EKLAVYA UNIVERSITY, DAMOH (M.P.)

Scheme of Examination B.Sc II Year

/For batch admitted in Academic Session 2020-21/

Subject wise distribution of marks and corresponding credits

S. No.	Subject Name	Subject Code	Paper Name	Maximum Marks Allotted											Total Marks	Contact Periods Per week			Total Credits
				Theory Slot									Practical Slot						
				Final Yearly				Half Yearly				Quiz/ Assignment/ Attendence	End Sem	Lab Work/ Sessional		L	T	P	
				P1	P2	P3	P4	P1	P2	P3	P4								
1	Common	BPIND20Y201	Summer Project/Industrial Training												150	0	0	0	11
		BSECA20Y201	Skill Enhancement Course (SEC-1)	60				30				10			100	2	0	0	2
		BSECB20Y202	Skill Enhancement Course (SEC-2)	60				30				10			100	4	0	0	4
		BYOGA20Y201	Yoga- 2 (University Core)	–	–	–		–	–	–		–	60	40	100	2	0	0	2
2	Biochemistry	BBIOC20Y201	Enzymology (Paper- I) (Core Course - 6A)	30				15				5			50	3	1	0	4
		BBIOC20Y202	Intermediary Metabolism (Paper- II) (Core Course - 6B)		30				15						50	3	1	0	4
		BBIOC20Y203	Paper- I and Paper II, Practical (Practical 6 A & 6 B, Core Course 6C)										30	20	50	0	0	2	2
		BBIOC20Y204	Cell Structure and Biology (Paper- III) (Core Course - 6D, for Honors)			30				15		5			50	3	1	0	4
		BBIOC20Y205	Paper- III, Practical (Practical 6 D for Honours, core coure 6E)										30	20	50	0	0	1	1
3	Common	BASPR20Y201	Assingment Presentation for 3 Core Courses											50	50	0	3	0	3

Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiencey Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.

Sharma Mehra Megha

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Estd. by Madhya Pradesh Niji Vishwavidyalaya (Sthapna Avam Sanchalanat) Adhyadesh, 2020

School of Basic and Applied Sciences

Class	**B.Sc. Biochemistry**
Semester/Year	**II Year**
Subject & Paper Code	**Biochemistry - BBIOC20Y201**
Paper	**Enzymology (Paper- I)**
Max. Marks	**30 (ETE) + 20(IA) = 50**

Credit			Total Credits
L	T	P	4
3	1	0	

Course Objectives:

This course has been designed to teach the student majoring in science all the major aspects of the study of enzymes. The course focuses on the theories of enzyme kinetics, the mechanisms of enzyme catalysis, and the mechanisms of enzyme regulation in the cell.

Course Outcome:

At the end of the course, learners will be able to:

1. Define differences between enzymes and normal catalytic substances recognize the catalytic substances.
2. Explain chemical structure of enzymes .
3. Recognize the enzymes chemical structure .
4. Explain cofactor and coenzymes chemical structure.
5. Recognize chemical structures of biological cofactor and coenzymes.
6. Express Important coenzymes and the groups they transfer.
7. Recognize biologic coenzymesexplain activity of catalytic center.
8. Recognize catalytic centerdefine factors that effect enzyme activity

Student Learning Outcomes (SLO):

Students will:

1. Describe and use the equations of enzyme kinetics.
2. Describe the methods used in enzyme kinetics.
3. Describe the principles of enzyme inhibition.
4. Describe the mechanisms of enzyme catalysis.
5. Describe the catalytic mechanisms employed by the most well-characterized enzymes.
6. Describe the mechanisms of enzyme regulation

