DEPARTMENT OF BIOCHEMISTRY
CURRICULUM OF STUDIES IN BIOCHEMISTRY

(i) GOAL
The broad goal of the teaching of undergraduate students in Biochemistry is to make them understand the scientific basis of the life processes at the molecular level and to orient them towards the application of the knowledge acquired in solving clinical problems, and to prepare him to be a teacher of Biochemistry.

OBJECTIVE

(a) KNOWLEDGE
At the end of the course the student shall be able to:

1. Describe the molecular and functional organization of a cell and list its sub cellular components;
2. Delineate structure, function and inter-relationship of biomolecules and consequences of deviation from normal;
3. Summarize the fundamental aspects of enzymology and clinical application wherein regulation of enzymatic activity is altered;
4. Describe digestion assimilation of nutrients and consequences of malnutrition;
5. Integrate the various aspects of metabolism and their regulatory pathways;
6. Explain the biochemical basis of inherited disorders with their associated sequence;
7. Describe mechanisms involved in maintenance of body fluid and pH homeostasis;
8. Outline the molecular concept of body defenses and their application in medicine;
9. Summarize the molecular concept of body defense and their application in medicine;
(10) Outline the biochemical basis of environmental health hazards, biochemical basis of cancer and carcinogenesis;

(11) Familiarize with the principles of various conventional and specialized laboratory investigations and instrumentation analysis and interpretation of a given data;

(12) Suggest experiments to support theoretical concepts and clinical diagnosis;

**SKILLS**

At the end of the course, the student shall be able to:

(1) Make use of conventional techniques/instruments to perform biochemical analysis relevant to clinical screening and diagnosis;

(2) Analyze and interpret investigative data;

(3) Demonstrate the skills of solving scientific and clinical problems.

**INTEGRATION**

The knowledge acquired in Biochemistry shall help the student to integrate molecular events with structure and function of the human body in health and disease.

**THEORY:**


(3) Modern techniques in Biochemistry – photoelectric colorimetry, spectrophotometry; electrophoresis and chromatography.

(4) Carbohydrates:
General Biochemistry, Classification- monosaccharides, amino sugars, uronic acids, sugar phosphates, glycosides and mucopolysaccharides.

(5) Proteins:
Proteins- Classification, structure, properties, plasma proteins, immunoglobins, hemoglobin, isolation of proteins. Separation of proteins.

(6) Lipids:

(7) Enzymes:
Definition, classification, properties, extraction, factors affecting enzyme action, mechanism of enzyme action, coenzymes, cofactors, Enzyme inhibitions- competitive, non-competitive, allosteric, and feedback inhibitions, isoenzymes, clinical enzymology.

(8) Nucleoproteins:
Nucleoproteins, nucleotides, naturally occurring free nucleotides, synthetic nucleoprotein made nucleosides, analogs for medical use.

(9) Biochemical Genetics:
Nucleic acid structure and function- DNA, mRNA, tRNA, DNA organization and replication, chromatin, histones, nonhistones, introexons, DNA synthesis and replication, DNA polymerase. Degradation and repair of DNA, DNA recombinant technology and restriction endonuclease.
RNA synthesis and processing. DNA dependent RNA polymerase and transcription heterogeneous nuclear RNA, transcription signals, nucleases.

Genetic code (codons) – characteristics and properties, protein synthesis tRNA function and anti codons translation of mRNA initiation, elongation and termination. Post translational processing, inhibitions of protein synthesis, mutations, regulation of gene expression, immunoglobin gene rearrangement, gene amplification, transcription control.

(10) Vitamins:
Vitamins water soluble and fat soluble: sources, functions, daily requirement, deficiency diseases, hypervitaminosis.

(11) Biological Oxidation:
Biological oxidations electron transport chain and oxidative phosphorylation in vitro. Mitochondrial inhibitors of electron transport chain and oxidative phosphorylation.

(12) Metabolism of carbohydrates:

(13) Metabolism of Lipids:
Biochemical aspects of digestion and absorption of lipids, physiological value of fats, essential fatty acids, prostaglandin, blood lipids, fatty acid synthesis and beta oxidation of fatty acids. Metabolism of acylglycerols, triacylglycerol, plasmalognes, metabolism of sphingol, metabolism of adipose tissue and mobilization of fat.

(14) Metabolism of Proteins:
Introduction: Biochemical aspects of digestion and absorption of proteins. Amino acid pool, protein equilibrium between tissue and plasma proteins, nitrogen equilibrium, storage of proteins and amino acids in the body, essential and non-essential amino acids. Proteins and amino acids in the urine. Fate of amino acids after absorption, metabolism of amino acids in general, production of ammonia (transamination and deamination), its transport and its conversion to urea. Regulation of urea formation and metabolic disorders of urea cycle. One carbon metabolism and sulfur metabolism. Catabolism of carbon skeleton of amino acids Ketogenesis and glycogenic amino acids, conversion of the carbon skeleton of amino acids to amphibolic intermediates, metabolism of phenyl alanine and tyrosine. Metabolic defects in amino acid metabolism. Hormonal control of protein metabolism, conversion of amino acids to specialized products, creatine, glutathione; GABA, serotonin, histamine etc.
Integration of carbohydrate, protein and fat metabolism. Terminal pathway of carbohydrate, protein and fat metabolism.

(15) Porphyrins: Porphyrins, hemoglobin, bile pigments and hyperbilirubinemias.
(16) Metabolism nucleotides:
Metabolism of purines- uric acid production, clinical disorders of purine metabolism. Hyperuricemia and gout. Lesch-Neyhans syndrome, hyperuricemia, metabolism of pyrimidine nucleotides.

(17) Metabolism of Minerals:
Sources, absorption, transport, requirement, metabolic role and metabolic disorders of minerals – calcium, absorption, daily requirement, metabolism, hormonal regulation of metabolism and metabolic, hormonal and nutritional disorders of calcium. Phosphorous metabolism. Iron; metabolism- ferritin, heamosiderosis and requirements of ion for different age groups. Magnesium, potassium, copper, zinc, and other trace elements.

(18) Nutrition:

(19) Organ Function Tests:
Liver function test and detoxification mechanism, gastric analysis, renal function tests, thyroid function tests.

(20) Biochemistry of blood clotting: Biochemical aspects.

(21) Biochemistry of muscle contraction:
Biochemical changes during contraction and relaxation, structure of muscle fiber.

(22) Biochemistry of Respiration: Biochemical aspects.
(23) Biochemistry of Hormones: Structure formation and functions of hormones.

(24) Environmental Hazards:
Etiology, mutagens, anti mutagens, oncogenic viruses, growth factor, anticancerous drugs, biochemical aspects of AIDS.
1. Test food substances of Biochemical importance.
2. Study of composition of Saliva.
4. Study of composition of gastric juice.
5. Study of pepsin activity of fibrin.
6. Study of composition of C.S.F.
7. Study of composition of milk.
8. Study of normal constituents of urine.
10. Study of hemoglobin and its derivatives.
11. Estimation of free and total acidity of gastric juice.
15. Estimation of serum uric acid.
17. Estimation of serum albumin.
BIOCHEMISTRY CURRICULUM
LIST OF DEMONSTRATION

1. Colorimetry
2. Measurement of pH.
3. Separation of proteins by electrophoresis by cellulose acetate strips.
4. Separation of amino acids by chromatography.
5. ELISA (Enzyme Linked Immuno Sorbent Assay)
7. Cardiac Function Tests.
9. Thyroid Function Tests.
11. Estimation of electrolytes by flame photometer.