

2.4 APPLIED BIOCHEMISTRY (THEORY)
75 hours ; 3 hours/week

1. Bio energetics **3 hours; 4-5 marks**

- a) Concept of free energy and its determination; redox potential
- b) Energy rich compounds; ATP; Cyclic AMP; their biological significance

2. Biological Oxidation **5 hours; 6-7 marks**

- a) Electron transport chain (its mechanism and role)
- b) Inhibitors and Uncouplers of ETC
- c) Oxidative phosphorylation
- d) Substrate level phosphorylation and oxidative phosphorylation

3. Proteins **2 hours; 2-3 marks**

Definition, classification, biological significance, properties viz, denaturation, isoelectric point

4. Enzymes and Coenzymes **13 hours; 16-17 marks**

- a) Definition ; Nomenclature ; IUB Classification
- b) Properties of enzymes;
- c) Factors effecting enzyme activity;
- d) Enzyme kinetics (Michaelis plot ; Line Weaver Burke plot)
- e) Enzyme Inhibition (with examples)
- f) Iso-enzymes
- g) Enzyme Induction; repression
- h) Applications of enzymes
- i) Coenzymes, categories of reactions requiring coenzymes;
- j) Structure of coenzymes, and their biochemical role
- k) Vitamins - water soluble, fat soluble

5. Carbohydrate metabolism **13 hours; 16-17 marks**

- a) Introduction: Definition, classification and biological significance
- b) Glycolysis along with significance and energetics
- c) Glycogenesis glycogenolysis,
- d) TCA cycle; (Amphibolic nature of TCA cycle) along with significance and energetics
- e) Gluconeogenesis and its significance
- f) Various shuttle systems (glycerol phosphate; Malate aspartate)
- g) HMP Shunt Pathway and its significance
- h) Uronic acid pathway and galactose metabolism
- i) disorders of carbohydrate metabolism: glycogen storage diseases, Diabetes mellitus
- j) Hormonal regulation of carbohydrate metabolism
- k) Glucose tolerance test and blood glucose regulation.

6. Lipid metabolism**10 hours; 12-13 marks**

- a) Introduction: Definition, classification, essential fatty acids
- b) Oxidation of saturated (palmitic acid) fatty acids
- c) Oxidation of unsaturated fatty acids (-linolenic acid)
- d) Oxidation of odd numbered fatty acids
- e) Formation and fate of ketone bodies
- f) Cholesterol metabolism,
- g) Biosynthesis of fatty acids (de novo)
- h) Phospholipids and sphingolipids.

7. Amino acid metabolism**12 hours; 14-15 marks**

- a) Amino acids definition, classification and significance
- b) General reactions of amino acids: Transamination, deamination and decarboxylations of amino acids
- c) Urea cycle, deficiency symptoms of urea cycle enzymes
- d) Metabolism of sulphur containing amino acids
- e) Catabolism of tyrosine, tryptophan, phenylalanine, phenyl ketonurea alkaptonurea
- f) Synthesis & significance of biologically important substances: creatine, histamine, 5-HT, dopamine, noradrenaline, adrenaline.
- g) Porphyrins, Bile Pigments; Hyperbilirubinemia

8. Nucleotides and Nucleic acids**12 hours; 14-15 marks**

- a) Introduction: Structure and numbering of purine and pyrimidine nucleus
- b) Purine nucleotides biosynthesis
- c) Pyrimidine nucleotides biosynthesis
- d) Catabolism of purines and pyrimidines
- e) DNA structure, significance as genetic material
- f) RNA types, structure and significance
- g) DNA replication
- h) Mutation and repair of DNA
- i) Transcription or RNA synthesis
- j) Genetic code
- k) Translation or protein synthesis and its Inhibition

9. Principles and significance for following Biochemical tests**5 hours; 6-7 marks**

- a) Kidney function tests
- b) Liver function tests
- c) Lipid profile
- d) Gastric function test

APPLIED BIOCHEMISTRY (PRACTICALS)
75 hours ; 3 hours/week

- 1. Identification of carbohydrates (Scheme and identification)**
(glucose, fructose, lactose, maltose, sucrose)
- 2 Identification of proteins (Scheme and identification)**
(casein, albumin, gelatin, peptone)
- 3. Quantitative estimation of carbohydrates (any one method)**
DNS reagent
Anthrone Reagent
- 4. Quantitative estimation of proteins (any one method): Biuret Reagent, Lowry's Reagent**
- 5. Qualitative analysis of Urine**
 - a) For Normal constituents
 - b) Abnormal constituents
- 6. Quantitative Urine analysis**
 - a. Titrable acidity and ammonia
 - b. Estimation of reducing sugars in urine (Benedict's method)
 - c. Estimation of chlorides in urine
 - d. Estimation of Creatinine in urine
 - e. Estimation of calcium in urine
- 7. Quantitative analysis of blood**
 - a. Estimation of glucose in blood (Folin-Wu method)
 - b. Estimation of creatinine in blood
 - c. Estimation of cholesterol in blood
 - d. Estimation of urea in serum
 - e. Estimation of SGOT in serum
 - f. Estimation of SGPT in serum
- 8. Enzyme**
 - a. Salivary amylase activity
 - b. Effect of temperature on enzyme (amylase) activity
 - c. Effect of pH on enzyme (amylase) activity

SCHEME OF EXAMINATION

1. Synopsis	10 Marks
2. Urine Analysis	15 Marks
3. Titrimetric Experiment	20 Marks
4. Colorimetric Experiment	15 Marks
5. Viva	10 Marks
Total	70 Marks

APPLIED BIOCHEMISTRY TEXT BOOKS

- 1) Pharmaceutical Biochemistry – KN Jayaveera et al, S Chand publishers
- 2) Textbook of Biochemistry – Harron and Mazur
- 3) Textbook of Biochemistry – Varun Kumar Malhotra
- 4) Fundamentals of Biochemistry- JL Jain et al, S Chand publishers

APPLIED BIOCHEMISTRY REFERENCE BOOKS

- 1) Harpers Review of Biochemistry – Martin
- 2) Text book of Biochemistry – Lehninger
- 3) Outlines of Biochemistry – Conn and Stump
- 4) Hawk's Physiological Chemistry- Oser
- 5) Hand Book of Basic Pharmacokinetics- Pitachel

LIST OF MINIMUM EQUIPMENTS REQUIRED

1) Colorimeter	01
2) Centrifuge	01
3) Electronic Balance	01
4) Physical/Chemical Balance	01
5) pH meter	01
6) Water bath	05
a) Temperature controlled	01
b) Ordinary	01
7) Volumetric flask	60
8) Pipette	20
a) Graduated	10
b) Bulb	10
9) Burettes	20
10) Conical flask	20
11) China dish	20
12) Burner	20
13) Glass wares such as measuring cylinders, reagent bottles, glass rods, tubes etc.	
14) Folin-Wu tube	120