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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 subcelluar 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.

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(iii) Syllabus Of Biochemistry **Total hours 240**

Theory:

Sl. No.	Name of the Unit	No. of Hours 120
1.	Introduction to biochemistry	1
2.	Cell- Molecular & functional organisation	2
3.	Chemistry of Carbohydrates: a)Classification of Carbohydrates: b)Structural and functional aspects of Mono-saccharides, Disaccharides, Homo and Hetero Polysaccharides	5
4.	Chemistry of Lipids: a)Classification b) Structural and functional aspects of simple, compound and Derived lipids including saturated, unsaturated and Essential Fatty aids.	4
5.	Chemistry of Proteins: a)Classification & functional aspects. b)Electrophoretic separation of proteins c)Classification and Properties of amono aids d)Separation of Amino acids by Chromatography e)Outlines of elucidation of Protein Structure. f) Biologically active Peptides	8
6.	Nucleic Acids: a)Bases, nucleotides, Nucleic acids,(structural and functional aspects) b) synthetic nucleotides	4
7.	Enzymes: 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	6
8.	Biological Oxidation: a)Bioenergetics b)Exergonic & Endergonic reaction c)Oxidases d)Electron Transport Chain e)Oxidative Phosphorylation f) High energy Compounds g) Low Energy Compounds	4
9.	Vitamins: 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

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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 Fatly acids
    e)Biosynthesis of Fatty acids
    f) Metabolism of Phospholipids and triacylgycerols
    g)Metabolism of Ketone bodics
    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, 4
    Porphyrias and Hemoglo Binopathies **Catabolism of home**
15 Integration of Metabolism 2
    Metabolic integration; liver, adipose tissue,
    Skeletal Muscle and Brain

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16. Mineral Metabolism 4
    Sodium, Patassium, 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)Foodfads
    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 Membranse 2
24. Carcinogenesis Malignancy **and cell cycle** 2

Division of syllabus for university exam

PAPER-I

1. Enzymes
2. Biological Oxidation
3. Digestion and absorption
4. Detoxification
5. Carbohydrate Chemistry and Metabolism
6. Vitamins
7. Nutrition
8. Lipid Chemistry and Metabolism
9. Hemoglobin Structure, functions & metabolism, Porphyrias and Hemoglobinopathies

PAPER-II

1. Protein Chemistry and Metabolism
2. Mineral metabolism
3. Nucleic acid chemistry and metabolism
4. Genetics
5. Hormones
6. Functional tests
7. Plasma Proteins and Immunoglobulins
8. Biological membranes
9. Carcinogens
10. Acid-base balance and water – Electrolyte balance

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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 Constitutents 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.

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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

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

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