Bharatiya Vidya Bhavan

BHAVAN'S VIVEKANANDA COLLEGE
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Sainikpuri, Secunderabad – 500094
Autonomous College - Affiliated to Osmania University
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Department of Biochemistry & Nutrition

PROGRAM NAME: M.Sc. BIOCHEMISTRY (2025-26)

SEMESTER I

PAPERS	Code	TITLE	Teaching hrs/week	Credits	Internal marks	Final exam marks	Total
Theory							
1	BI101	Chemistry of Biomolecules (**core**)	4	3	30	70	100
2	BI102	Endocrine biochemistry, Vitamins and Nucleic Acids **(core)**	4	3	30	70	100
3	BI103	Cell biology and Bioenergetics **(core)**	4	3	30	70	100
4	BI104	Basic Bio-Analytical Techniques **(core)**	4	3	30	70	100
Practicals							
5	BI 101P	Chemistry of Biomolecules	4	2	--	50	50
6	BI 102P	Endocrine biochemistry, Vitamins and Nucleic Acids	4	2	--	50	50
7	BI103P	Cell biology and Bioenergetics	4	2	--	50	50
8	BI104P	Basic Bio-Analytical Techniques	4	2	--	50	50
	Total		**32**	**20**	**120**	**480**	**600**

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Department of Biochemistry & Nutrition

PROGRAM NAME: M.Sc. BIOCHEMISTRY (2025-26)

SEMESTER-II

PAPERS	Code	TITLE	Teaching hrs/week	Credits	Internal marks	Final exam marks	Total
Theory							
1	BI201	Metabolism **(core)**	4	3	30	70	100
2	BI202	Enzymology **(core)**	4	3	30	70	100
3	BI203	Molecular Biology **(core)**	4	3	30	70	100
4	BI204	Biochemical Genetics **(core)**	4	3	30	70	100
Practicals							
5	BI201P	Metabolism	4	2	--	50	50
6	BI202P	Enzymology	4	2	--	50	50
7	BI203P	Molecular Biology	4	2	--	50	50
8	BI204P	Biochemical Genetics	4	2	--	50	50
	Total		**32**	**20**	**120**	**480**	**600**

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PROGRAM NAME: M.Sc. BIOCHEMISTRY (2025-26)

SEMESTER-III

PAPERS	CODE	TITLE	Course Type	Teaching hrs/week	Credits	Internal marks	Final exam marks	Total
			Theory					
1	BI301	Gene expression and Advanced Bioanalytical Techniques	DSC	4	3	30	70	100
2	BI302	Immunology and Immunotechnology	DSC	4	3	30	70	100
3	BI303	**Elective I** A: Nutrition and Clinical Biochemistry B: Nanobiochemistry	DSE	4	3	30	70	100
4	BI304	**Elective II** A: Physiology and Reproductive Biology B: Evolution, Ecology and Developmental Biology	DSE	4	3	30	70	100
5	BI305	MOOCS		4	2	-	50	50
			Practicals					
6	BI 301P	Gene expression and Advanced Bioanalytical Techniques		4	2	--	50	50
7	BI 302P	Immunology and Immunotechnology		4	2	--	50	50
8	BI 303P	**Elective I** A: Nutrition and Clinical Biochemistry B: Nanobiochemistry		2	1	-	25	25
9	BI 304P	**Elective II** A:Physiology and Reproductive Biology B: Evolution, Ecology and Developmental Biology		2	1	-	25	25
	Total			**32**	**20**	**120**	**480**	**600**

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PROGRAM NAME: M.Sc. BIOCHEMISTRY (2025-26)