Unit	Syllabus	Periods

UNIT - I	Introduction: Definition, general characteristics, nomenclature, IUB enzyme classification(rationale, overview and specific examples), significance of numbering system.Definitions and examples of holoenzymes, apoenzymes, coenzymes, cofactors, activators, inhibitors, active site (identification of group excluded), metallo-enzymes, units of enzyme activity, specific enzymes, isoenzymes, monomeric enzymes, oligomeric enzymes and multi• enzyme complexes.Enzyme specificity.	15
UNIT - II	Nature of non-enzymatic and enzymatic catalysis: Measurements and expression of enzyme activity -enzyme assays; Definition of IU, Katal, enzyme turn over number and specific activity. Role of non-protein organic molecules and inorganic ions-coenzymes, prosthetic groups. Role of vitamins as coenzyme precursors (general treatment).Enzyme purification: Methods for isolation, purification and characterization of enzymes.	15
UNIT - III	Enzyme catalysis: Role of cofactors in enzyme catalysis: NAD/ NADP', FMN/ FAD, coenzyme A, biocytin, cobamide, lipoamide, TPP, pyridoxal phosphate, tetrahydrofolate and metal ions with special emphasis on coenzyme functions.Acid-base catalysis, covalent catalysis, proximity and orientation effects, strain and distortion theory. Mechanism of action of chymotrypsin, carboxypeptidase, ribonuclease and lysozyme.	15
UNIT - IV	Enzyme kinetics: Factors affecting enzyme activity- enzyme concentration, substrate concentration and temperature. Derivation of Michaelis-Menten equation for uni-substrate reactions. Km and its significance.Kinetics of zero and first order reactions.Reversible and irreversible inhibition, competitive, non-competitive and uncompetitive inhibition, determination of Km and Vmax in presence and absence of inhibitor; Allosteric enzymes	15
UNIT - V	Industrial ad clinical applications of enzymes.Immobilization of enzymes and their industrial applications.Production of glucose from starch, cellulose and dextran; Use of lactase in dairy industry; Production of glucose-fructose syrup from sucrose; Use of proteases in food, detergent and leather industry; Medical applications of enzymes; Use of glucose oxidase in enzyme electrodes.	15

References:

1 Textbook of Biochemistry by West E.S. Todd W.R., Mason H.S. and Bruggen J.T.V. . Oxford and IBH Publishing House.

2 Biochemistry by U.Satyanarayana.

3 Rastogi Publications by Gupta S.N. Biochemistry .

4 Biochemistry Wiley lnterscience Publishers by Voet and Voet. .

5 Conn E.E., stumpf P.K., Bruening G., and Doi R.H. Outlines of Biochemistry. J. ohn Wiley and Sons.

6 Murray R.K., Mayes PA., Granner D.K., Rodwell V.W. Harper's Biochemistry. Tata McGraw Hill.

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School of Basic and Applied Sciences

Class				**B.Sc. Biochemistry**
Semester/Year				**II Year**
Subject & Paper Code				**Biochemistry - BBIOC20Y202**
Paper				**Intermediary Metabolism (Paper- II)**
Max. Marks				30 (ETE) + 20 (IA) = 50
Credit			**Total Credits**	
L	**T**	**P**	4	
3	1	0		

Course Objectives:

Intermediary metabolism means how the cells extract and utilize energy through numerous enzyme-catalyzed reactions.
The students will learn the interrelated aspects.

Course Outcome:

At the end of the course, learners will be able to:
1. To explain the major catabolic and anabolic pathways by which human cell types metabolize carbohydrates, lipids, amino acids and nucleotides.
2. To recall the key regulatory points in human metabolic pathways.
3. To explain how diet and hormonal signaling regulate major human metabolic pathways.
4.To recognize the role of vitamins and minerals in intermediary metabolism.
5. To describe how vitamin deficiencies impact human metabolism and pathophysiology.

Student Learning Outcomes (SLO):

Students will:
1. Be able to learn General features of metabolism.
2. Correlate how the living organisms exchange energy and matter with the surroundings for their survival, and store free energy in the form of energy-rich compounds
3. Recognize how the catabolic breakdown of the substances is associated with release of free energy; whereas, free energy is utilized during synthesis of biomolecules i.e., anabolic pathways.
4. Assess the crucial role of some hormones with regard to the integration of metabolic pathways.
5. Apply the knowledge of metabolic pathways to biotechnological and biochemical research.

