

Integral University, Lucknow

**Department of Biosciences
B.Sc. (Hons.) (Biochemistry)**

(w.e.f 2018-2019)

Department of Biosciences Evaluation Scheme
B. Sc. (Hons.) Biochemistry Semester – I Choice Based Credit System (CBCS)
(w.e.f 2018-2019)

Course Code	Course Title	Type of Paper	Periods/Week			Evaluation Scheme				Maximum Marks	Credits	Total Credit
			L	T	P	CT	TA	Total	ESE			
LN104	Essential Professional Communication	Foundation	3	1	0	25	15	40	60	100	3:1:0	4
MT106	Mathematics	Foundation	3	1	0	25	15	40	60	100	3:1:0	4
CS109	Concept of Computers	Foundation	3	1	0	25	15	40	60	100	3:1:0	4
CH112	Fundamental of Inorganic Chemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS112	Fundamentals of Biochemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4
CH113	Chemistry Lab-I	Practical	0	0	6	25	15	40	60	100	0:0:3	3
BS141	Biochemistry Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3
	Total									700		26

B. Sc. (Hons.) Biochemistry Semester – II
(w.e.f 2018-2019)

Course Code	Course Title	Type of Paper	Periods/week			Evaluation Scheme				Maximum Marks	Credits	Total Credit
			L	T	P	CT	TA	Total	ESE			
ES115	Fundamentals of Environmental Studies	Foundation	3	1	0	25	15	40	60	100	3:1:0	4
CH114	Fundamental of Organic Chemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS232	Plant Physiology	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS233	Animal Physiology	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS113	Fundamentals of Microbiology	Core	3	1	0	25	15	40	60	100	3:1:0	4
CH115	Chemistry Lab-II	Practical	0	0	6	25	15	40	60	100	0:0:3	3
BS205	Microbiology lab.	Practical	0	0	6	25	15	40	60	100	0:0:3	3
		Total								700	26	26

**B. Sc. (Hons.) Biochemistry Semester – III
(w.e.f 2019-2020)**

Course Code	Course Title	Type of Paper	Periods/Week			Evaluation Scheme				Subject Total	Credit Hours	Total Credit
			L	T	P	CT	TA	Total	ESE			
CH215	Fundamentals of Physical Chemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS202	Biophysical Chemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS241	Fundamentals of Genetics	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS242	Introduction to Cell Biology	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS243	Fundamentals of Bioinformatics	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS244	Physiology Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3
BS206	Cell Biology & Genetics Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3
	Total									700	26	26

**B. Sc. (Hons.) Biochemistry Semester – IV
(w.e.f 2019-2020)**

Course Code	Course Title	Type of Paper	Periods/Week			Evaluation Scheme				Subject Total	Credit Hours	Total Credit
			L	T	P	CT	TA	Total	ESE			
BS251	Enzymes and Hormones	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS212	Molecular Biology	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS252	Clinical Biochemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS253	Fundamentals of Plant Biochemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS201	Metabolism	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS255	Enzymology Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3
BS308	Genetic Engineering Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3
			Total							700	26	26

B. Sc. (Hons.) Biochemistry Semester – V
(w.e.f 2020-2021)

Course Code	Course Title	Type of Paper	Periods/Week			Evaluation Scheme				Subject Total	Credit Hours	Total Credit
			L	T	P	CT	TA	Total	ESE			
BS211	Immunology	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS341	Nutritional Biochemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS303	Genetic Engineering	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS306	Applied Biotechnology	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS305	Electives: (Any one of the following) Genomics, Proteomics & Metabolomics	Elective	3	1	0	25	15	40	60	100	3:1:0	4
BS342	Introduction to Tissue culture technologies											
BS343	Tissue Culture & Bioinformatics Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3
BS216	Immunology Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3
		Total								700	26	26

**B.Sc. (Hons.) Biochemistry Semester – VI
(w.e.f 2020-2021)**

Course Code	Course Title	Type of Paper	Periods/week			Evaluation scheme				Subject Total	Credit Hours	Total Credit
			L	T	P	CT	TA	Total	ESE			
BS204	IPR & Biosafety	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS312	Elective courses (Any one of the following)	Elective	3	1	0	25	15	40	60	100	3:1:0	4
BS351	Human Physiology											
BS352	Seminar Presentation	Practical	0	0	4	25	15	40	60	100	0:0:2	2
BS315	Project & Training* (3 months)		3 Months						300	0:0:4	4	
BS316	Educational Tour (8-10 days)								100	0:0:2	2	
	Total								700	16	16	

