

| BIOCHEMISTRY         |                  |
|----------------------|------------------|
| Subject Title        | : BIOCHEMISTRY   |
| Duration             | : 0 – 12 Months  |
| Total Hours          | : 60             |
| Theory               | : 60 Hrs         |
| Lecture              | : 2 Hours / Week |
| Method of Assessment | : Written        |

## THEORY

### 1. Nutrition [ 7 Hours]

Introduction, Importance of nutrition

Calorific values,

Respiratory quotient – Definition, and its significance

Energy requirement of a person -

Basal metabolic rate: Definition, Normal values, factor affecting BMR

Special dynamic action of food

Physical activities - Energy expenditure for various activities.

Calculation of energy requirement of a person

Balanced diet

Recommended dietary allowances

Role of carbohydrates in diet: Digestible carbohydrates and dietary fibers

Role of lipids in diet

Role of proteins in diet: Quality of proteins - Biological value, net protein utilization, Nutritional aspects of proteins-essential and non essential amino acids. Nitrogen balance Nutritional disorders

### 2. Carbohydrate Chemistry [3 Hours]

Definition, general classification with examples, Glycosidic bond

Structures, composition, sources, properties and functions of Monosaccharides, Disaccharides, Oligosaccharides and Polysaccharides.

Glycosaminoglycans (mucopolysaccharides)

### 3. Lipid Chemistry [ 3 Hours]

Definition, general classification

Definition, classification, properties and functions of Fatty acids, Triacylglycerol, Phospholipids, Cholesterol

Essential fatty acids and their importance

Lipoproteins: Definition, classification, properties, Sources and function

Ketone bodies

### 4. Amino-acid Chemistry [ 3 Hours ]

Amino acid chemistry: Definition, Classification, Peptide bonds

Peptides: Definition, Biologically important peptides

Protein chemistry: Definition, Classification, Functions of proteins,

5. Enzymes [ 3 Hours]

Definition, Active site, Cofactor (Coenzyme, Activator), Proenzyme. Classification with examples, Factors effecting enzyme activity, Enzyme inhibition and significance, Isoenzymes, Diagnostic enzymology (clinical significance of enzymes)

6. Nucleotide and Nucleic acid Chemistry [2 Hours]

Nucleotide chemistry: Nucleotide composition, functions of free nucleotides in body.

Nucleic acid (DNA and RNA) chemistry: Difference between DNA and RNA, Structure of DNA (Watson and Crick model), Functions of DNA. Structure and functions of tRNA, rRNA, mRNA.

7. Digestion and Absorption [ 3 Hours]

General characteristics of digestion and absorption, Digestion and absorption of carbohydrates, proteins and lipids. Disorders of digestion and absorption – Lactose intolerance,

8. Carbohydrate Metabolism [ 5 Hours]

Introduction, Glycolysis – Aerobic, Anaerobic

Citric acid cycle, Substrate level phosphorylation

Glycogen metabolism – Glycogenesis, Glycogenolysis, Metabolic disorders glycogen,

Gluconeogenesis, Cori cycle

Hormonal regulation of glucose, Glycosuria, Diabetes mellitus,

9. Lipid Metabolism [ 5 Hours]

Introduction to lipid metabolism, Lipolysis, Oxidation of fatty acids  $\beta$ -oxidation of fatty acids, Lipogenesis - Denovo synthesis of fatty acids, chain elongation, desaturation, triacylglycerol synthesis, fat metabolism in adipose tissues

Ketone body metabolism: Ketone body formation (ketogenesis), utilization (ketolysis), ketosis, Rothera's test

Cholesterol metabolism: synthesis, degradation, cholesterol transport

Hypercholesterolemia and its effects (atherosclerosis and coronary heart diseases)

Hypocholesterolemic agents, Common hyperlipoproteinemia, Fatty liver

10. Amino acid and Protein Metabolism [3 Hours]

Catabolism of amino acids - Introduction, transamination, deamination, Fate of ammonia, transport of ammonia, Urea cycle

Specialized products formed from amino acids - from glycine, arginine, methionine, phenylalanine and tyrosine.

11. Vitamins [ 7 Hours]

Definition, classification according to solubility,

Individual vitamins - Sources, Coenzyme forms, functions, RDA, digestion, absorption and transport, deficiency and toxicity

12. Mineral Metabolism [ 2 Hours]

Definition, Sources, RDA, Digestion, absorption, transport, excretion, functions, disorder of Individual minerals - Calcium, phosphate, iron, Magnesium, fluoride, selenium, molybdenum, copper. Phosphate, calcium and iron in detail

13. Cell Biology [ 2 Hours]

Introduction, Cell structure, Cell membrane structure and function, various types of absorption. Intracellular organelles and their functions, briefly on cytoskeleton

14. Muscle Contraction [ 2 Hours]

Contractile elements in muscle, briefly on the process of muscle contraction, Energy for muscle contraction.

15. Biochemistry of Connective tissue [ 2 Hours]

Introduction, various connective tissue proteins: Collagen, elastin - Structure and associated disorders. Glycoproteins, Proteoglycans

16 Hormone Action [ 2 Hours]

Definition, classification, Mechanism of hormone action. Receptors, signal transduction, second messengers and cell function

17 Acid-Base balance[ 2 Hours]

Acids, bases and buffers, pH. Buffer systems of the body, bicarbonate buffer system

Role of lungs and kidneys in acid base balance, Acid base imbalance

18 Water balance[ 1 Hour]

Water distribution in the body, Body water, water turnover, Regulation of water balance: role of ADH and thirst centre

19 Electrolyte balance[ 1 Hour]

Osmolarity. Distribution of electrolytes

Electrolyte balance: Role of aldosterone, rennin angiotensin system and ANF

20 Clinical Biochemistry [ 2 Hours]

Normal levels of blood and urine constituents, Relevance of blood and urine levels of Glucose, Urea, Uric acid, Creatinine, Calcium, Phosphates, pH and Bicarbonate. Liver function tests, Renal function tests

**Recommended Text books**

1. MURRAY [ROBERT KK], *Harper's Bio Chemistry Ed 24, Prentice Hall. 1996, p925, Rs. 650/-*
2. RAMAKRISHNA [S], PRASANNA [KG], RAJAN [R], *Text Book of Medical Biochemistry, Ed 1, orient Langman, Bombay 1980, p717.*
3. VASUDEVAN [DM] and SREE KUMARI [S], *Text Book of Bio Chemistry for Medical students, Ed 1, Jaypee Brothers, New Delhi, 1995, p637, Rs.175/-.*
4. DAS [Debajyothi], *Biochemistry, Ed. 7, Academic Publishers Calcutta, 1992, p648, Rs. 175/-.*
5. PRASAD RM, *RM's Physiotherapy Textbook Series, Text book of Biochemistry for Bachelor of Physiotherapy First Edition, RM Publications, Mangalore.*

**Reference**

1. LEHNINGER [Albert] et. al., *Principles of Biochemistry, Ed. 3, LBS Publishers, Delhi, 1993, p1143, Rs.795/-*
2. ORTEN [James M] and NEUHAUS [OHO.W]. *Human Biochemistry, Ed. 9, Mosby, St.Louis, 1975 p994.*

3. *Strayer [LUBERT], Biochemistry, Ed. 4, WH, Freeman & Co., Ny. 1995, p1064, \$49.95*
4. *DEVLIN [Thomas M], Biochemistry with Clinical Correalation, Ed. 4, Willey Libs, Ny 1997, p1186, \$30.95.*