Unit	Syllabus	Periods
UNIT - I	Introduction to Metabolism: General features of metabolism. Experimental approaches to study metabolism: use of intact organism, bacterial mutants, tissue slices, stable and radioactive isotopes.Carbohydrate metabolism: Reactions and energetics of glycolysis; Alcoholic and lactic acid fermentation; Reaction and energetics of TCA cycle; Regulation of glycolysis and TCA cycle. Gluconeogenesis, glycogenesis and glycogenolysis. Reaction and physiological significance of pentose phosphate pathway.	15

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Amit Megha

UNIT - II	Electron transport chain and oxidative phosphorylation: Structure of mitochondria, sequence of electron carriers, sites of ATP production, inhibitors of electron transport chain.Hypothesis of mitochondrial oxidative phosphorylation (Basic concepts): Inhibitors and uncouplers of oxidative phosphorylation. Transport of reducing potentials into mitochondria.	15
UNIT - III	Lipid metabolism: Introduction, hydrolysis of triacylglycerols, transport of fatty acid into mitochondria, [-oxidation of saturated fatty acids, ATP yield from fatty acids oxidation.Biosynthesis of saturated and unsaturated fatty acids. Metabolism of ketone bodies, oxidationof unsaturated and odd chain fatty acids. Outlines of biosynthesis of triglycerides and important phospholipids, glycolipids, sphingolipids and cholesterol.Regulation of cholesterol biosynthesis	15
UNIT - IV	Amin acid Metabolism: General reaction of amino acids metabolism: Transamination, oxidative deamination and decarboxylation.Urea cycle Degradation and biosynthesis of amino acids. Glycogenic and ketogenic amino acids.	15
UNIT - V	Nucleotide Metabolism: Sources of the atoms in the purine and pyrimidine molecules.Biosynthesis and degradation of purines and pyrimidines. Regulation of purine and pyrimidine biosynthesis. Porphyrin Metabolism: Biosynthesis and degradation of pophyrins. Production of bile pigments.	15

References:

1. Mathews von Holde. Biochemistry. Pearson Education Publishers.

2.Talwar, Hasnain and Sarin. Text Book of Biochemistry, Biotechnology, Allied and Molecular Biology. PHI Learning.

3.Powar C.B. and Chatwal. Biochemistry. Himalaya Publishing House,

4.Swarup, Pathak and Arora. Laboratory Techniques in Modern Biology. Kalyani Publishers.

5.Sadasivam S. and Manickam A. Biochemical Methods. New Age International Publishers.

6.Gupta R.C. and Bhargava S. Practical Biochemistry. CBS Publishers and Distributors.

7.Plummer D.T. An Introduction to Practical Biochemistry. Tata McGraw Hill Publishing Company.

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School of Basic and Applied Sciences

Class	**B.Sc. Biochemistry**
Semester/Year	**II Year**
Subject & Paper Code	**Practical Biochemistry - BBIOC20Y203**
Paper	**Paper- I and Paper II, Practical**
Max. Marks	**50= (30+20) (ETE + IA)**

L	T	P	
0	0	2	2

PRACTICALS

1 Separation of blood plasma and serum.

2 (a) Estimation of protein from serum by Biuret and Lowry methods
(b) Determination of albumin and A/G ratio in serum.

3 Estimation of bilirubin conjugated and unconjugated in serum.

4 (a) Estimation of lipids in serum by Vanillin method
(b) Estimation of cholesterol in serum.

5 Estimation of lipoproteins in plasma.

6 Estimation of blood urea nitrogen from plasma.

7 Separation ad identification of amino acids by
(a) paper chromatography and
(b) thin layer chromatography

8 Separation of polar and non-polar lipids by thin layer chromatography.

9 (a) Assay of serum alkaline phosphatase activity
(b) Inhibition of alkaline phosphatase activity by EDTA
(c) Effect of substrate concentration on alkaline phosphatase activity and determination of its Km value.

10 (a) Effect of temperature on enzyme activity and determination of activation energy .
(b) Effect of pH on enzyme activity and determination of optimum pH
(c) Effect of enzyme concentration on enzyme activity.

11 (a) Preparation of starch from potato and its hydrolysis by salivary amylase.
(b) Determination of achromatic point in salivary amylase (c) Effect of sodium chloride on amylases.

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School of Basic and Applied Sciences

Class				**B.Sc. Biochemistry (Honours)**
Semester/Year				**II Year**
Subject & Subject Code				**Biotechnology Honours- BBIOC20Y204**
Paper				**Cell Structure and Biology (Paper- III)**
Max. Marks				30 (ETE) + 20(IA) = 50
Credit			**Total Credits**	
L	**T**	**P**	4	
3	1	0		

Course Objectives:

Students will understand the structures and purposes of various components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles . Students will understand how these cellular components are used to generate and utilize energy in cells. Students will understand the cellular components underlying mitotic cell division. Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function. These can include responses to environmental or physiological changes, or alterations of cell function brought about by mutation.

