

FT205 BIOCHEMISTRY & NUTRITION

Course Description & Objectives:

This course will impart knowledge to the students on the fundamentals of Biochemistry to understand the concepts of Biochemistry.

By the end of the course, the students will be able to understand the structural organization of plant cell, study the chemical properties and metabolism of biomolecule and understand the biochemical reactions occurring in plant cell.

Course Outcomes:

By the end of the course, the students will be able to

- 1. Understand the concepts of Biochemistry*
- 2. Know the structural organization of plant cell*
- 3. Study the chemical properties and metabolism of biomolecules*
- 4. Understand the biochemical reactions occurring in plant cell*

UNIT I - Introduction to Carbohydrate

Introduction - Importance of biochemistry - Scope of biochemistry - Historical aspects of biochemistry and branches of Bio-chemistry. Plant cell - Animal cell - Various organelles in plant cell and animal cell – Their functions. Carbohydrates - Introduction - Definition of carbohydrates, functions, classification of carbohydrates- Monosaccharides, disaccharides, polysaccharides. Reducing sugars - monosaccharides, glucose, fructose, disaccharides - Maltose, Lactose, Non reducing sugars - Sucrose, trehalose, inversion of sucrose. Polysaccharides - starch, Glycogen, Cellulose, Chitin, - Structures, functions, uses.

UNIT II - Protein : classification and function

Carbohydrates physical properties - Isomerism, Structural isomerism, Stereoisomerism, optical isomerism, Enantiomers, Anomers, Mutarotation, Epimers. Chemical properties of carbohydrates - Dehydration, oxidation, reduction, formation of esters, amination, glucoside formation, formation of osazones, cyanohydrin reaction, oximes formation. Amino acids

- occurrence - classification - Protein and non-protein amino acids – essential and non-essential amino acids - classification based on Hydrophobicity of R-side chain groups, based on the structure, based on the polarity, based on the nutritional and metabolic rate. Chemical properties of amino acids- Ninhydrin - peptide bond reaction - decarboxylation - Schiff base formation - Transamination - oxidative and non - oxidative deamination – sangers reagent - Edmans reagent - Dansyl chloride test..

UNIT III - Protein and Enzyme

Structure of proteins - primary, secondary, tertiary and quaternary structure and forces involved in the stabilizing proteins. Classification of proteins - based on solubility, function, properties of proteins - U.V. absorption Denaturation, Renaturations and immune reaction. Purification techniques of proteins – salting in, salting out, Gel filtration, Ion exchange chromatography. Enzymes - characteristics of enzymes, chemical nature, specificity, active site and mechanism of action - Lock and key model, Induced fit model. Measurement of enzymatic activity, factors affecting enzymes activity. Enzymatic inhibitions, Iso enzymes, co-enzymes, haloenzymes, prosthetic group classification and Nomenclature of enzymes.

UNIT IV- Lipids

Lipids - occurrence - Classification, functions and structures of saturated and unsaturated fatty acids, importance of essential fatty acids. Chemical properties of fatty acids Rancidity, saponification, Iodine number, Reichart Meissel number, acid value. Nucleic acids - functions, structure of Nitrogen bases, Nucleosides and Nucleotides- ATP, GTP, CTP, UTP, TTP, Secondary structure of DNA. Various types of DNA and RNA. Metabolism - Anabolism - Catabolism - stages of respiration, overall metabolic view of carbohydrate, protein and lipids. Glycolysis and its energetics

UNIT V- Metabolic pathway

TCA cycle and its energetics. Gluconeogenesis. Glycogen metabolism - Glycogenesis, Glycogenolysis. Hexose mono phosphate pathway Metabolism of lipids - Anabolism of saturated fatty acids , unsaturated fatty acid. Catabolism of lipids - Triacylglycerol and ω - oxidation of fatty acids in brief and β -oxidation in detail. Vitamins - occurrence, chemistry and structure of vitamins. Metabolic functions of fat. Bio chemical functions of vitamins. Biochemical functions of Minerals

TEXTBOOKS:

1. Lehninger, A.L., Nelson, D.A and Cox, M.M. 2005. *Principles of Biochemistry*. CBS Publishers and Distributors, Delhi
2. Conn, E.E., Stumpf, P.K., Bruening, G. and Doi, R.H. 1995. *Outlines of Biochemistry*. John Wiley and Sons Inc., Singapore.

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1. Buchanan, B.B., Grisse, W. and Jones, R.L. 2002. *Biochemistry and Molecular Biology of Plants*. JohnWiley and Sons, UK..
2. Jayaraman, J. 1980. *Laboratory Manual in Biochemistry*. Wiley Eastern Publishers, New Delhi.
3. Plummer, D.T. 1979. *An introduction to Practical Biochemistry*. Tata McGraw-Hill Publishing Co., NewDelhi.
4. Rameshwar, A. 2006. *Practical Biochemistry*. Kalyani Publishers, Ludhiana.
5. Sadasivam, S. and Manickam, A. 1996. *Biochemical methods for Agricultural Sciences*. New AgeInternational Publisher, New Delhi