# VIDYASAGAR UNIVERSITY

# BIOCHEMISTRY

(General)

## Under Graduate Syllabus

**(3 Tier Examination Pattern)**

**w.e.f. 2014-2015**

**REVISED**

**Vidyasagar University**

**Midnapore 721 102**

**West Bengal**

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## PART – I (90 LECTURES)

Paper-I Maximum Marks: 100(90 + Internal Assessment-10)

Unit – 01 Marks 50 (45 + 05)

GENERAL BIO-CHEMISTRY:

1. **Organic Molecules**: General introduction of organic compounds and their classification; Nomenclature of organic compounds. Covalent bond, bond length, energy and dissociation energy. (5 Lectures)
2. Stereochemistry: Different types of isomerism: optical isomerism, specific rotation and optical rotation, geometrical isomerism - associated with C=N & C=C bonds. (5 Lectures)
3. **Carbohydrate chemistry**: Definition and classification of carbohydrates, linear and ring forms (Haworth's formula) for all monosaccharide (glucose, fructose, mannose) and disaccharides (maltose, lactose, sucrose). Physical properties and chemical properties of carbohydrate - oxidation, reduction, osazone formation, Seliwanoff's reaction. (10 Lectures)
4. **Lipid chemistry**: Definition and biological classification of lipids, fatty acids: Classification and properties. Properties of lipids - saponification, rancidity, reduction, oxidation, halogenations. Structure and Functions of Phospholipids. Cholesterol: Structure and chemical properties and biological importance. (10 Lectures)
5. **Protein chemistry**: Definition, Biological function and classification of proteins and amino acids. Chemical properties of amino acids and proteins. Primary, secondary and tertiary structures of proteins and involving bonds. (8 Lectures)
6. **Nucleic acid chemistry**: Purine and pyrimidine bases, nucleosides, nucleotides, polynucleotide, DNA structure, various types and properties - Different types of RNA: structure and functions. (7 Lectures)



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**Unit – 02** **Marks 50 (45 + 05)**

## 1. GENERAL ENZYMOLOGY:

Enzyme definition, units, various classifications, nomenclature, specificity, isoenzymes, factors affecting enzyme activity-substrate, pH, temperature, Michaelis-Menten equation, Lineweaver-Burk plot, Enzymes inhibition: Competitive, non competitive and uncompetitive, Clinical importance of enzyme. (10 Lectures)

## 2. VITAMINS:

Definition, classification, structure and functions of water soluble vitamins, B 1, B2, B3, B6, B 12 and vitamin C. Coenzyme forms and functions, Sources, deficiency disorder, biochemical roles, daily requirements. Fat soluble vitamins - A, D, E and K - deficiency disorder, biochemical roles, daily requirements, provitamins, anti vitamins, pseudovitamins. (12 Lectures)

## 3. FOOD BIOCHEMISTRY:

Physical and chemical methods for determining the constituents of foods, Food processing, Preservation and storage of traditional foods, roots and stem tubes, fruits and. fruit drinks, seeds. and grains, green and leafy vegetables, food poisoning and intoxication: (10 lectures)

## 4. NUTRITIONAL BIOCHEMISTRY:

Food Nutrients: Energy values of foods and energy expenditure in different work. Nutritive value of foods - carbohydrates, fats, proteins, vitamins, mineral elements, and water. Nutritional disorders: prevention and therapy. Nutritional status and nutritional requirement, dietary allowances, Assessment of nutritional status, Nutritional requirements in relation to physical activity and ageing; diet and disease, obesity and under nutrition. . (13 lectures)



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## PART - II (90 LECTURES)

**Paper - II Maximum Marks: 100 (90 + Internal assessment -10)**
**Unit - 03 Marks 50 (45 + 05)**

### 1. BIOENERGETICS:

High - energy compounds: redox potentials, Electron transport chain and oxidative phosphorylation; regulation of ATP production. (5 Lectures)

### 2. METABOLISM OF CARBOHYDRATES:

Basic idea about carbohydrate metabolism, glycolysis; tricarboxylic acid cycle; Phosphoglutamate pathway; Glyoxylate pathway; Pentose phosphate pathway; Cori cycle; Calvin pathway; glycogenolysis; gluconeogenesis, Disorders of carbohydrate metabolism, Hyperglycemia, Diabetes, Lactose intolerance. (10 Lectures)

### 3. METABOLISM OF LIPIDS:

Oxidation and synthesis of fatty acids, formation and utilization of ketone bodies, biosynthesis of phospholipids, cholesterol biosynthesis, metabolism of lipoproteins and its significance. Biosynthesis of phospholipids and its biological significance.

