

1st PROFESSIONAL- SYLLABUS**4) BIOCHEMISTRY**

Syllabus of Biochemistry including Molecular Biology

(i) Goal :

The broad goal of the teaching of Biochemistry to undergraduate students 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 acquired, in solving clinical problems.

(ii) Objectives:**A. Knowledge:**

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

- a) describe the molecular and functional organization of a cell and list its subcellular components;
- b) delineate structure, function and inter-relationship of biomolecules and consequences of deviation from normal;
- c) summarize the fundamental aspects of enzymology and clinical application wherein regulation of enzymatic activity is altered;
- d) describe digestion and assimilation of nutrients and consequences of malnutrition;
- e) integrate the various aspects of metabolism and their regulatory pathways;
- f) explain the biochemical basis of inherited disorders with their associate sequelae;
- g) describe mechanisms involved in maintenance of body fluid and pH homeostasis;
- h) outline the molecular mechanisms of gene expression and regulation, the principles of genetic engineering and their application of medicine;
- i) summarize molecular concept of body defences and their application in medicine;
- j) out line the biochemical basis of environmental health hazards, biochemical basis of cancer and carcinogenesis;
- k) familiarize with the principles of various conventional and specialized laboratory investigations and instrumentation; analysis and interpretation of a given data;
- l) suggest experiments to support theoretical concepts and clinical diagnosis;

B. SKILLS:

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

- a) make use of conventional techniques/instruments to perform biochemical analysis relevant to clinical screening and diagnosis;
- b) analyze and interpret investigative data;
- c) demonstrate the skills of solving scientific and clinical problems and decision making;

C. INTEGRATION:

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

(iii) Syllabus Of Biochemistry
Total hours 240
Theory:

Sl. No.	Name of the Unit	No. of Hours
1.	Introduction to biochemistry	1
2.	Cell- Molecular & functional organisation	2
3.	Chemistry of Carbohydrates:	5
	a) Classification of Carbohydrates:	
	b) Structural and functional aspects of Mono-saccharides, Disaccharides, Homo and Hetero Polysaccharides	
4.	Chemistry of Lipids:	4
	a) Classification	
	b) Structural and functional aspects of simple, compound and Derived lipids including saturated, unsaturated and Essential Fatty acids.	
5.	Chemistry of Proteins:	8
	a) Classification & functional aspects.	
	b) Electrophoretic separation of proteins	
	c) Classification and Properties of amino acids	
	d) Separation of Amino acids by Chromatography	
	e) Outlines of elucidation of Protein Structure.	
	f) Biologically active Peptides	
6.	Nucleic Acids:	4
	a) Bases, nucleotides, Nucleic acids, (structural and functional aspects)	
	b) synthetic nucleotides	
7.	Enzymes:	6
	a) Classification	
	b) Mechanism of Enzyme action	
	c) Enzyme kinetics	
	d) Factors affecting enzyme activity	
	e) Isoenzymes	
	f) Coenzymes	
	g) Enzyme Inhibition	
	h) Cellular & Plasma enzymes	
	i) Diagnostic importance of Enzymes	
	j) Regulation of Enzyme activity	
8.	Biological Oxidation:	4
	a) Bioenergetics	
	b) Exergonic & Endergonic reaction	
	c) Oxidases	
	d) Electron Transport Chain	
	e) Oxidative Phosphorylation	
	f) High energy Compounds	
	g) Low Energy Compounds	
9.	Vitamins:	10
	a) Classification	
	b) Structure, Sources, Daily requirement,	
	Physiological role and deficiency disorders of Fat soluble vitamins – A,D,E,& K and water soluble vitamins-B. complex group and Vit. C.	

10. Carbohydrate Metabolism:	10
a) Digestion	
b) Absorption	
c) Metabolism of Glucose	
i) Entry of Glucose into Cells	
ii) Glycolysis	
iii) Rapaport – Leubering Cycle	
iv) Pyruvate Dehydrogenase Complex	
v) Citric Acid Cycle	
vi) Gluconeogenesis	
vii) Glycogenesis	
viii) Glycogenolysis	
ix) Glycogen Storage Diseases	
x) Hexose Mono Phosphate Shunt Pathway	
xi) Uronic Acid Pathway	
xii) Metabolism of Galactose & Fructose	
xiii) Blood Glucose Homeostasis, Glucose Tolerance Test, Diabetes Mellitus and Hypoglycemia	
11. Metabolism of Proteins:	10
a) Protein Digestion & Absorption	
b) General Pathways of metabolism including	
c) Transamination & Deamination and Ammonia transport	
d) Urea Cycle	
e) Metabolism of individual amino acids & Molecular disorders.	
f) Creatine & Creatinine	
12. Metabolism of Nucleic Acids:	9
a) Outlines of Metabolism of Purines & Pyrimidines & Metabolic disorders	
b) DNA replication and transcription	
c) Protein Biosynthesis (Translation)	
d) Regulation of Gene Expression	
e) Outlines of Genetic Engineering	
13. Lipid Metabolism :	9
a) Digestion & Absorption	
b) Plasma Lipids	
c) Mobilisation of Fats from adipose tissue	
d) Oxidation of Fatty acids	
e) Biosynthesis of Fatty acids	
f) Metabolism of Phospholipids and triacylglycerols	
g) Metabolism of Ketone bodies	
h) Metabolism of Cholesterol	
i) Lipo Proteins – Metabolism and Disorders	
j) Lipotropic factors	
k) Chemistry and metabolism of Prostaglandins.	
14 Hemoglobin structure, Functions and Metabolism, Porphyrins and Hemoglobinopathies Catabolism of heme	4
15 Integration of Metabolism	2
Metabolic integration; liver, adipose tissue, Skeletal Muscle and Brain	