*** The Evaluation scheme for the Project Work**

	Course Code	Dissertation	Presentation	Viva/Discussion	Total
Project Work	BS315	200	50	50	300

Credit Précis

S.No.	Semester	Total Marks	Total Credit
1	I	700	26
2	II	700	26
3	III	700	26
4	IV	700	26
5	V	700	26
6	VI	700	16
Grand Total	-	4200	146

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

B.Sc. BC II yr
Subject Name: Fundamentals of Genetics

III sem
Subject Code: BS241

(w.e.f 2019-2020)

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3 1 0

- UNIT I** **8**
Genetics of bacteria and viruses: Mechanism of genetic exchange - conjugation, transformation and transduction. Gene mapping in bacteria.
- UNIT II** **8**
The genetic control of development and sex determination: Model organism for genetic analysis, Drosophila development, maternal effect genes, morphogens and zygotic gene activity in development, sex chromosomes and sex determination, dosage compensation of X-linked genes.
- UNIT III** **8**
Chromosomes: Structural Organization: centromere, telomere, chromonema, euchromatin and heterochromatin, chemical composition and karyotype, nucleosome model, Special types of chromosomes: Salivary gland and Lampbrush chromosomes, Chromosomal Variations, Chromosome mapping, structural and numerical aberrations.
- UNIT IV** **8**
Mendelism: Mendel's laws of heredity, Test cross, Incomplete dominance and simple problems, Interaction of Genes: Supplementary factors, Comb pattern in fowls, Complementary genes: Flower color in sweet peas, Multiple factors: Skin color in human beings, Epistasis: Plumage colour in poultry, Multiple allelism: Blood groups in human beings, Concepts of allosomes and autosomes, XX-XY, XX-XO, ZW-ZZ, ZO-ZZ type, Linkage and Crossing Over, Mechanism and importance.
- UNIT V** **8**
Mutations: Spontaneous and induced mutations, Physical and chemical mutagens, Mutation at the molecular level, Mutations in plants, animals, and microbes for economic benefit of man. Human Genetics: Karyotype in man, inherited disorders: Allosomal (Klinefelter syndrome and Turner's syndrome), Autosomal (Down syndrome and Cri-Du-Chat syndrome). DNA Damage and Repair: Causes and Types of DNA damage, Major mechanisms of DNA repair: photoreactivation, nucleotide and base excision repairs, mismatch repair, SOS repair.

Suggested Reading:

1. Genetics (2012) 6th ed., Snustad, D.P. and Simmons, M.J., John Wiley & Sons. (Singapore), ISBN: 978-1-118-09242-2.
2. Genetics - A Conceptual Approach (2012), 4th ed., Pierce, B.A., W.H. Freeman & Co. (New York), ISBN:13:978-1-4292-7606-1 / ISBN:10:1-4292-7606-1.
3. An Introduction to Genetic Analysis (2010), 10th ed., Griffiths, A.J.F, Wessler, S. R, Carroll, S. B. and Doebley, J., W.H. Freeman & Company (New York), ISBN:10: 1- 4292-2943-8.
4. Molecular Cell Biology – Daniel, Scientific American Books.
5. Principles of Gene Manipulations – Old & Primrose, Black Well Scientific Publications.

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

B.Sc. BC /BT/ LS II yr

Subject Name: Fundamentals of Physical Chemistry

III sem

Subject Code: CH215

(w.e.f 2019-2020)

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3 1 0

UNIT I

8

Chemical kinetics: Rate of a reaction, factors influencing the rate of a reaction concentration, temperature, pressure, solvent, light, catalyst concentration dependence of rates, mathematical characteristics of simple chemical reactions- First & second order, half life. Determination of the order of reaction (integration method). Arrhenius equation, concept of activation energy.

