

SARDAR PATEL UNIVERSITY  
S.Y.B.Sc. BIOCHEMISTRY  
SEMESTER – IV (Credit – 3)  
BIOCHEMISTRY (US04CBC01)

Unit-1- PROTEIN

- Functions of protein.
- Chemistry of peptide linkage.
- Structure of protein: Primary, Secondary, Tertiary and Quaternary structure of protein with reference to hemoglobin.
- Classification of protein :
  1. fibrous, globular,
  2. Simple, conjugated and derived proteins.
- Solubility criteria, salting in and salting out of protein precipitation of protein, denaturation of protein.
- Determination of sequences of amino acid in protein.

References:

- Out line of biochemistry Conn & Stumpf.
- Fundamental of biochemistry –Donald Voet, Judith Voet and Charlotte W. Pratt. John Wiley Publishers.
- Principles of Biochemistry by Horton, Moran, Scimgeour, Prey, Rawn, Pearson interantional edition (4<sup>th</sup> edition)

Unit-2–LIPIDS

- Fatty acids:
  1. Definition, saturated, unsaturated and branched fatty acids.
  2. Physical and chemical properties of fatty acid; Cis and Trans essential fatty acid and importance.
- Structure and properties of animal sterols- Cholesterol
- Classification of lipids: simple, complex, derived and miscellaneous lipids.
  1. Triacylglycerides and waxes rancidity of lipids, auto oxidation.
  2. Phospholipids-structure, classification, properties; sphingolipids; glycolipids, sulfolipids.
  3. Basic structure and importance of gangliosides, proteiolipids.
  4. Types and importance of lipoprotein.
  5. Amphipathic lipids, bilayer membrane Micelles.
- Chemical analysis of fat to check quality of oil: acid value, saponification number, iodine number, peroxidation number, RM value.
- Lipids as signals, cofactors and pigments: eicosanoids- prostaglandins, thromboxanes, leucotrienes.

References:

- Harper illustrated biochemistry by Robbert Murray.
- Lehinger's principles of biochemistry by David L.Nelson and M.M.Cox CBS (4<sup>th</sup> edition)
- Text book of medical Biochemistry by Rana Shindey and Chattergy.

### UNIT-3-CELL

- Characteristics of cells.
- Cell structure: composition, chemical view point.
  1. inorganic constituents
  2. organic constituents
- sub cellular composition of eukaryotic cell, separation of sub cellular organelles, functions of sub cellular organelles,
- Cytoskeleton, cytoplasm.
- Chemical composition of cell membrane (lipid bilayer membrane).

#### References:

- Lehinger's principles of biochemistry by David L. Nelson and M. M. Cox CBS (4<sup>th</sup> edition).
- Text of Medical biochemistry – by Puri.

### Unit-4- NUCLEIC ACID

- Nucleic acid as genetic material- Hershey and Chase experiment, Avery and Mac Cleod, McCarty experiment.
- Structure and types of RNA: Secondary & tertiary structure of DNA.
- Basic concepts about the secondary structure of nucleic acid 5'- 3' direction, anti parallel strand base composition, base equivalence, base pairing & Chargoff's rule.
- Plasmids-definition, structure and types of pBR 322 & pUC 8.
- GENES- definition -gene, genome, chromosome, genetic code,
- Concept of organization of gene in eukaryotes and prokaryotes.

#### References:

- Out line of biochemistry Conn & Stumpf.
- Lehinger's principles of biochemistry by David L. Nelson and M. M. Cox CBS (4<sup>th</sup> edition).

### Unit-5- ENZYMES

- Introduction of enzyme and coenzymes.
- Classification of coenzymes.
- Classification of enzyme with examples.
- Specificity of enzymes.
- Factors affecting enzyme action.
- Definition – substrate, isoenzyme, oligomeric enzyme, multienzyme, endo-enzyme, exo-enzyme, catalytic site.

#### References:

- text book of medical biochemistry by rana shindey and chattergy.
- lehinger's principles of biochemistry by david l.nelson and m.m.cox cbs (4<sup>th</sup> edition).
- Harper illustrated biochemistry by robbert murray.

## Unit-6- BIOCHEMISTRY OF CANCER

- Definition-cancer,
- properties of cancer cells.(biochemical and morphological changes)
- Etiology of cancer cells (predisposing factors, carcinogenic agents).
- Natural occurring anticancer substances.

### References:

- Outline of biochemistry Conn & Stumpf.
- Text book of medical Biochemistry by Rana Shindey and Chattergy.
- Text of Medical biochemistry – by Puri.

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BIOPHYSICAL BIOCHEMISTRY - US04CBC02

UNIT-1: WATER

Acid .base imbalance

Buffer- Definition, mechanism of action, acid production in body,  
mechanism of regulation of pH, physiological buffer system-bicarbonates,  
phosphate, hemoglobin, protein, etc.

