

NUTRITIONAL BIOCHEMISTRY

4 Credits (Th)

Objectives:

This course will enable the students to:

1. Augment the knowledge of biochemistry acquired at the undergraduate level
2. Understand the mechanisms adopted by the human body for regulation of metabolic pathways
3. Develop an insight into interrelationships between various metabolic pathways
4. Understand integration of cellular level metabolic events to nutritional disorders and imbalances.
5. Become proficient for specialization in nutrition

Contents:

Module No	Topics and Details	Number of credits
1	<p>a. Membrane structure, composition and Transport of metabolites across membranes</p> <p>b. Acid base balance and its regulation</p> <p>c. Enzymes</p> <ul style="list-style-type: none">- Kinetics of monosubstrate and bisubstrate catalysed reactions (including inhibition)- Enzyme specificity, regulation of enzyme activity and synthesis- Enzymes in clinical diagnosis <p>d. Detoxification in the body-metabolism of xenobiotics (Phase I and Phase II enzymes)</p> <p>e. Cell Signaling : Overview of extracellular cell signaling, G protein couple receptors and their effectors, enzyme linked receptors and their effectors, second messengers, map kinase pathways</p> <p>f. Free radicals, ROS and oxidative damage</p>	2
2	<p>Review of :</p> <p>a. Carbohydrate Metabolism : Intestinal transport of carbohydrates, Transport of glucose across various cells, Cellular metabolism of carbohydrates Glycogen</p>	1

	<p>metabolism Regulation of carbohydrate metabolism at substrate level, enzyme level, hormonal level and organ level, Disorders of carbohydrate metabolism. Definition, classification, structure and properties of glycoproteins and proteoglycans</p> <p>b. Metabolism of Lipids : Metabolism is to be discussed with reference to: Intestinal transport of lipids, Cellular uptake and metabolism of lipids (beta-oxidation, denovo synthesis of fatty acids, synthesis and breakdown of unsaturated fatty acids, cholesterol, phospholipids and triacylglycerol) Lipoprotein metabolism, VLDL and LDL (‘Forward’ Cholesterol transport) VLDL and LDL (Endogenous TAG transport), HDL (‘Reverse’ Cholesterol transport), Regulation of lipid metabolism at substrate level, enzyme level, hormonal level and organ level, Disorders of lipid metabolism, Dyslipidemias, Lipid storage diseases</p> <p>c. Protein Metabolism: Metabolism of amino acids- biosynthesis and catabolism - energy, glucose and ketone bodies, protein amino acids, non-protein amino acids (including urea cycle, transamination, one-carbon metabolism), Creatine and creatinine, Plasma proteins – Nature, properties and functions, Biologically active peptides, polypeptides and transport proteins, Inborn errors of amino acid metabolism</p> <p>d. Intermediary Metabolism: Review of regulation of intermediary metabolism- equilibrium and non-equilibrium reactions, committed steps, allosteric modifications, covalent modulation, hormonal induction and repression, cross-over theorem, starve-feed cycle, caloric homeostasis and futile cycles, Tricarboxylic acid cycle</p> <p>e. Biological Oxidation : Electron transport chain and oxidative phosphorylation</p>	
<p>3</p>	<p>Biochemical aspects of purine and pyrimidines</p> <ol style="list-style-type: none"> Metabolism of purines Metabolism of pyrimidines Role of purine and pyrimidine nucleotides in metabolism. <p>Biochemistry of Nucleic Acids</p> <ol style="list-style-type: none"> Metabolism of DNA Metabolism of RNAs 	<p>1</p>

	<p>c. DNA replication, mutation, repair and recombination concepts d. Disorders of nucleic acid metabolism</p> <p>Protein Biosynthesis</p> <p>a. Gene expression and its regulation, transcription, translation, post-translational modification b. Inhibitors of protein biosynthesis c. Gene expression in mitochondria d. Systems Biology including Metabolomics and Proteomics</p>	
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References:

1. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2000): 25th Ed. Harpers Biochemistry. Macmillan Worth Publishers.
2. Nelson, D.L. and Cox, M.M. (2000): 3rd Ed. Lehninger's Principles of Biochemistry, Macmillan Worth Publishers.
3. Devlin, T.M. (1997): 4th Ed. Text book of Biochemistry with Clinical Correlations, Wiley Liss Inc
4. Stryer, L. (1998): 4th Ed. Biochemistry, WH Freeman and Co.
5. Conn, E.E., Stumpf, P.K., Bruening, G. and Doi, R.H. (2001): 5th Ed. Outlines of Biochemistry, John Wiley and Sons.
6. Voet, D. Voet, J.G. and Pratt, C.W. (1999). Fundamentals of Biochemistry.
7. Tietz, N.W. (1976) Fundamentals of Clinical Chemistry. WB Saunders Co.
8. King, E.J. and Wootton, I.D.P. (1956). 3rd ed. Micro-Analysis in Medical Biochemistry. J and A Churchill Ltd.
9. Plummer, D.T. (1987). 3rd ed. An Introduction to Practical Biochemistry. McGraw-Hill Book Co.