UNIT-II

8

Thermodynamics: Definition and explanation of terms - System, boundary, surroundings, Homogeneous and heterogeneous system, Isolated system, Closed system, Open system Intensive and extensive properties. First law of thermodynamics; Statement and equation - Cp, Cv relationship - calculation of W, Q, ΔE and ΔH for the expansion of ideal gases under reversible - isothermal and adiabatic conditions.

UNIT-III

8

Electrochemistry: Galvanic cells, Electrode potential, Standard electrode potential, Nernt's equation, Electrochemical series and its applications; measurement of pH, Solubility and solubility product and its applications.

UNIT-IV

8

Gaseous state: Ideal and real gases, Causes of deviation from ideal behaviour, van der Waal's equation and their limitations, Kinetic gas equation, deduction of gas laws from the kinetic gas equation, Kinds of velocities; average velocity, root mean square velocity, most probable velocity, Calculation of molecular velocities.

UNIT-V

8

Colligative Properties: Lowering of vapour pressure, Raoult's law, Determination of molecular mass of solute from lowering of vapour pressure, Elevation of boiling point, Relation between elevation of boiling point and lowering of vapour pressure, Determination of molecular mass of solute from elevation of boiling point, Depression of freezing point, Relation between depression of freezing point and lowering of vapour pressure, Determination of molecular mass of solute from depression of freezing point, Osmosis and osmotic pressure, van't Hoff's equation.

Suggested Reading:

1. Essentials of Physical Chemistry, Bahl & Tuli, S. Chand & Co. Ltd.
2. Principles of Physical Chemistry, Puri, Sharma & Pathania, Vishal Publishing Co.
3. Simplified course in Physical Chemistry, Madan & Tuli, S. Chand & Co. Ltd.
4. Atkin's Physical Chemistry, Atkin, Oxford Press.
5. Physical Chemistry, Vemulapalli, Prentice Hall of India
6. Modern Physical Chemistry, R.P. Rastogi et al. United Book Department, Allahabad.

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

B.Sc. BT/BC II yr
B.Sc LS II yr
B.Sc ZBC III yr
Subject Name: Biophysical Chemistry

III sem
IV sem
VI sem
Subject Code: BS202

(w.e.f 2019-2020)

	L T P
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UNIT I	8
Basics of Biophysics, Chemical bonding – Ionic bond, covalent bond, hydrogen bond and peptide bond, Vander-Waals forces, Principles of thermodynamics.	
UNIT II	8
Analytical techniques: Spectrophotometry and colorimetry, Spectroscopic techniques: UV-visible spectroscopy, NMR, IR, Fluorescence and atomic absorption spectroscopy, X-ray crystallography.	
UNIT III	8
Chromatography: Paper, thin-layer, column, HPLC, GLC and molecular sieving.	
UNIT IV	8
Centrifugation: Principles, types, instrumentation and applications. Electrophoresis: Principles and applications (PAGE and Agarose gel electrophoresis).	
UNIT V	8
Radioactivity: Types, their importance in biological studies, measure of radioactivity, GM counters and Scintillation counting.	

Suggested Reading:

1. Narayanan, P (2000) Essentials of Biophysics, New Age Int. Pub. New Delhi.
2. Bliss, C.J.K (1967) Statistics in Biology, Vol. I c Graw Hill, New York.
3. Campbell R.C (1974) Statistics for Biologists, Cambridge Univ. Press, Cambridge.
4. Daniel (1999) Biostatistics (3rd Edition) Panima Publishing Corporation.
5. Swardlaw, A.C (1985) Practical Statistics for Experimental Biologists, John Wiley and Sons, Inc. NY
6. Khan (1999) Fundamentals of Biostatistics Publishing Corporation
7. Roy R.N. (1999) A Text Book of Biophysics New Central Book Agency.

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

B.Sc. BC II yr

III sem

Subject Name: Introduction to Cell Biology

Subject Code: BS242

(w.e.f 2019-2020)

L T P
3 1 0

UNIT 1

8

Introduction and tools of cell biology: Prokaryotic (archaea and eubacteria) and eukaryotic cells (animal and plant cells), Light microscopy, phase contrast microscopy, fluorescence microscopy, confocal microscopy, electron microscopy.