SEMESTER-IV

PAPERS	CODE	TITLE	Course Type	Teaching hrs/week	Credits	Internal marks	Final exam marks	Total
			Theory					
1	BI401	Biostatistics &Bioinformatics	DSC	4	3	30	70	100
2	BI402	Cell-cell communication and Signalling	DSC	4	3	30	70	100
3	BI403	**Elective III** A: General Microbiology, Bacteriology and Virology B: Biotechnology	DSE	4	3	30	70	100
4	BI 404	Project work		7	5	50	100	150
			Practicals					
5	BI 401P	Biostatistics & Bioinformatics		4	2	--	50	50
6	BI 402P	Cell-cell communication and Signalling		4	2	--	50	50
7	BI 403P	**Elective III** A: General Microbiology, Bacteriology and Virology B: Biotechnology		4	2	-	50	50
	Total			**31**	**20**	**140**	**460**	**600**

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Department of Biochemistry & Nutrition
PROGRAM NAME: M.Sc. BIOCHEMISTRY
2025-26
COURSE NAME: CHEMISTRY OF BIOMOLECULES

PAPER CODE: BI101 **PPW: 4**
YEAR/SEMESTER: I/I **NO OF CREDITS: 3**

COURSE OBJECTIVE: To explain the chemistry of proteins, carbohydrates, lipids and porphyrins.

CREDITWISE COURSE OBJECTIVES:

COb1 To describe the structure, classification and properties of amino acids and proteins.
COb2 To describe structure, classification and properties of carbohydrates.
COb3 To explain the structure, classification and properties of lipids and porphyrins.

CREDIT 1 Amino acids and Proteins **15h**

1. Classification and structure of amino acids
2. Essential, non - essential, and non - protein or unusual amino acid.
3. General Properties and Acid- Base Reactions of AA, (pKa Values)
4. Peptide bond - stability and formation, polypeptides.
5. Methods for determining amino and carboxy terminal and molecular weight
6. Primary structure of protein
7. Secondary structure α helix, βsheet, 3_{10}helix
8. GN Ramachandran plots. Phi, Psi and omega angle
9. Tertiary & Quarternary structure (myoglobin, hemoglobin)
10. Small peptides (glutathione, peptide hormones)
11. Cyclic peptides (Gramicidin)
12. Classification of proteins - globular, fibrous,
13. Membrane, Metallo - proteins, SCOP,CATH
14. Denaturation (pH, temperature, chaotropicagents), Renaturation
15. Protein folding, role of Chaperons in folding

CREDIT 2 Carbohydrates **15h**

1. Classifications and structure of Carbohydrates
2. Configurations and conformations
3. Reactions of Monosaccharides
4. Stability and formations of glycosidic bonds

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5. Disaccharides and Oligosaccharides
6. Structural Polysaccharides (Cellulose, Chitin, Chitosan)
7. Storage polysaccharides (Starch, Glycogen, Inulin)
8. Hemicelluloses- Lignins, Pectins,
9. Hetero-Polysaccharides /acidic MucoPolysaccharides , Glycosaminoglycan
10. Chemistry and biological role of Hyaluronic acids, Chondroitin sulphate,
11. Keratan sulphate, dermatan sulphate, heparin
12. Glycoproteins and Proteoglycans
13. Bacterial cellwall Polysaccharides- Peptidoglycans
14. Blood group substances
15. Structural determinations of polysaccharides

CREDIT 3 Lipids & Porphyrins **15h**

1. Classification of lipids & fatty acids
2. Biological significance of lipids & fatty acids
3. Steroids, Sterols, relation to vitamin D
4. Steroid hormones
5. Bile acids and salts
6. Phospholipids
7. Oils, waxes, isoprene units
8. Lipoproteins
9. Glycolipids
10. Sphingolipids
11. Structure & function of porphyrins: Heme
12. Structure & function of porphyrins: Chlorophyll
13. Cerebrosides, Gangliosides
14. Prostaglandins, Prostacyclins, Eicosanoids
15. Thromboxanes, Leukotrienes

REFERENCES:

1. Lehninger's Principles of Biochemistry, David L. Nelson, Michael M Cox Publisher: W H Freeman.
2. Biochemistry-Jeremy M Berg, John L Tymoczko, and Lubert Stryer.: W H Freeman
3. Biochemistry, 4th Edition-Donald Voet, Judith G. Voet. –Publisher John Wiley & Sons.

