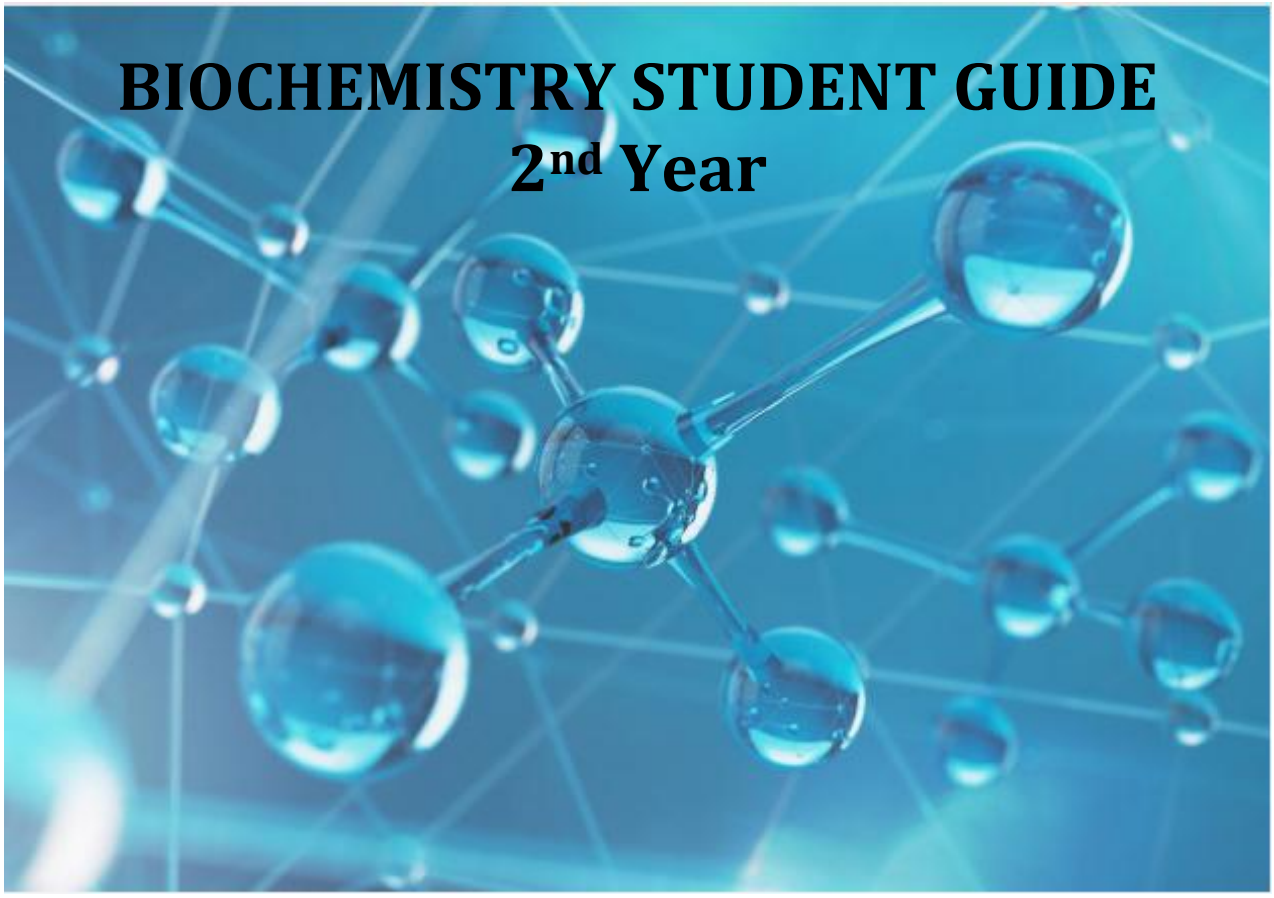
AZIZ FATIMAH MEDICAL & DENTAL COLLEGE



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BIOCHEMISTRY DEPARTMENT IN A GLANCE

Biochemistry is the dynamic, exciting science in which chemistry is applied to the study of the atoms and molecules which comprise living organisms. This includes organic molecules and their chemical reactions. It has revolutionized our understanding of and provides a backbone to modern medicine.

Biochemistry Department at Aziz Fatimah Medical & Dental College has a unique approach to the biochemical sciences that cultivates critical thinking as well as depth of knowledge by exposing its students to the full spectrum of modern biochemistry. The comprehensive teaching and assessment plan is strategically designed according to the UHS and PMC syllabi and guidelines to achieve maximum results.