UNIT 2

8

Intracellular organization: Cell Membrane and Permeability: Chemical components and organization of biological membranes, Fluid Mosaic Model and membrane transport. Structure and functions of organelles: nucleus, ER, Golgi, Lysosome, mitochondria, chloroplasts and peroxisomes. Zellweger syndrome.

UNIT 3

8

Cytoskeletal proteins and protein targeting: Structure and organization of actin filaments. Intermediate filament proteins, Microtubules: assembly and intracellular organization. Organization and movement of cilia and flagella. concept of protein targeting.

UNIT 4

8

Cell wall and extracellular matrix: Prokaryotic and eukaryotic cell wall, cell matrix proteins. Cell-matrix interactions and cell-cell interactions. Adherence junctions, tight junctions, gap junctions, desmosomes, hemidesmosomes, focal adhesions and plasmodesmata. Basics of signal transduction, Role of cAMP, G-proteins and inositol phosphates in signal transduction.

UNIT 5

8

Cell cycle, cell death and cell renewal: Eukaryotic cell cycle, restriction point, and checkpoints. Cell division: Mitosis and Meiosis. Apoptosis and necrosis - brief outline.

Suggested Reading:

1. The Cell: A Molecular Approach (2009) 5th ed., Cooper, G.M. and Hausman, R.E., ASM Press & Sunderland (Washington DC), Sinauer Associates, MA, ISBN:978-0-87893300-6.
2. Molecular Cell Biology (2012) 7th ed., Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell, J., W.H. Freeman & Company (New York), ISBN:13:9781-4641-0981-2 / ISBN:10: 1-4641-0981-8.
3. Molecular Biology of the Cell (2008) 5th ed., Alberts, B., Johnson, A., Lewis, J., and Enlarge, M., Garland Science (Princeton), ISBN:0-8153-1619-4 / ISBN:0-8153-1620-8.
4. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.
5. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.

Integral University, Lucknow
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B.Sc. BC II yr

Subject: Fundamentals of Bioinformatics

(w.e.f 2019-2020)

III sem

Subject Code: BS243

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3 1 0

UNIT I

8

Introduction to Bioinformatics

Genesis, definition and need of Bioinformatics, Brief history of biological databases, International nucleotide databases (e.g., GenBank, European Molecular Biology Laboratory (EMBL), Bioinformation and DNA Data Bank of Japan (DDBJ) Center), International Nucleotide Sequence Database Collaboration (INSDC).

UNIT II

8

Protein Databases

Introduction to structural elements of proteins, Classification of protein databases (e.g., primary, secondary, and composite databases), Brief overview of ExPASy (Expert Protein Analysis System) bioinformatics resource portal, Protein 3D structural databases (e.g., RCSB-PDB (Research Collaboratory for Structural Bioinformatics Protein Data Bank), and MMDB (Molecular Modeling Database) of NCBI).

UNIT III

8

Biological File Formats and Literatures Databases

Brief overview of biological sequence and 3D structure file formats (e.g., GenBank/GenPept, EMBL, FASTA, PIR, and PDB), NCBI's literature databases (e.g., PubMed, PubMed Central, PubChem Project (e.g., PubChem Compound, Substance and Bioassay databases), and OMIM (Online Mendelian Inheritance in Man) database.

UNIT IV

8

Database Similarity Searching and Phylogenetics

Requirements of database searching, BLAST (Basic Local Alignment Search Tool) algorithm, Statistical significance and variants of BLAST, FASTA algorithm and its statistical significance, Comparison of BLAST and FASTA, Brief Overview of phylogenetic analysis.

UNIT V

8

Computer Aided Drug Design

Introduction to drug discovery, drugs derived from natural products, existing drugs as a source for new drug discovery, screening for new drug leads, modern rational approach to drug design, docking and virtual screening. Brief overview of online databases of Ligands and Drugs.