COURSE OUTCOMES:

At the end of the course students will be able to:

BI101.CO1 relate structural organization of amino acids and proteins with their properties and functions.
BI101.CO2 differentiate the structural features and properties of various carbohydrates.
BI101.CO3 associate the different classes of lipids with their tissue distribution.

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PROGRAM NAME: M.Sc. BIOCHEMISTRY
2025-26
COURSE NAME: CHEMISTRY OF BIOMOLECULES

PAPER CODE: BI101P **PPW: 4**
YEAR/SEMESTER: I/I **NO OF CREDITS: 2**

CREDIT WISE COURSE OBJECTIVES:
Cob4 To explain the qualitative and quantitative methods for the analysis of amino acids.
Cob5 To describe qualitative and quantitative methods for analysis of lipids

CREDIT 4 Amino acid analysis **30h**
1. Qualitative analysis of amino acids.
2. Determine pKa and pI of acidic, basic, and neutral amino acids.
3. Estimation of amino acids by Ninhydrin method.
4. Quantification ofglycine by formal titration.
5. Estimation of tryptophan by Spies and Chambers method

CREDIT 5 Lipid analysis **30h**
1. Qualitative analysis of lipids.
2. Saponification value of fats.
3. Iodine number of oil.
4. Peroxide value of fats.
5. Acid value of fats.

References:
1. An introduction to practical biochemistry. By: David T Plummer. Publisher Tata McGraw- Hill
2. Biochemical Calculations – Segel, I.H. John Wiley & sons
3. Experimental Biochemistry: A Student companion- Sashidhar Rao, B and Deshpande, V. IK International (P) Ltd
4. Experiments And Techniques In Biochemistry: by Sheel Sharma, Galgotia publications.

COURSE OUTCOMES:
At the end of the course students will be able to:
BI101P.CO4 Analyze amino acids and proteins qualitatively and quantitatively in research labs/industries.
BI101P.CO5 Apply the knowledge of qualitative and quantitative analysis of lipids from various samples in research/industry.

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Department of Biochemistry & Nutrition
PROGRAM NAME: M.Sc. BIOCHEMISTRY
2025-26
COURSE NAME: ENDOCRINE BIOCHEMISTRY, VITAMINS AND NUCLEIC ACIDS

PAPER CODE: BI102 **PPW: 4**
YEAR/SEMESTER: I/I **NO.OF CREDITS: 3**

COURSE OBJECTIVE: To understand the physiology of endocrine system, structural features, types and properties of nucleic acids and vitamins.

CREDIT-WISE COURSE OBJECTIVES:

Cob1 To outline the organization, chemistry, mechanism of action and physiological functions of endocrine system.

Cob2 To explain the importance of vitamins in human health.

Cob3 To discuss the structural features of nucleic acids.

CREDIT 1 Endocrine system **15h**

1. Endocrine glands Types and secretion of hormones
2. Control of hormone secretion
3. Mechanism of hormone action
4. Pituitary gland: Structure, Anterior Pituitary: hormones secreted and functions
5. Posterior Pituitary- Hormones secreted and their functions
6. Disorders related to pituitary hormones
7. Thyroid gland and Parathyroid gland: Structure and functions
8. Disorders: hypothyroidism, hyperthyroidism
9. Parathormone and associated disorders
10. Adrenal gland: Structure
11. Secretions of adrenal cortex and their functions, hypoadrenalism, hyperadrenalism
12. Secretions of adrenal medulla and their functions
13. Pancreas: Islets of Langerhans, alpha and beta cells
14. Functions of Insulin and glucagon, deficiency of insulin
15. Testes and Ovaries Structure, Functions of testosterone, estrogens and progesterone

