproduction of the program and self-perpetuation of that collection of molecules—in short, life.

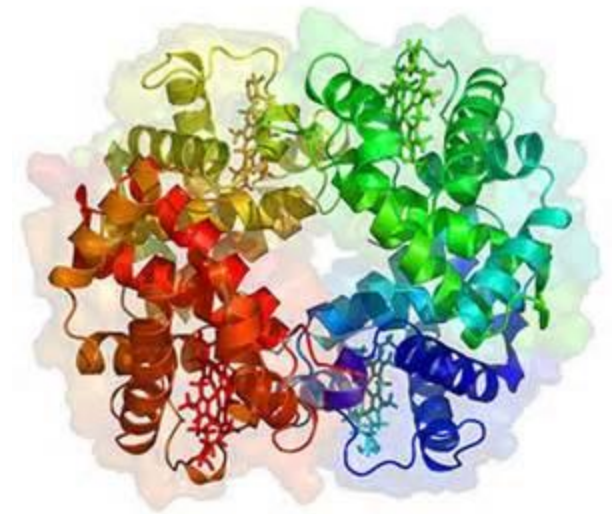
Biochemistry describes in molecular terms the structures, mechanisms, and chemical processes shared by all organisms and provides organizing principles that underlie life in all its diverse forms, principles we refer to collectively as

The MOLECULAR LOGIC OF LIFE

Although biochemistry provides important insights and practical applications in medicine, agriculture, nutrition, and industry, its ultimate concern is with the **wonder of life itself**

NORMAL BIOCHEMICAL PROCESSES ARE THE BASIS OF HEALTH

- WHO defines health as a state of "complete physical, mental and social well-being"



Biochemical viewpoint

health may be considered that situation in which all of the many thousands of intra- and extracellular reactions that occur in the body are proceeding at rates commensurate with the organism's maximal survival in the physiologic state

Most & Perhaps All Disease Has a Biochemical Basis

Most if not all diseases are
manifestations of abnormalities of
molecules, chemical reactions, or
biochemical processes

A Knowledge of Biochemistry Is Essential to All Life Sciences

- Biochemistry of the nucleic acids - lies at the heart of genetics
- Use of genetic approaches has been critical for elucidating many areas of biochemistry
- Physiology, the study of body function, overlaps with biochemistry almost completely

- **Immunology** employs numerous biochemical techniques and many immunologic approaches have found wide use by biochemists
- **Pharmacology/pharmacy** rest on a sound knowledge of biochemistry
- **Physiology**; in particular, most drugs are metabolized by enzyme-catalyzed reactions

- Poisons act on biochemical reactions or processes; this is the subject matter of **toxicology**
- Biochemical approaches are being used increasingly to study basic aspects of **pathology** (the study of disease), such as inflammation, cell injury, and cancer
- Many workers in **microbiology, zoology, and botany** employ biochemical approaches almost exclusively

Biochemical Research Has Impact on Nutrition & Preventive Medicine

- Major prerequisite for the maintenance of health is optimal dietary intake of a number of chemicals
vitamins, amino acids, fatty acids, minerals, water

Because much of the subject matter of both biochemistry and nutrition is concerned with the study of various aspects of these chemicals, there is a close relationship between these two sciences.



References:

1. Murray, R.K., D.K. Granner, P.A. Mayes and V.W. Rodwell. 2009. Harper's Illustrated Biochemistry. 28th Ed. Appleton and Lange Inc.
2. Nelson, D.L and M.M. Cox. 2013. Lehninger Principles of Biochemistry. 6th ed. Worth Publishers, NY.