16. Mineral Metabolism	4
Sodium, Potassium, Calcium, Phosphorus, Magnesium, Manganese, Sulphur, Iron, Copper, Zinc, Iodine, Cobalt, Fluorine, Selenium and chromium.	
17. Nutrition :	4
a) Calorific Value	
b) Specific Dynamic Action	
c) Energy Requirements	
d) Balance Diet, Nitrogen balance, Dietary fiber	
e) Food fads	
f) Nutritional disorders kwashiorkor and marasmus	
18. Detoxification:	2
19. Hormones :	5
i) General Principles of Hormonal action	
ii) Outline of Hormone Structure	
iii) Mechanism of Action and metabolic roles of	
a) Pituitary	
b) Pancreas	
c) Adrenal	
d) Gonadal	
e) Thyroid	
20. Functional Tests :	4
a) Renal	
b) Hepatic	
c) Pancreatic	
d) Gastric	
21. Fluid- Electrolyte and Acid - Base Balance	5
22. Plasma Proteins & Immunoglobulins	3
23. Biological Membrane	2
24. Carcinogenesis Malignancy and cell cycle	2

Division of syllabus for university exam

PAPER-I

- Enzymes
- Biological Oxidation
- Digestion and absorption
- Detoxification
- Carbohydrate Chemistry and Metabolism
- Vitamins
- Nutrition
- Lipid Chemistry and Metabolism
- Hemoglobin Structure, functions & metabolism, Porphyrias and Hemoglobinopathies

PAPER-II

- Protein Chemistry and Metabolism
- Mineral metabolism
- Nucleic acid chemistry and metabolism
- Genetics
- Hormones
- Functional tests
- Plasma Proteins and Immunoglobulins
- Biological membranes
- Carcinogens
- Acid-base balance and water – Electrolyte balance

PRACTICALS IN BIOCHEMISTRY:
40 Hrs.
A. Qualitative :

	No.of Practicals
1.Reactions of Carbohydrates	
a) Glucose & Fructose	1
b) lactose, Maltose and sucrose	1
c) Identification of Carbohydrates	1
2.Reactions of Proteins :	
a) Precipitation reactions	1
b) General colour reactions of Proteins and	
c) Albumin and above a&b	1
d) Casein	1
e) Gelatin and peptone	1
f) Identification	2
3.Normal Constituents of Urine	2
4.Abnormal Constituents of Urine	2
Identification of Abnormal Constituents of urine	2

B. Quantitative :

1. Blood glucose	1
2. Blood Urea	1
3. S. Proteins	1
4. Urinary Creatinine	1
5. CSF Analysis	1
a) Proteins (I) Sulphosalicylic acid test (ii) Pandy's test	
b) Glucose	
c) Chlorides	

10 Hrs.
C. Demonstrations :

1. Chromatography
2. Electrophoresis
3. GTT
4. S. Uric acid estimation
5. S. Bilirubin estimation

Revision and conduct of Tests = 5 Practicals
20 Hrs.
Tutorials and group discussions = 10 Practicals
50 Hrs.

NOTE: Each Practical Carries two hours.

RECOMMENDED BOOKS :

1. Review of Biochemistry _ Harper
2. Biochemistry by Debajyoti das
3. Text book of Biochemistry for Medical Students by D.M. Vasudevan & Sreekumari
4. Text book of Medical Biochemistry by M.N.Chatterjea and Rana shinde
5. **Medical Biochemistry by Dinesh Puri**

REFERENCE BOOKS

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| 1. Biochemistry | Lehninger |
| 2. Biochemistry | Stryer |
| 3. Text Book of Clinical Biochemistry | Tietz |
| 4. Clinical Biochemistry | Varley |

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