The strength of Biochemistry Department is its conductive environment and committed staff. The vibrant teaching staff is highly qualified with post graduates degrees and certifications along with vast teaching experience. The department's aim is establishment of research culture and encouragement of student participation in it.

Biochemistry department has a well-equipped laboratory and is managed by qualified and experienced technical staff. Practical training of the subject has been devised and the focus has been shifted to diagnostic biochemistry, in accordance with the UHS syllabi.

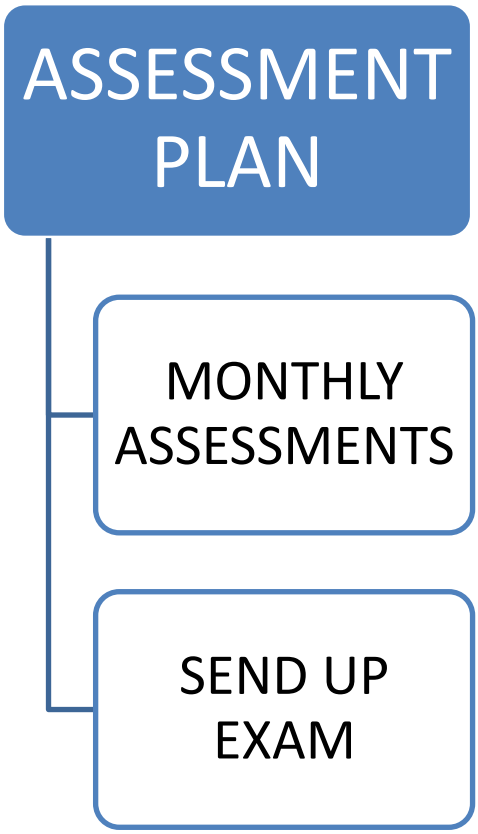
The department follows a proficient and result oriented teaching and assessment plan which includes new and interesting teaching strategies. Learning is made easy by increasing interactive student teacher sessions. Students are evaluated in cognitive, psychomotor and applied domains by conduction of regular formative and summative assessments like multiple choice questions, quizzes, written tests, assignments, presentations and OSPE and oral viva. At the end of each academic year a university standard send-up examination is conducted.

Biochemistry Department Team-

Aziz Fatimah Medical & Dental College

Positions	Name
Head of Department	Prof. Dr. Shakeel Ahmad
Associate Professor	Dr. Saira Saad
Assistant Professor	Dr. Sajjad Ghani
Demonstrators	Dr. Jameel Ahmad
	Dr. Huda
	Dr. Mehwish
	Dr. Urwah
Laboratory Incharge	Miss Qurat-ul-Ain
Laboratory Assistant	Mr. Saleem
Computer Operator	Mr. Ramzan

Assessments



LEARNING OBJECTIVES OF BIOCHEMISTRY

SECOND YEAR M.B.B.S

TOPIC	SUBTOPICS	LEARNING OBJECTIVES
BIOENERGETICS & BIOLOGICAL OXIDATION	**Bioenergetics**	• Discuss endergonic and exergonic reactions, free energy, free energy change, ATP and other compounds as carriers of energy.
	Electron transport chain	• Discuss electron transport chain along with its components and organization.
		• Identify reactions of electron transport chain.
		• Explain redox potential.
		• Describe methods of electron transfer among the components of electron transport chain and energy release during electron transport.
		• Identify Inhibitors and uncouplers of electron transport chain.
	Oxidative phosphorylation	• Elaborate the process of ATP synthesis in ETC.
		• Define chemiosmotic hypothesis of oxidative phosphorylation.
CARBOHYDRATE METABOLISM	**Glycolysis**	• Discuss the reactions of aerobic and anaerobic glycolysis occuring in RBCs and other tissues. • Outline the Biomedical significance and energy yeild of aerobic and anaerobic glycolysis. • Describe sSubstrate level phosphorylation.
		• Discuss the regulation of gycolytic pathway. • Highlight the metabolic fates of pyruvate.
	Citric acid cycle	• Discuss the reactions of TCA cycle and their regulation along with energy yeild.
		• Identify the importance of TCA cycle and its amphibolic role.
	Gluconeogenesis	• Discuss the reactions of gluconeogenesis using pyruvate as precursor and its regulation.
		• Explain the entrance of amino acids into TCA cycle. • Highlight the intermediates of TCA cycle. • Discuss the role of glycerol and other compounds as gluconeogenic precursors.
		• Identify the role of gluconeogenesis in plasma glucose level regulation, cori cycle and glucose alanine cycle.
	Glycogen Metabolism	• Explain the synthesis and importance of UDP glucose.