CREDIT 2: Vitamins **15h**

1. Water Soluble Vitamins; Structure and Classifications
2. Water Soluble Vitamins: Chemistry, Biological Source and physiological significance
3. Fat Soluble Vitamins: Structure and Classification
4. Fat Soluble Vitamins: Chemistry, Biological Source and Significance
5. Structure, function and the deficiency disorder of Vit Bl (Thiamine), B2 (Riboflavin)

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6. Structure, function and the deficiency disorder of B3 (Niacin) and Vit B5 (Pantothenic acid)
7. Structure, function and the deficiency disorder ofB6 (Pyridoxine) and B7(Biotin)
8. Structure, function and the deficiency disorder of Vit B9 (Folic acid) and B 12 (Cobalamins)
9. Structure, function and the deficiency disorder of Vit C (Ascorbic acid)
10. Structure, function and the deficiency disorder of Vit A (Retinol)
11. Structure, function and the deficiency disorder of Vit D (Calciferol)
12. Structure, function and the deficiency disorder of Vit E (Tocopherol)
13. Structure, function and the deficiency disorder of Vit K (Phytonadione)
14. Recommended daily allowance of vitamins
15. Vitamin supplementation

CREDIT 3 Chemistry of Nucleic Acids **15h**

1. Purines: structure and functions
2. Pyrimidines- structure and functions,
3. Nucleosides, nucleotides, phosphodiester bond
4. Unusual bases, Modified bases: Structure andproperties.
5. Structure of DNA – Watson Crick Model, A- and Z- forms.
6. Supercoiling of DNA – negative and positive, linking number.
7. Properties of DNA – denaturation and renaturation
8. T_m (factors affecting T_m) and Cot curves.
9. Structure of mRNA, tRNA
10. Structure of rRNA, siRNA / miRNA.
11. Properties of RNA-denaturation and renaturation
12. Difference between DNA and RNA.
13. Hetero duplex mapping
14. D loops and R loops.
15. Catalytic RNA.

REFERENCES:

1. Lehninger Principles of Biochemistry, David L. Nelson, Michael M. Cox Publisher: W. H. Freeman.
2. Biochemistry-Jeremy M Berg, John L Tymoczko, and Lubert Stryer.: W H Freeman.
3. Biochemistry, 4th Edition - Donald Voet, Judith G. Voet – Publisher John Wiley & Sons.
4. Principles of Biochemistry: Mammalian Biochemistry: Smith EL, Hill RL, White A, McGraw Hill

COURSE OUTCOMES:

At the end of the course students will be able to:

BI102.CO1 Categorize the types of hormones with their physiology and analyse the process of endocrine regulation.

BI102.CO2 Implement the importance of vitamins in daily health.

BI102.CO3 Distinguish the structural features and properties of nucleic acids.

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PROGRAM NAME: M.Sc. BIOCHEMISTRY
2025-26
COURSE NAME: ENDOCRINE BIOCHEMISTRY, VITAMINS AND NUCLEIC ACIDS

PAPER CODE: BI102P **PPW: 4**
YEAR/SEMESTER: I/I **NO OF CREDITS: 2**

CREDIT WISE COURSE OBJECTIVES :
COb4 To explain the qualitative and quantitative methods for the analysis of carbohydrates.
COb5 To explain the qualitative and quantitative methods for analysis of nucleic acids.

CREDIT 4 Carbohydrate analysis **30 h**
1. Qualitative analysis of carbohydrates
2. Quantitative analysis of carbohydrates
3. Estimation of Fructose
4. Estimation of total sugars by phenol sulfuric acid method
5. Estimation of reducing sugars by DNS

CREDIT 5 Nucleic acid analysis **30 h**
1. Estimation of DNA by DPA
2. Assessment of DNA purity by A260/A280 method
3. Estimation of RNA by Orcinol method
4. Separation of purines by paper chromatography
5. Separation of pyrimidines by paper chromatography

References:
1. An introduction to practical biochemistry. By: David T Plummer. Publisher Tata McGraw- Hill
2. Biochemical Calculations – Segel, I.H. John Wiley & sons
3. Experimental Biochemistry: A Student companion- Sashidhar Rao, B and Deshpande, V. IK International (P) Ltd
4. Experiments And Techniques In Biochemistry: by Sheel Sharma, Galgotia publications.