Henderson-Hassel Bach equation and its examples to find pKa and pH.  
measurement of pH -1)Use of indicators 2) pH meter

References:

1. Text book of Medical Biochemistry by Rana Shinde & Chattergy
  2. Lehninger.s principles of Biochemistry by David L. Nelson and Michael M. Cox, CBS Publisher (4<sup>th</sup> Edition).
- Outline of biochemistry Conn & Stumpf.

UNIT -2- TOXICOLOGY

Introduction to toxicology

Sources of natural toxicants & its effects on plants & animals...

Environmental metal toxicants & its effects on plants & animals....

Carcinogens.

UNIT-3: ISOTOPES IN BIOLOGY

Introduction of isotopes-atomic no., mass number, isotopes, Radioisotope,

Units of Radioactivity, Half lives of isotopes,

Techniques used in measurement of radioactivity.

Principle and method of Geiger-Muller counter, Autoradiography,  
scintillation counting.

Biological hazards of radiation and its safety.

REFERENCES:

Biophysical Chemistry by Upadhyay, Upadhyay & Nath

UNIT: 4: SEPERATION AND PURIFICATION TECHNIQUES-1

General principle and classification of chromatography.

Paper chromatography – principle techniqe and classification of paper  
chromatography.

Proper developing of mobile phase

Applications.

TLC –principle method and application.  
Coating materials  
Preparation of thin layer  
Activation of adsorbent.  
Purification of silica gel G layers,  
Adsorption column chromatography  
Principle, apparatus, adsorbents, preparation of adsorption column  
detectors,  
analysis  
Application,  
Affinity chromatography-principle, chromatography procedure, application.  
HPLC.

#### REFERENCES:

Biophysical Chemistry by Upadhyay, Upadhyay & Nath

#### Unit -5- Electrophoresis

- a) Basic Principle
- b) Factor affecting electrophoresis mobility
- c) Type of electrophoresis- 1) Free electrophoresis 2) Zone Electrophoresis
- d) The supporting medium
- e) Electrophoresis apparatus (Power pack and electrophoresis unit in General)
- f) General technique of zone electrophoresis:
  - paper electrophoresis
  - Cellulose Acetate
  - Gel electrophoresis-(a) Mode of gel electrophoresis
    - 1. Column electrophoresis
    - 2. Slab gel electrophoresis (Horizontal and Vertical)
  - (b) Agarose, Native PAGE, SDS-PAGE

#### REFERENCES:

1. Biophysical Chemistry by Upadhyay, Upadhyay & Nath
2. Instrumental analysis by Skoog

## UNIT-6 CONCEPT OF BIOSTATISTICS AND ENVIROMENT

### 1. BIOSTATISTICS

- a) Measures of Location-Percentiles, graphic-Histogram, frequency polygon, frequency curve
  - b) Measures of Variance-Mean deviation, Standard deviation, Coefficient Of variation with two examples of each.
2. Environment: Biochemical effect of metals on human body and their Sources- Arsenate and Cyanide.

### REFERENCES:

1. Introduction of Biostatistics-Pranab K Banerje
2. Methods in biostatistics-B K Mahajan
3. Environmental chemistry by B K Sharma
4. Environmental chemistry by M M Chattergy

SARDAR PATEL UNIVERSITY  
S.Y. B.Sc. (BIOCHEMISTRY)  
PRACTICAL SYLLABUS  
COURSE No. US04CBC03

Part: 1.

I. Qualitative Analysis of protein

- Precipitation test of proteins
  1. Mercuric nitrate test
  2. Lead acetate test
  3. Sulphosalicylic test
  4. Potassium ferricyanide test
  5. Tannic acid test
  6. Alcohol test
  7. Heller's test
  8. Ammonium sulphate test.
  
- Qualitative analysis for amino acid
  1. Color reaction for amino acid
  2. Biuret test
  3. Ninhydrine test
  4. Millon's test
  5. Arginine test (Sakaguchi test)
  6. Xanthoproteic test
  7. Hopkins-Cole test

II. Quantitative analysis of fat

1. Test for oil
2. Solubility test
3. Emulsion test
4. Absorption test
5. Glycerol test
6. Acid value of oil
7. Saponification test
8. Iodine test
9. Borax test
10. Liebermann-Burchard test for cholesterol

**PART: 2. COLORIMETRIC ANALYSIS**

11. Estimation of protein by Biuret method.
12. Estimation of protein by Folin Lowry method
13. Estimation of DNA by DPA method
14. Estimation of RNA by Orcinol method
15. Estimation of iron by Wong's method.
16. Separation of amino acids by circular paper chromatography

**PART: 3 TITRAMETRIC ANALYSES**

17. Detection of water alkalinity
18. Detection of water acidity

**REFERENCES:**

1. Laboratory manual in biochemistry by J.Jayaraman Willey eastern Ltd.
2. Practical Biochemistry by David Plummer
3. Fundamentals of biochemistry A Practical approach by Naren Kumar Dutta KANISHKA PUBLISHERS, NEW DELHI.