		• Discuss the reactions of glycogenesis and glycogenolysis.
		• Explain regulation of glycogen synthase and glycogen phosphorylase. • Identify the iImportance of allosteric regulation of glycogen phosphorylase 'a' (a plasma glucose sensor) by plasma glucose.
	HMP Shunt Pathway	• Discuss the reactions of oxidative and nonoxidative phases of HMP pathway.
		• Identify the importance of HMP pathway along with uses of NADPH.
		• Discuss the reactions of uronic acid pathway along with its biologic importance.
	Mono/Disaccharide metabolism	• Explain the metabolism of fructose and galactose. • Discuss sorbitol metabolism. • Describe the synthesis of lactose.
	Blood Glucose Regulation	• Explain the regulation of plasma glucose via hormonal (insulin, glucagon, growth hormone, epinephrine and cortisol) and nonhormonal factors. • Identify the role of various metabolic pathways in glucose level regulation.
		• Discuss hypoglycemia and hyperglycemia along with their important causes and clinical manifestations.
	Clinical diseases	• Discuss Lactic acidosis. • Identify the causes of gGenetic deficiency of pyruvate kinase and pyruvate dehydrogenase. • Explain the disorders of glycogen metabolism. • Highlight the G6PD deficiency. • Identify the effect of hyperglycemia on sorbitol metabolism. • Explain Essential fructosuria and hereditary fructose intolerance. • Describe galactokinase deficiency and classic galactossemia.
	Diabetes mellitus	• Enlist various types of diabetes mellitus along with its clinical manifestations. • Outline the metabolic changes in type 1 and type 2 diabetes mellitus. • Discuss the diagnosis of diabetes mellitus.
BIOCHEMISTRY OF GASTROINTESTINAL TRACT		• Discuss chemical composition, secretion and regulation of various digestive juices (saliva, gastric juice, pancreatic juice, bile and succus entericus).

		• Explain hydrolysis (digestion) of carbohydrates, lipids, proteins and nucleic acids in gastrointestinal tract.
		• Describe absorption of monosaccharides, lipids and amino acids.
		• Discuss achlorhydria, peptic ulcers, lactose intolerance, cholelithiasis and pernicious anemia.

METABOLISM OF LIPIDS	**Fatty acid synthesis**	• Describe production of cytosolic acetyl CoA, fatty acid synthase multienzyme complex, reactions of cytosolic fatty acid synthesis.
		• Describe elongation of fatty acid chain, synthesis of polyunsaturated fatty acids and regulation of fatty acid synthesis.
		• Outline the synthesis and storage of triacylglycerols.
		• Discuss the mobilization of triacylglycerols along with its regulation.
	Fatty acid oxidation	• Define activation of fatty acid. • Discuss the translocation of fatty acyl CoA into mitochondrial matrix. • Describe the reactions of β oxidation of saturated and unsaturated fatty acids along with its energy yield.
		• Outline fate of acetyl CoA. • Describe all the other types of fatty acid oxidation (α oxidation, Ω oxidation and oxidation of odd carbon fatty acids.
	Ketone bodies	• Discuss the reactions of hepatic ketogenesis and utilization of ketone bodies by extrahepatic tissues.
		• Describe ketoacidosis and regulation of ketogenesis.
	Eicosanoids	• Discuss the synthesis of eicosanoids along with its regulation and biologic importance of eicosanoids. • Outline the cycloxygenase and lipoxygenase pathway. • Discuss Inhibitors of COX-1 and COX-2.
	Phospholipids	• Highlight the synthesis of phopholipids (phosphatidylcholine and phosphatidylethanolamine), synthesis of glycerol and ether phospholipids (cardiolipin and platelet activating factor). • Discuss degradation of phospholipids.
	Glycolipids	• Describe biosynthesis of ceramide, sphingomyelin and gangliosides. • Explain degradation of sphingolipids.
	Cholesterol	• Elaborate the reactions and regulation of cholesterol biosynthetic pathway.