COURSE OUTCOMES:
At the end of the course students will be able to:
BI102P.CO4 apply the knowledge of qualitative and quantitative analysis of carbohydrates from various samples in research/industry.
BI02P.CO5 identify and analyse nucleic acids qualitatively and quantitatively in molecular biology/ biotech labs or industry.

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Department of Biochemistry & Nutrition
PROGRAM NAME: M.Sc. BIOCHEMISTRY
2025-26
COURSE NAME: CELL BIOLOGY AND BIOENERGETICS

PAPER CODE: BI103 **PPW: 4**
YEAR/SEMESTER: I/I **NO OF CREDITS: 3**

COURSE OBJECTIVE: To familiarize the students with the concepts of cell biology, biomembranes and bioenergetics.

CREDIT-WISE COURSE OBJECTIVES:

COb1 To describe the structural organization of cells and the process of Cell cycle and apoptosis
COb2 To describe the composition and organization of biomembranes.
COb3 To explain the concepts of thermodynamics and its relevance to biological energy production

CREDIT 1 Structure of Prokaryotic & Eukaryotic cells **15 h**

l. Classification of prokaryotes and eukaryotes (systems of classification)
2. Ultrastructure of eubacteria, cyanobacteria, mycoplasma
3. Ultra structure of plant cell
4. Ultrastructure of animal cell
5. Composition of cytoskeleton: microfilaments, microtubules, intermediate filaments
6. Function of cytoskeleton
7. Nuclear skeleton: lamina, scaffold
8. Structure of Chromosomes (centromere, telomere, kinetochore)
9. Euchromatins, heterochromatin
10. Formation and structure of special chromosomes (polytene and lampbrush)
11. Cell cycle
12. Mitosis and meiosis
13. Cell cycle check points and regulation
14. Apoptosis
15. Regulation of Apoptosis

CREDIT 2 Biomembranes **l5h**

1. Composition and Structure of Cell membrane
2. Membrane Dynamics
3. Membrane Lipids: Composition distribution and Functions
4. Membrane Proteins: Composition distribution and Functions

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5. Trans - membrane proteins and their classification
6. Methods of detecting Trans membrane proteins, Hydropathyplots
7. Membrane Asymmetry
8. Fluid Mosaic Model of Membrane
9. Membrane fluidity and its regulations, Flip flop.
10. RBC membrane structure.
11. Membrane transport: active and passive transport, symport and antiport; Na^+-K^+ ATPase
12. Transport channels: voltage gated, ion gated and ligand-gated channels
13. Aquaporin, Glucose transporters, Valinomycin: structure and mechanism
14. Artificial membranes; Reconstitution of functional membrane system from purified components
15. Liposomes , Micelles and vesicles

CREDIT 3 Bioenergetics **15 h**

1. Elements of importance in biochemistry (H, C,N,O,P,S), types and energy of bonds and interactions (ionic,covalent, coordinate, H-bonds, van der Waals, hydrophobic interactions).
2. Laws of thermodynamics, Gibbs free energy, relevance of entropy and enthalpy in biological systems and reactions.
3. Thermodynamically coupled reactions
4. Order of the reactions: first and second order reactions
5. Log and lnscales in biological processes (exponential growth curves, radioactive decay)
6. Biological oxidation, Redox potential, Nernst equation
7. Enzymes involved in biological oxidation
8. High energy compounds
9. Oxidative phosphorylation
10. High energy bonds, phosphate potential, Forces stabilizing membrane
11. ETC in mitochondria
12. ETC in Chloroplasts
13. Uncouplers and inhibitors of energy transfer.
14. Shuttle pathways- Glycerol phosphate shuttle, Malate- Aspartate shuttle
15. Biological Fluorescence (GFP and derivatives), Bioluminescence.