Course Outcome:

At the end of the course, learners will be able to:
1:To understand the basic unit of the organism.
2:To differentiate the organisms by its cell structure.
3:To know Components of the Cell and their division.
4:To Understand about the Nucleic acids.
5:To know the structure of nucleic acid, types of Nucleic acid and its Forms.
6:To explain genome organization in Prokaryotes and Eukaryotes.

Student Learning Outcomes (SLO):

Students will:
1.Understand and utilize the scientific vocabulary used in communicating information in cell and molecular biology
2.Understand and apply general concepts of cell and molecular biology to relevant, specific problems
3. Describe and discuss the properties and biological significance of the major classes of molecules found in living organisms and the relationship between molecular structure and biological function
4. Represent and illustrate the structural organization of genes and the control of gene expression
5. Conceptualize and describe protein structure, folding and sorting
6. Explain the structure of membranes and intracellular compartments and relate to their function.
7. Summarize the processes of energy transduction in cells and explain their significance.

Unit	Syllabus	Periods

UNIT - I	Cell Structure Theory, Structure of Prokaryotic cell, Eubacteria and Archaebacteria. Size, Shape and arrangement of bacterial cells. Gram's positive and Gram's negative bacterial cell. Difference between prokaryotic and eukaryotic cells.	15
UNIT - II	Structure and function of bacterial cell - flagella, pili. Cell wall, cytoplasmic membrane Nuclear region. Mesosomes, ribosomes, vacuoles. Metachromatic granules. Spores and cysts. Structure and function of eukaryotic cell - Cell wall, cell membrane, mitochondria, chloroplast, endoplamic reticulum, Golgi bodies, nucleus, cytokeleton, microbodies, Centriole, Lysosome.	15
UNIT - III	Cell cycle and cell division – mitosis,meiosis. Anomalies in cell division and associated diseases. Cell synchrony, Cell -Cell interactions, Cell locomotion, Cell differentiation.	15
UNIT - IV	Transport Process - Membrane : Models of membrane structure, Membrane proteins and their properties Membrane carbohydrates and their roles. Transport across membrances. Active and passive diffusion and its mechanisms.	15
UNIT - V	Introduction to Necrosis, Senescence. Apoptosis - Programmed cell death. Mechanism of Apoptosis, Intrinsic & Extrinsic pathways of cell death, Apoptosis in relation to Cancer, Oncogenes - Types of cancer.	15

References:

1 Benjamin Lewin, GeneVII, Oxford University Press, (2000).

2 BruceAlberts,AlexanderJohnson,JulianLewis,MartinRaff,KeithRoberts,PeterWalter, Molecular biologyoftheCell, 4th Edition. Garland publishing Inc. (2002).

3 Darnell,LodishandBaltimore, MolecularCellBiology, ScientificAmericanPublishingInc. (2000).

4 Watson.J.D,Baker.T.A,Bell.S.P,Gann.A.Levine.M.Losick.R, Molecular BiologyofGene, 5th Edition. The Benjamin/CummingsPub.Co.Inc. (2003).

5 BrownT.A., GeneCloningand DNA analysis. 2nd Edition,ASMpress. (2004).

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School of Basic and Applied Sciences

Class				**B.Sc. Biochemistry (Honours)**
Semester/Year				**II Year**
Subject & Subject Code				**Practical Biochemistry Honours - BBIOC20Y205**
Paper				**Paper- III, Practical**
Max. Marks				**50= (30+20)** (ETE+IA)
L	**T**	**P**	**1**	
0	0	1		

PRACTICALS

1 To study the plant cell structure using various plant materials.

2 Prepare slide for study of stomata.

3 Demonstration of Osmosis.

4 Study of plasmolysis and de-plasmolysis.

5 Study of structure of any prokaryotic and Eukaryotic cell.

6 Cell division in onion root tip/Allium cipa.

7 Isolation of Microbes from Air, Water and Soil.

8 To Study microbial cell by Monochrome staining and Gram staining.

Sharma

Megha