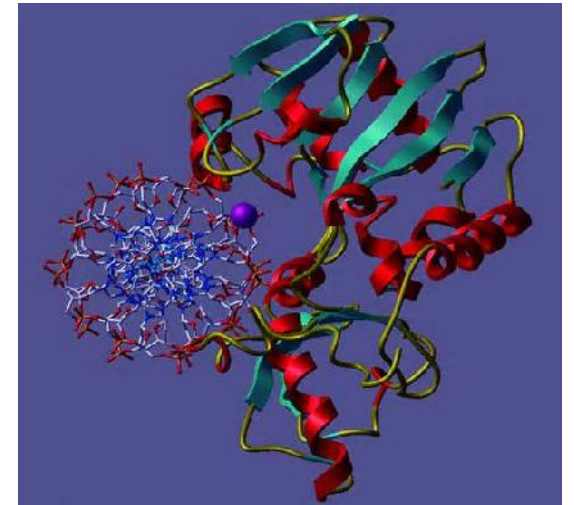


# Biochem-700

3(3-0)

## CONCEPTS OF BIOCHEMISTRY



|                   |                        |                    |                        |              |              |
|-------------------|------------------------|--------------------|------------------------|--------------|--------------|
| <b>Assessment</b> | <b>Marks</b>           | <b>Sessional</b>   | <b>Mid</b>             | <b>Final</b> | <b>Total</b> |
|                   | <b>Criteria Theory</b> | <b>Assignments</b> | <b>Paper</b>           | <b>Paper</b> |              |
|                   |                        | 6 (10%)            | 18                     | 36           | 60<br>(100%) |
|                   | <b>Result</b>          |                    | <b>Total: 60 Marks</b> |              |              |

## **Theory**

An introduction to Biochemistry and its applications in applied sciences. Introduction to prokaryotic, eukaryotic and archeal cells. Concept of probiotics and prebiotics. Architecture and composition of biomembranes and transportation. Significance and applications of enzymes and co-enzymes. Therapeutic enzymes. Glycobiology, glyco-conjugates and their applications. Tumors and their biomarkers. Programmed cell death. Metabolic roles of vitamins and minerals. Metabolism of macromolecules and their regulation. Electron transport chain, ATP synthesis. Photosynthesis. Photorespiration and C<sub>4</sub> plants. Energetics of photosynthesis and respiration. Secondary metabolites of plants and their role as bioactive compounds. Biosignalling. Structure of nucleic acids. Flow of genetic information. Post transcriptional and post translational modifications. Protein folding and misfolding. Protein targeting. Introduction to gene cloning. Genetic engineering and genetically modified organisms. Introduction to bioinformatics and omics (Genomics, Transcriptomics, Proteomics, Metabolomics). Introduction to nanobiotechnology and its applications.

- **Suggested Readings**

- Chatterjea, M. N. and R. Shinde. 2011. Textbook of Medical Biochemistry. 8<sup>th</sup> ed (Indian edition). Jaypee Brothers, Medical Publishers (P) Ltd, New Delhi, India.
- Champe, P.C., R.A. Harvey and D.R. Ferrier. 2014. Biochemistry: Lippincott's Illustrated Reviews. 6<sup>th</sup> ed. Lippincott Williams and Wilkins. U.S.A.
- Goodwin, T.W. and E.I.Mercer.2003. Introduction to Plant Biochemistry, 2<sup>nd</sup> ed. CBS publishers and distributors. New Delhi. India
- Kaufmann, P.B. and W.Wu, L.J. Creke. 2011. Handbook of Molecular and Cellular Methods in Biology and Medicines, 3<sup>rd</sup> ed., CRC Press.
- Nelson, D.L and M.M. Cox. 2013. Lehninger Principles of Biochemistry. 6<sup>th</sup> ed. Worth Publishers, New York, NY, USA.
- Taiz, L. and E. Zeiger. 2015. Plant Physiology 6<sup>th</sup> ed. Sinauer Associates Inc., USA.
- Voet, D. J.G. Voet and C. W. Pratt. 2011. Fundamentals of Biochemistry. 4<sup>th</sup> ed. John Wiley and Sons. Inc. New York, NY, USA.
- Weaver, R. F. 2012. Molecular Biology. 5<sup>th</sup> ed. McGraw Hill Higher Education.



# 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.

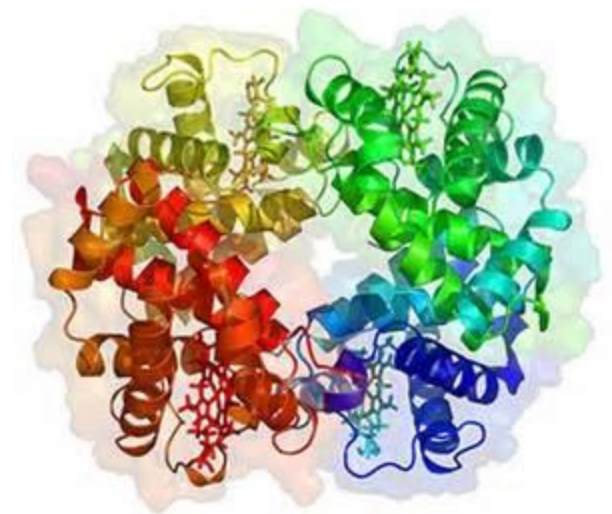
Biochemistry describes in molecular terms the structures, mechanisms, and chemical processes shared by all organisms and provides organizing principles that underlie life in all its diverse forms, principles we refer to collectively as

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



## 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.