REFERENCES:

1. Lehninger Principles of Biochemistry, David L. Nelson, Michael M. Cox Publisher: W. H. Freeman.
2. Biochemistry, 4th Edition - Donald Voet, Judith G. Voet – Publisher John Wiley & Sons
3. Molecular Cell Biology, 4th edition. Harvey Lodish, Arnold Berk, S Lawrence Zipursky, Paul Matsudaira, David Baltimore, and James Darnell. New York: W. H Freeman

COURSE OUTCOMES:

At the end of the course students will be able to:

BI103.CO1 illustrate the structural organisation of cell
BI103.CO2 differentiate the structural organization of various biomembranes and membrane transport mechanisms with their functions.
BI103.CO3 relate the concepts of thermodynamics to biological oxidation and energy production.

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2025-26
COURSE NAME: CELL BIOLOGY AND BIOENERGETICS

PAPER CODE: BI103P **PPW: 4**
YEAR/SEMESTER: I/I **NO OF CREDITS: 2**

CREDIT- WISE COURSE OBJECTIVES:

COb4 To explain the importance of good laboratory practices, preparation of buffers and titrimetric methods

COb5 To demonstrate bioanalytical techniques for separation of proteins, nucleic acids and subcellular organelles

CREDIT 4 Laboratory maintenance, safety and basic methods **30 h**

1. GLP; Use of balance and pH meter, Lab safety,
2. Calculations and preparation of standard solutions (primary, working standard)
3. Preparation of buffers: Phosphate, Citrate and Tris-buffer
4. Titration: Estimation of Calcium in milk
5. Titration: Estimation of vitamin C in lemon juice

CREDIT 5 Separation and identification of biomolecules **30 h**

1. SDS PAGE for protein
2. Agarose gel for DNA
3. Desalting proteins by dialysis
4. Gel filtration (size exclusion)
5. Cell fractionation (centrifuge)

References:

1. An introduction to practical biochemistry. By: David T Plummer. Publisher Tata McGraw- Hill
2. Experimental Biochemistry: A Student companion- Sashidhar Rao, B and Deshpande, V. IK International (P) Ltd
3. Experiments and Techniques In Biochemistry: by Sheel Sharma, Galgotia publications.
4. Biochemical Calculations – Segel, I.H. John Wiley & sons

COURSE OUTCOMES:

At the end of the course students will be able to:

BI103P.CO4 implement the knowledge of good laboratory practices and select suitable buffers for biochemical experiments and also carry out titrimetric procedures.

BI103P.CO5 apply different techniques for analysis of biomolecules and cell organelles in biological samples.

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Department of Biochemistry & Nutrition
PROGRAM NAME: M.Sc. BIOCHEMISTRY
2025-26
COURSE NAME: BASIC BIOANALYTICAL TECHNIQUES

PAPER CODE: BI104 **PPW: 4**
YEAR/SEMESTER: I/I **NO OF CREDITS: 3**

COURSE OBJECTIVE: To explain the principle, instrumentation and applications of various bio-analytical and cell study techniques.

CREDIT- WISE COURSE OBJECTIVES:

COb1 To familiarize with principle, instrumentation and applications of various spectroscopic techniques and chromatographic techniques

COb2 To explain centrifugation, electrophoresis and tracer techniques with their applications in biology.

COb3 To explain the principles and working of various analytical tools to study cell structure and function.