(12 Lectures)

### 4. METABOLISM OF AMINO ACIDS AND PROTEINS:

Oxidative degration of one carbon units. Deamination, transamination, transmethylation, metabolism of amino acids and some derivatives, Urea cycle, specialized products of aminoacids, inborn error of amino acid metabolism. Protein biosynthesis and its inhibitors. (12 Lectures)

### 5. METABOLISM OF NUCLIC ACIDS:

Chromosome organization, Replication of DNA, Genetic code, Translation, Metabolism of purines and pyrimidines. (6 Lectures)



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**Unit – 04** **Marks 50**

**1. MEMBRANE BIOCHEMISTRY:**

Structure, composition and functions of biological membranes. The unit membrane hypothesis, Fluid Mosaic Model of membrane, Membrane transport system - active and passive transport, transport of sugars and amino acids, lonophores. (15 Lectures)

**2. TISSUE BIOCHEMISTRY:**

Biochemistry of muscles, kidney, liver, adipose and brain tissue. Biochemistry of reproductive organs, Detoxification and excretion in tissues. (5 Lectures)

**3. PLANT -BIOCHEMISTRY:**

Organization of plant cells, photosynthesis, Alkaloids and flavonoids, plant hormones. Biosynthesis of carotenoid pigments; The plant cell wall structure, Lignin formation, Free amino acids, pyrimidines, purines and nucleosides in plants, Metabolism and functions of auxins, gibberellins, cytokinins, synthetic growth regulators and biocides (herbicides and pesticides). (15 Lectures)

**4. BIOCHEMICAL PHARMACOLOGY:**

Pharmacokinetics and Pharmacodynamics, Toxicity study, The mechanism of drug action, drug resistance and other factors affecting drug efficacy. (5 Lectures)

**5. METHODS IN BIOCHEMISTRY**

Tritrimetry, colorimetry, photometry, spectophotometry, electrophoresis, chromatography, centrifugation, isotopic techniques and immunoassay techniques.

(5 Lectures)



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## BIOCHEMISTRY PRACTICAL (90 LECTURES)

**Paper- III (Practical)** **Maximum Marks: 100**

**Unit - 05**

**1. VOLUMETRIC ANALYSIS:**

a. Estimation of HCI using suitable bases.
b. Estimation of chloride by Mohr's method
c. Determination of saponification value of edible oil.
d. Determination of acid number of edible oil.
e. Estimation of glycine by formal titration method.
f. Estimation of glucose by Benedict's methods.
g. Estimation of Ascorbic acid using 2, 6 – dichlorophenol indophenols.

**2. QUALITATIVE ANALYSIS:**

a. Qualitative analysis of carbohydrates : Glucose, fructose, galactose, lactose, maltose and sucrose.
b. Qualitative analysis of amino acids : Arginine, cystine, tryptophan and tyrosine.
c. Ractions of lipids – solubility, saponification tests for unsaturation, Liebermann Burchard test for cholesterol.

**Unit -06**

**3. BIOCHEMICAL PREPARATION:**

a. Preparation of starch from potatoes;
b. Preparation of casein and lactalbumin from milk.
c. Preparation of hemoglobin from blood.
d. Preparation of albumin from eggs.
e. Preparation of cellulose from plant material.

**4. CLINICAL BIOCHEMISTRY:**

a. A brief review of and abbreviations used in expressing concentrations and standard solutions.
b. Specimen collection and processing (blood, urine and feces), anti-coagulant and preservatives for blood and urine.



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**5. QUANTITATIVE ANALYSIS:**

a. Preparation of buffers (acidic, neutral and alkaline) and determination of pH.
b. Determination of saponification value of edible oil.
c. Determination of acid number of edible oil.
d. Estimation, of reducing sugar .from biological fluids by Benedict's titrimetric methods.
e. Estimation of protein by Biuret method
f. Absorption maxima of colored substance, Methyl orange
g. Absorption spectra of protein - BSA

**6. EXPERIMENTS ON COLLOIDS AND GEL (ONLY FOR DEMONSTRATION)**

a. Preparation of lyophilic and lyophobic sols.
b. Preparation of gel (agar, gelatin or starch) and demonstration of diffusion.

**7. LABORATORY NOTE BOOK**

**8. VIVA VOCE**



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## BOOKS RECOMMENDED

### THEORY:

1. Biochemistry - D. Das
2. Medical Biochemistry Vasudevan
3. Medical Biochemistry- M. N. Chatterjee
4. Physical Biochemistry - David Friefelder
5. Biochemistry - Stryer
6. Biochemistry - Voet and Voet
7. Principle's of Biochemistry - Lehninger, Nelson and Cox
8. Harper's biochemistry - Murray
9. Instrumental methods of analysis - Chatwal- Anand.
10. Environmental biology: P. D. Sharma.

### Books References:

1. Enzymes seagal
2. Text book of bio chemistry - Lehninger et al.
3. Biochemistry of Nuclic acid - Adam et al.
4. Molecular Biology - David Friefelder
5. Molecular Biology of gene - James and Watson
6. Environmental Chemistry: A. K. De
7. Chemicals in Environment: Y Mydo and M. Satak.
8. Environmental Chemistry: A. K. De.
9. Harper's Physiological Biochemistry - Harper et al.
10. General Physiology - A. Mariakuttlkan and N. Arumugan
11. The Living body - Best and Taylor.

PRACTICAL:

1. A biochemical guide to principles and techniques of practical biochemistry - Keith Wilson and Kenneth H. Goulding.
2. Principles and techniques of practical biochemistry - Bryan L. Williams and keith Wilson.
3. Practical biochemistry - Shawney
4. Manuals of biochemistry - Sathyanarayana
5. Practical Clinical Biochemistry - Chawala



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