Suggested Reading:

1. Protein Bioinformatics: From Sequence to Function, Academic Press, 2011, ISBN 0123884241, 9780123884244.
2. Essential Bioinformatics, Cambridge University Press, 2006, ISBN 113945062X, 9781139450621
3. Kerns EH, Di L. Drug-Like Properties: Concepts, Structure Design and Methods: from ADME to Toxicity Optimization, Academic Press, Oxford, 2008

**Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry**

PRACTICALS

B.Sc. BC II yr

Subject Name: Physiology Lab

(w.e.f 2019-2020)

III sem

Subject Code: BS244

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1. Determination of osmotic potential of plant cell sap by plasmolytic method.
2. To study the effect of two environmental factors (light and wind) on transpiration by excised twig.
3. To study the effect of light intensity and bicarbonate concentration on O₂ evolution in photosynthesis.
4. Comparison of the rate of respiration in any two parts of a plant.
5. Demonstration of R.Q.
6. Estimation of haemoglobin.
7. Measurement of blood pressure

B.Sc BT/BC II yr

Subject: Cell Biology & Genetics Lab

III sem

Subject Code: BS 206

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1. Use of Micrometer and calibration, measurement of onion epidermal cells and yeast.
2. Cell division: Mitotic and meiotic studies in grasshopper testes, onion root tips and flower bud
3. Chromosomes: Mounting of polytene chromosomes
4. Buccal smear – Barr bodies
5. Karyotype analysis – Man and Onion Man – Normal and Abnormal – Down and Turner's syndromes (with the help of slides)
6. Isolation of chloroplasts and mitochondria
7. Vital staining of mitochondria
8. Blood smear – differential staining

Integral University, Lucknow
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B.Sc. (Hons.) Biochemistry

B.Sc. (BC) II year
Subject: Enzymes & Hormones

IV sem
Subject Code: BS251

(w.e.f 2019-2020)

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UNIT I	8
General properties and modes of actions of enzymes. Criteria of purity of enzymes-Specific activity. Enzyme units-Katal and IU. Chemical nature of enzymes. Protein nature of enzymes and Non protein enzymes- Ribozymes and DNAzymes.Activation energy and thermodynamics of enzyme action. Classification of proteases with their mechanism of action.	
UNIT II	8
Enzyme Kinetics, Briggs-Haldane steady state approach, methods for the determination of K_m and V_{max} normalized initial rate equation and normalized curves. Enzyme inhibition and activation.Effect of enzymes concentration, pH and temperature on kinetics of enzyme reactions.	
UNIT III	8
Vitamins - Structure, source, biochemical role and deficiency disease: Fat soluble vitamins- A, D & Water soluble vitamin – B ₁ , B ₂ , niacin, pyridoxine, folic acid, B ₁₂ and C	
UNIT IV	8
Hormones: classification, structural features & functions in Plants: auxin, gibberellin, cytokinin, ethylene, and abscisic acid	
UNIT V	8
Hormones and their functions secreted by endocrine glands: Hypothalamus, pituitary gland- anterior pituitary and posterior pituitary; thyroid gland; adrenal gland; Pancreas; gonads.	

Suggested Reading:

- 1) Lehninger, AL "Principles of Biochemistry".
- 2) Lubert Stryer "Biochemistry".
- 3) Voet & Voet "Biochemistry".
- 4) Shuler "Bioprocess Engineering".
- 5) Alan Fersht "Enzyme Structure and Mechanism".
- 6) David S. Sigman, Paul S. Sigman "The Enzymes: Mechanisms of Catalysis".
- 7) Palmer "Enzymes" Dixon & Webb "Enzymes".
- 8) Vander's Human Physiology (2008) 11th ed., Widmaier, E.P., Raff, H. and Strang, K.T. McGraw Hill International Publications, ISBN: 978-0-07-128366-3.
- 9) Endocrinology (2007) 6th ed., Hadley, M.C. and Levine, J.E. Pearson Education (New Delhi), Inc. ISBN: 978-81-317-2610-5.

Integral University, Lucknow
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B.Sc. (Hons.) Biochemistry

B.Sc. BC/BT/LS II yr

B.Sc ZBC III yr

Subject Name: Molecular Biology

(w.e.f 2019-2020)

IV sem

V sem

Subject Code: BS212

L T P
3 1 0

UNIT I

8

Central Dogma of Molecular Biology: Organization of Genetic Material: split genes, overlapping genes; pseudogenes, cryptic genes, Insertion elements and transposons. Gene organization and expression in Mitochondria and Chloroplast

UNIT II

8

DNA Replication: Prokaryotic and Eukaryotic – Enzymes and proteins involved in replication, Theta model and Rolling circle model.