CREDIT 1 Spectroscopy and Chromatography **15 h**

1. Colorimetry, Beer Lambert's Law-application and limitation, Molar extinction coefficient, Absorption maximum
2. UV - Vis Spectrophotometer - Instrumentation, application
3. Fluorescence Spectroscopy - principle, instrumentation, application
4. Infrared(IR) spectroscopy - principle, instrumentation, application
5. Raman spectroscopy - principle, instrumentation, application
6. CD - and ORD - principle, instrumentation, application
7. Partitioning and counter current distribution;
8. PC and TLC -principle,instrumentation,application
9. GC - principle, instrumentation, application
10. Ion – exchange chromatography - principle, instrumentation, application
11. Gel filtration (Gel exclusion chromatography) - principle, application
12. Affinity chromatography -principle instrumentation, application; immunoprecipitation
13. HPLC and RP-HPLC - principle, instrumentation, application
14. FPLC, LC - principle, instrumentation, application
15. Peptide mapping and N-Terminal sequencing of proteins

CREDIT 2 Centrifugation, Electrophoresis and Tracer techniques **15h**

1. Centrifugation, RCF and types of rotors. Ultra centrifugation - principle, instrumentation, application
2. CsCl density gradient and sucrose gradient centrifugation - principle, application
3. Electrophoresis - moving boundary and zonal electrophoresis, Native and SDS PAGE

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4. IEF and 2D PAGE, PAGE for DNA sequencing
5. Agarose Gels, PFGE, Zymography
6. Denaturing gels for RNA, Southern and Northern Blots
7. Western Blot
8. Stable and radioactive isotopes, theory of radioactivity
9. Half life and emission spectra of biologically useful isotopes:^{2}H, ^{3}H, ^{14}C, ^{18}O, ^{32}P, ^{35}S, ^{125}I;
10. Detection of radio activity by Scintillation counting. Autoradiography Isotopes used for labelling proteins, (^{3}H, ^{14}C,^{35}S , ^{125}I) and nucleic acids (^{3}H, ^{32}P)
11. GM counter, gamma counter
12. Fluorography, applications of Phosphor -imaging, luxmetry and chemiluminescence as alternative to radioactivity.
13. Radiation hazards and safe disposal of radioactivity waste
14. Isotope dilution method pulsechase
15. Historic examples -^{14}C and ^{18}O to study photosynthesis: ^{32}P and ^{35}S to study viral replication (Hershey - Chase experiment ^{16}N and ^{15}N in DNA replication Meselson and Stahl experiment)

CREDIT 3 Microscopy and Cell Study **15h**

1. Simple and compound microscope.
2. Phase contrast,
3. Dark field and polarization microscopy.
4. Electron microscopy: SEM, freeze fracture.
5. Electron microscopy: TEM
6. Fluorescence microscopy
7. Confocal microscopy, imaging live cells.
8. FRET
9. FRAP
10. Flow-Cytometry and cell sorting (FACS).
11. Cell counting- hemocytometer
12. Plant tissue culture.
13. Animal tissue culture
14. Insect tissue culture.
15. Methods of cell disruption and fractionation, isolation of organelles.

REFERENCES:

1. Principles and Techniques of Practical Biochemistry- Wilson. K. And Walker. J. Pub: Cambridge Press
2. Physical Biochemistry- Friefelder, Publisher D. W.H. Freeman Press
3. Biophysical Chemistry: Principles and Techniques, 2nd edition by A. Upadhyay, K. Upadhyay and N. Nath. Himalaya Publishing House, Delhi.

COURSE OUTCOMES:

At the end of the course students will be able to:

BI104.CO1 apply relevant spectroscopic and chromatographic methods to study of molecular mass physical and chemical properties biomolecules.

BI104.CO2 design protocol for separating and identifying proteins or nucleic acids using centrifugation, electrophoresis and tracer technique methods.

BI104.CO3 identify suitable methods to study cells.