		• Identify the fate and functions of cholesterol in the body. • Highlight the biosynthesis and fate of bile acids in the body and their significance in health and disease.
	Lipoproteins	• Discuss the synthesis, transport and fate of chylomicrons, VLDL, IDL, LDL and HDL.
	Clinical diseases	• Explain the effects of deficiency of lung surfactant. • Identify Sphingolipidoses. • Enlist the disorders related with impairment of lipoprotein metabolism. • Highlight the atherogenic effect of oxidized LDL.
METABOLISM OF PROTEINS	**Protein turnover**	• Highlight the process of protein turnover in the body. • Discuss nitrogen balance.
	Amino acid degradation	• Explain the removal of nitrogen from amino acids by transamination and deamination. • Identify the sources of ammonia in the body. • Discuss the fate of ammonia. • Describe the reactions and regulation of urea cycle.
		• Give an overview of amphibolic intermediates formed from the carbon skeletons of amino acids.
		• Outline the concept of glucogenic and ketogenic amino acids. • Discuss metabolism of individual amino acids like glycine, cysteine, arginine, proline, phenylalanine, tyrosine, histidine, tryptophan and methionine.
		• Describe the metabolism of epinephrine and norepinephrine, creatine, creatinine, histamine, gamma aminobutyrate, serotonin, melatonin and melanin.
	Clinical diseases	• Identify ammonia toxicity. • Highlight the diorders of the urea cycle. • Outline the causes and salient features of important metabolic defects in amino acids metabolism like phenylketonuria, maple syrup urine disease, histidinemia, alkaptonuria, cystathioninuria, homocystinuria, hyperprolinemia, cystinuria, cystinosis, tyrosinemias and albinism.
INTEGRATION AND REGULATION OF METABOLIC PATHWAYS		• Highlight basic concepts of intermediary metabolism. • Give an Introduction to anabolic and catabolic pathways.
		• Give an overview of regulation and integration of various metabolic pathways.
WATER , ELECTROLYTE & ACID/BASE BALANCE	**Water regulation**	• Discuss biochemical mechanisms to regulate water and electrolyte balance in the body. • Identify different fluid compartments of the body • Discuss regulation of body water balance.

	Buffers	• Describe body buffer systems. • Highlight the role of kidney and lung in maintenance of acid base balance.
		• Discuss how to assess a patient's fluid status. • Enlist replacement fluids. • Explain ICF imbalances (dehydration and water intoxication) ECF imbalances (hypervolemia and hypervolemia/edema)
	Electrolytes	• Discuss sodium and potassium imbalances
		• Discuss magnesium and chloride imbalances
	Acid/ Base disturbances	• Interpret ABGs. • Discuss Acid base disturbances like respiratory acidosis, metabolic acidosis (lactic and ketoacidosis; repiratory and metabolic alkalosis. • Explain concept of anion gap, base excess and base deficit.
ENDOCRINOLOGY		• Discuss the general features of Group I and Group II hormones.
		• Describe the structure, synthesis, secretion, mechanism of action, receptors and biologic actions and regulation of Steroid hormones
		• Discuss the structure, synthesis, secretion, mechanism of action, receptors and biologic actions and regulation of secretion of hormones that bind to intracellular receptors.
		• Discuss the second messenger, structure, synthesis, secretion, mechanism of action, receptors and biologic actions and regulation of secretion of hormones that bind to cell surface receptors.
		• Discuss dwarfism, gigantism, acromegaly. Hypoparathyroidism and hyperparathyroidism (primary, secondary and tertiary), pseudohyperparathyroidism.
		• Discuss Cushing's syndrome. • Discuss Rickets and osteomalacia. • Discuss Hypogonadism and hypergonadism in males and females.
		• Explain Addisons disease. • Discuss diabetes insipidus and syndrome of inappropriate ADH secretion (SIADH).
		• Elaborate goiter, hypothyroidism, hyperthyroidism, Graves' disease and Pheochromocytoma.

		• Discuss Diabetes mellitus.