UNIT III

8

Transcription: Transcription in prokaryotes and Eukaryotes: Mechanism, Promoters and RNA polymerase, transcription factors, Post-transcriptional modifications of eukaryotic mRNA.

UNIT IV

8

Genetic code: Properties and Wobble hypothesis. Translation: Mechanism of translation in Prokaryotes and Eukaryotes, Post-translational modifications of proteins.

UNIT V

8

Regulation of Gene expression: Regulation of Gene expression in Prokaryotes: Operon concept (Lac), Regulation of Gene expression in Eukaryotes: transcriptional activation, galactose metabolism in yeast.

Suggested Readings:

1. Howe.C. (1995) Gene Cloning and manipulation, Cambridge University Press, USA
2. Lewin, B., Gene VI New York, Oxford University Press.
3. Sambrook et al (2000) Molecular cloning Volumes I, II, & III Cold spring Harbor Laboratory Press, New York, USA
4. Walker J.M. and Gingold, E.B. (1983) Molecular Biology & Biotechnology (Indian Edition) Royal Society of Chemistry U.K
5. Karp.G (2002) Cell & Molecular Biology, 3rd Edition, John Wiley & Sons; INC.

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

B.Sc. BC II yr

Subject Name: Clinical Biochemistry

(w.e.f 2019-2020)

IV sem

Subject Code: BS252

L T P
3 1 0

UNIT I

8

Basic concepts of Clinical Biochemistry: A brief review of units and abbreviations used in expressing concentrations and standard solutions. Specimen collection and processing (Blood, urine, faeces). Anticoagulant preservatives for blood and urine. Transport of specimens.

UNIT II

8

Hematology: Blood: Composition and their functions, Anemia:- classifications, erythrocyte indices. Blood coagulation system, Clotting time, Bleeding time, Prothrombin time, RBC count, WBC count, Platelet count, Differential count, determination of Hb, PCV and ESR. Hemoglobinopathies, Thalassemias.

UNIT III

8

Disorder in carbohydrate metabolism: Regulation of blood sugar, Glycosuria-types of glycosuria. Oral glucose tolerance test in normal and diabetic condition. Diabetes mellitus and Diabetic insipidus - hypoglycemia, hyperglycemia. Ketonuria, ketosis.

UNIT IV

8

Disorder in lipid metabolism: Lipid and lipoproteins: Classifications, composition, mode of action. Cholesterol: Factors affecting blood cholesterol level. Dyslipoproteinemias, atherosclerosis, risk factor and fatty liver. Involvement of enzymes in diagnostics of heart disease including aspartate transaminase, isoenzymes of creatine kinase and lactate dehydrogenase and troponin.

UNIT V

8

Liver function test: Metabolism of bilirubin, jaundice - types, differential diagnosis. Liver function test - Icteric index, Vandenberg test, plasma protein changes.

Renal function test: Clearance test—Urea, Creatinine, Inulin, para-aminohippuric acid (PAH) test, Concentration and dilution test.

Enzymology: Clinical significance of SGOT, SGPT, ALP, ACP, CPK and LDH

Suggested Readings:

1. Medical Biochemistry by MN Chatterjee, Rana Shinde, 8 edition, 2013, Jaypee publications.
2. Textbook of Medical Laboratory Technology by Praful B. Godkar and Darshan P. Godkar th
3. Medical Laboratory Technology by Ramnik sood, 5 Edition, 1999, Jaypee publishers.
4. Text book of Biochemistry with clinical correlation, Thomas M. Devlin, 3rd edition, A. JohnWiley-Liss Inc. Publication.
5. Practical Clinical Biochemistry, Harold Varley, 4th edition, CBS Publication and Distributors, New Delhi.

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

B.Sc. BC II yr

Subject name: Fundamentals of Plant Biochemistry
(w.e.f 2019-2020)

IV sem

Subject code: BS253

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3 1 0

UNIT 1 **8**

Photosynthesis and Carbon assimilation: Structure of PSI and PSII complexes, Light reaction, Cyclic and non cyclic photophosphorylation, Calvin cycle and regulation; C4 cycle and Crassulacean acid metabolism (CAM), Photorespiration.

