



Course Syllabus
Gyanmanjari Pharmacy College
Semester-2(B.Pharm.)

Subject: Biochemistry (BPHBP12308)

Type of course: Major

Prerequisite: NA

Rationale: Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
CI	T	P		Theory Marks		Practical Marks	CA	
			ESE	MSE	VP	ALA		
3	-	4	5	75	25	35	15	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V-- Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Chapter No	Course content	Hrs	% Weightage
1.	<p>Carbohydrate metabolism:</p> <ul style="list-style-type: none"> • Introduction, classification, chemical nature and biological role of Carbohydrates. • Glycolysis – Pathway, energetics and significance Citric acid cycle- Pathway, energetics and significance • HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency • Glycogen metabolism Pathways and glycogen storage diseases (GSD) Gluconeogenesis- Pathway and its significance • Hormonal regulation of blood glucose level and Diabetes mellitus 	10	22



	<ul style="list-style-type: none"> • Biological oxidation: Electron transport chain (ETC) and its mechanism. Oxidative phosphorylation & its mechanism and substrate level phosphorylation Inhibitors ETC and oxidative phosphorylation/Uncouplers. 		
2.	<p>Bioenergetics: Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential. Energy rich compounds; classification; biological significances of ATP and cyclic AMP.</p>	6	13
3.	<p>Lipid metabolism:</p> <ul style="list-style-type: none"> • Introduction classification, chemical nature and biological role of lipids. • β-Oxidation of saturated fatty acid (Palmitic acid) Formation and utilization of ketone bodies; ketoacidosis De novo synthesis of fatty acids (Palmitic acid) • Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D • Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity. 	6	13
4.	<p>Amino acid metabolism:</p> <ul style="list-style-type: none"> • Introduction, classification, chemical nature and biological role of amino acids and proteins. • General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders • Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, Albinism, alkaptonuria, tyrosinemia) • Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline • Catabolism of heme; hyperbilirubinemia and jaundice 	6	13
5.	<p>Nucleic acid metabolism and genetic information transfer</p> <ul style="list-style-type: none"> • Introduction, classification, chemical nature and biological role of nucleic acids. • Biosynthesis of purine and pyrimidine nucleotides. • Catabolism of purine nucleotides and Hyperuricemia and Gout disease Organization of mammalian genome • Structure of DNA and RNA and their functions DNA replication (semi conservative model) Transcription or RNA synthesis • Genetic code, Translation or Protein synthesis and inhibitors 	10	22
6.	<p>Enzymes: Introduction, properties, nomenclature and IUB classification of enzymes Enzyme kinetics (Michaelis plot, Line Weaver Burke plot) Enzyme inhibitors with examples, Regulation of Enzymes: enzyme induction and repression, allosteric enzymes regulation, Therapeutic and diagnostic applications of enzymes and isoenzymes, Coenzymes Structure and biochemical functions.</p>	7	17

Continuous Assessment:

(For each activity maximum-minimum range is 5 to 10 marks)

Sr. No	Active Learning Activities	Marks
1.	Identification: Faculty will provide name of some physiological symptoms or disease condition and students find their reasons and give their solution based on metabolites and upload on portal.	5
2.	Think – Pair – Share (Structural configuration of compounds) Faculty will provide name of different pair of name of metabolites and students draw their structure with significances of configuration of its and upload on portal.	5
3.	Case studies: Faculty asks to students to collect any two patient's blood, urine or cholesterol reports and explain it and upload on portal.	5
Total		15

Suggested Specification table with Marks (Theory):75

Distribution of Theory Marks . (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	25%	50 %	15%	05%	05%	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course the students should be able to:	
CO1	Understand importance of metabolism of substrates.
CO2	Acquire knowledge in qualitative and quantitative estimation of the biological macromolecules.
CO3	Know the interpretation of data emanating from a Clinical Test Lab.
CO4	Understand the genetic organization of mammalian genome of DNA and functions of DNA in the synthesis of RNAs and proteins.
CO5	Describe the sample collection procedure to analyse various biochemical parameters.



List of Practical

Sr. No	Descriptions	Unit No	Hrs
1.	Qualitative analysis of carbohydrates (Glucose, Fructose and Lactose)	1	4
2.	Qualitative analysis of carbohydrates (Maltose, Sucrose and starch)	1	4
3.	Identification tests for Proteins (albumin and Casein)	2	4
4.	Quantitative analysis of reducing sugars (DNSA method)	2	4
5.	Quantitative analysis of Proteins (Biuret method)	2	4
6.	Qualitative analysis of urine for abnormal constituents	3	4
7.	Determination of blood creatinine	4	4
8.	Determination of blood sugar	4	4
9.	Determination of serum total cholesterol	5	4
10.	Preparation of buffer solution and measurement of pH	5	4
11.	Study of enzymatic hydrolysis of starch	6	4
12.	Determination of Salivary amylase activity	6	4
13.	Study the effect of Temperature on Salivary amylase activity.	6	4
14.	Study the effect of substrate concentration on salivary amylase activity	6	4
15.	Determination of urea concentration in serum and urine.	6	4
		Total	60

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction. Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory.

The internal evaluation will be done on the basis of Active Learning Assignment.

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.



Reference Books:

- [1] Principles of Biochemistry by Lehninger.
- [2] Fundamentals of Biochemistry: Life at the molecular level by Voet and Voet.
- [3] Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
- [4] Biochemistry by Stryer.
- [5] Biochemistry by D. Satyanarayan and U.Chakrapani
- [6] Textbook of Biochemistry by Rama Rao.
- [7] Textbook of Biochemistry by Deb.
- [8] Outlines of Biochemistry by Conn and Stumpf
- [9] Practical Biochemistry by R.C. Gupta and S. Bhargavan.
- [10] Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
- [11] Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
- [12] Practical Biochemistry by Harold Varley.