METABOLISM OF XENOBIOTICS		• Identify principal classes of xenobiotics of medical relevance. • Discuss phases of metabolism of xenobiotics.
		• Identify the role of cytochrome p450 as most versatile biocatalyst in phase I metabolism of xenobiotics. • Enlist isoforms of cytochrome p450 and properties of human cytochrome p450s. • Explain induction of cytochrome p450 and its clinical implications.
		• Enumerate different types of phase II reactions of xenobiotics.
METABOLISM OF NUCLEOTIDES		• Discuss the de novo synthesis of purines and pyrimidines.
		• Identify Salvage pathways. • Describe degradation of purine and pyrimidine nucleotides.
		• Explain disorders associated with purine and pyrimidine metabolism like adenosine deaminase deficiency, gout, purine nucleoside phosphorylase deficiency, Lesch Nyhan syndorme.
BIOCHEMICAL GENETICS	**DNA Replication**	• Identify the structural basis of cellular information. • Discuss the reactions of DNA replication in eukaryotes and prokaryotes.
		• Discuss types of damage to DNA and DNA repair.
	Transcription	• Describe the steps in the transcription of eukaryotic and prokaryotic genes. • Explain reverse transcription in retroviruses.
		• Describe post transcriptional modifications (processing) of RNA.
		• Explain AIDS
	Translation	• Identify the genetic code and components required for translation. • Outline composition of eukaryotic and prokaryotic ribosomes.
		• Discuss steps in protein synthesis.
		• Explain post translational modifications.
		• Identify the genetic basis of disease and mutations.
	Regulation of gene expression	• Discuss the regulation of gene expression in prokaryotes and eukaryotes. • Highlight gene amplification.
		• Identify oncogenes and their role in carcinogenesis.

		• Highlight the mechanism of activation of protooncogenes. • Elaborate the mechanism of action of oncogenes, oncogenic viruses & tumor markers.
	Techniques	• Discuss basic information and biomedical importance of molecular biology techniques. • Highlight DNA isolation, recombinant DNA technology, cloning, polymerase chain reaction, hybridization and blotting techniques.
		• Identify the role of biotechnology in screening, diagnosis, therapeutics and forensic evidence.

TEXTBOOKS AND REFERENCES

1. Champe, P.C. & Harvey, E.A. (2017). Biochemistry (Lippincott's Illustrated Reviews), 7nd edition. J.B Lippincort Co.
2. Harper's Biochemistry – 30th Ed
3. Texbook of medical Biochemistry by MN Chatterjea – 8th Ed
4. Biochemistry by Stryer – 7th Ed
5. Marks, D.B., Marks, A.D. & Smith, C.M. (2005). Basic Medical Biochemistry: A Clinical Approach. 2nd edition. Williams and Wilkins Co.: Baltimore.
6. Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell. (2005). Harper's Biochemistry. 26th edition. McGraw-Hill

TABLE OF SPECIFICATIONS FOR BIOCHEMISTRY

THEORY PAPER SECOND PROFESSIONAL

CONTENTS		SEQs	MCQs
1.	Bioenergetics & Biological Oxidation	0.5	2
2.	Carbohydrate Metabolism	1.5	6
3.	Lipid Metabolism	1.5	6
4.	Metabolism of Proteins and Amino acids	1.5	6
5.	Metabolism of Purines, Pyrimidines and Nucleotides	0.5	2
6.	Replication of DNA, mutations and DNA repair	0.5	3
7.	Transcription, RNA processing and proteins synthesis, Regulation of gene expression, genetic diseases and basic techniques used in molecular genetics.	0.5	3 3
8.	Endocrinology	1.0	6
9.	Biochemistry of digestive juices of GIT, digestion & absorption in GIT	0.5	3
10.	Oncogenesis and metabolism of Xenobiotics	0.5	3
11.	Water & Electrolyte balance; Acid- base regulation	0.5	2
TOTAL ITEMS		**09 SEQs**	**45 MCQs**
TOTAL MARKS		**45 Marks**	**45 Marks**

25% of MCQs and SEQs should be clinically oriented or problem- based.

10% *marks are allocated for 'Internal Assessment'*

Total marks for theory paper: SEQ+ MCQ + Internal Assessment = 45 +45+10=***100 Marks***

ORAL AND PRACTICAL EXAMINATION FIRST PROFESSIONAL

Oral and practical examination carries 100 marks.

EXAMINATION COMPONENT		MARKS
A	**Internal Assessment**	10
B	**Practical notebook manual (Internal Examiner)**	05
C	**Viva voce** a) External Examiner: 25 Marks b) Internal Examiner: 25 Marks	50
D	**OSPE** a) Observed stations (6 Marks) b) Non-Observed Station (16 Marks)	22
E	**Practical** a) Principle &supposed calculation: 4 Marks b) Performance: 4 Marks c) Structured Table viva (External Examiner): 5 Marks	13


Thank You