UNIT II **8**

Respiration: Overview of glycolysis, Alternative reactions of glycolysis, Fate of pyruvate, Regulation of plant glycolysis, TCA cycle, oxidative phosphorylation and electron transport system.

UNIT III **8**

Nitrogen metabolism: Biological Nitrogen fixation by free living and in symbiotic association, structure and function of enzyme Nitrogenase. Nitrate assimilation: Nitrate and Nitrite reductase.

UNITIV **8**

Cell wall structure and plant growth Regulation: Components and structure of plant cell wall, Plant hormones and their effect on plant growth and development, Regulation of plant morphogenetic processes by light. Plant growth regulators – salicylic acid, polyamines, brassinosteroids.

UNITV **8**

Secondary metabolites: Representatives alkaloid group and their amino acid precursors, function of alkaloids, Examples of major phenolic groups; simple phenylpropanoids, flavonoids, tannins and lignin, biological role of plant phenolics, Classification of terpenoids and representative examples from each class, biological functions of terpenoids. Concept of phytoalexins.

Suggested Reading:

1. Taiz, L., Zeiger, E.,. Plant Physiology. Sinauer Associates Inc., U.S.A. 5th Edition.
2. Hopkins, W.G., Huner, N.P.,. Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.
- 3 Bajracharya, D.,. Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.
4. Frank B. Salisbury, Cleon W. Ross: Plant Physiology. Wadsworth Publishing Company

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

B.Sc. BT II yr
B.Sc BC II yr
Subject Name: Metabolism

III sem
IV sem
Subject Code: BS201

(w.e.f 2019-2020)

L T P
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8

UNIT I

Enzymes: Classification, properties and factors influencing enzyme activity, co-enzymes, prosthetic group and co-factors, Lock & key hypothesis, induced fit hypothesis, Enzyme kinetics: Michelis Menten equation, Lineweaver-Burk plot, Enzyme inhibition, Allosteric enzymes.

UNIT II

Carbohydrate Metabolism: Glycolysis, TCA cycle, Electron Transport Chain and Oxidative phosphorylation, Gluconeogenesis and Glycogen metabolism.

UNIT III

Lipid Metabolism: Degradation of fatty acids: β oxidation; Ketone bodies, acidosis, ketosis, cholesterol synthesis.

UNIT IV

Protein Metabolism: Urea Cycle, transport of ammonia, deamination and transamination reactions. Inborn errors of protein metabolism.

UNIT V

Nucleic Acid Metabolism: Purine and Pyrimidine biosynthesis and degradation.

Suggested Reading:

1. Principles of Biochemistry- AlbertL. Lehninger CBS Publishers & Distributors
2. Biochemistry – Lubert stryer Freeman International Edition.
3. Biochemistry – Keshav Trehan Wiley Eastern Publications
4. Fundamentals of Biochemistry-J.L.Jain S.Chand and Company
5. Biochemistry- Prasaranga, Bangalore University
6. Fundamental of Biochemistry – Dr.A.C.Deb
7. Textbook of Organic Chemistry (A Modern Approach)
8. The Biochemistry of Nucleic acid – Tenth Edition-Roger L.P.Adams, John T. Knowler and David P.Leader, Chapman and Hall Publications

**Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry**

PRACTICALS

**B.Sc. BC II year
Subject: Enzymology Lab**

(w.e.f 2019-2020)

**III sem
Subject Code: BS255**

**L T P
0 0 6**

1. Amino acid detections (Paper chromatography/ TLC).
2. Isolation of enzyme and determination of enzyme activity.
3. Study of the effect of pH on the enzyme activity.
4. Study of the effect of varying substrate concentration on the enzyme activity and determination of K_m and V_{max} .
5. Study of the effect of temperature on the enzyme activity.
6. Study of the effect of inhibitors on the enzyme activity.
7. Poly Acrylamide Gel Electrophoresis Technique.

**B.Sc BC II yr
B.Sc BT/ LS III yr
Subject Name: Genetic Engineering Lab**

**IV sem
V sem
Subject Code: BS308**

**L T P
0 0 6**

1. Isolation of genomic DNA from bacteria, plant and animal tissue
2. Isolation of plasmid DNA (*E. coli*)
3. Restriction digestion of DNA
4. Agarose Gel Electrophoresis
5. Demonstration of PCR