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Department of Biochemistry & Nutrition
PROGRAM NAME: M.Sc. BIOCHEMISTRY
2025-26
COURSE NAME: BASIC BIOANALYTICAL TECHNIQUES

PAPER CODE: BI104P **PPW: 4**
YEAR/SEMESTER: I/I **NO OF CREDITS: 2**

CREDIT WISE COURSE OBJECTIVES:

COb4 To explain the quantitative methods for the analysis of amino acids, minerals and proteins.
COb5 To demonstrate chromatographic techniques for separation of biomolecules

CREDIT 4 Quantitation of Biomolecules by Spectroscopy **30 h**
1. Absorption spectrum of tyrosine, determination of molar extinction coefficient
2. Estimation of concentration of biomolecules based on Beer Lambert's Law
3. Estimation of inorganic phosphate by Fiske-Subbarow method
4. Estimation of protein by Biuret method
5. Estimation of protein by Lowry method

CREDIT 5 Separation of Biomolecules by Chromatography **30 h**
1. Separation of plant pigments by paper Chromatography
2. l-D and 2-D paper chromatography of amino acids
3. TLC of plant pigments and lipids
4. Anion/ Cation-exchange capacity ofresin
5. Separation of amino acids by ion-exchange chromatography

References:
1. An introduction to practical biochemistry. By: David T Plummer. Publisher Tata McGraw- Hill
2. Experimental Biochemistry: A Student companion- Sashidhar Rao, B and Deshpande, V. IK International (P) Ltd
3. Experiments and Techniques In Biochemistry: by Sheel Sharma, Galgotia publications.
5. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern
6. Biochemical Methods- Sadasivam, S and Manickam, A. New Age International Publishers.

COURSE OUTCOMES:
At the end of the course students will be able to:
BI104P.CO4 analyse amino acids and proteins quantitatively in research lab and industries.
BI104P.CO5 apply different chromatographic techniques for separation of biomolecules in biological samples in industries and research labs

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Department of Biochemistry & Nutrition
PROGRAM NAME: M.Sc. BIOCHEMISTRY
2025-26
COURSE NAME: METABOLISM

PAPER CODE: BI201 **PPW: 4**
YEAR/SEMESTER: I/II **NO OF CREDITS: 3**

COURSE OBJECTIVE: To explain the metabolism of proteins, carbohydrates, lipids, porphyrins and nucleic acids.

CREDITWISE COURSE OBJECTIVES:

COb1 To describe various metabolic pathways of amino acids and associated genetic defects
COb2 To discuss metabolism of various carbohydrates.
COb3 To explain metabolic pathways of lipids, porphyrins and Nucleic acids

CREDIT 1 Metabolism of Amino Acids and Proteins **15h**

1. Metabolic fate of dietary proteins and amino acids
2. Overview of biosynthesis of amino acids
3. Glucogenic and ketogenic amino acids
4. Degradation of aminoacids to pyruvate and oxaloacetate
5. Degradation of aminoacids to acetyl – CoA
6. Degradation of aminoacids to succinyl– CoA
7. Metabolism of branched chain amino acids
8. Role of glutamate cycle in formation and circulation of ammonia
9. Glucose-alanine cycle
10. Urea cycle
11. Linking of citric acid and urea cycles
12. Amino acids as biosynthetic precursors (Synthesis of glutathione, neurotransmitters)
13. Genetic defects in metabolism of amino acids: albinism, phenylketonuria, maple syrup urine disease
14. Genetic defects in metabolism of amino acids: homocystinuria, alkaptonuria, methylmalonic academia
15. Genetic defects in metabolism of urea: argininemia, ariginino succinic acidemia, carbamoyl phosphate synthetase – I deficiency

CREDIT 2 Metabolism of Carbohydrates **15h**

1. Reactions and energy balance in glycolysis

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2. Regulation of glycolysis; entry of other sugars
3. Reactions and energy balance in gluconeogenesis
4. Pyrurate dehydrogenase complex
5. Reactions and energy balance in TCA cycle
6. Pentose phosphate pathway
7. Pasteur effect and Crabtree effect
8. Anaplerotic reactions
9. Glyoxylate cycle
10. Glucuronic acid cycle
11. Glycogen metabolism
12. Photosynthesis reactions for biosynthesis of glucose
13. C3 carbon fixation
14. C4 carbon fixation and Crassulacean acid metabolism
15. Biosynthesis of starch and sucrose

CREDIT 3 Metabolism of Lipids, Porphyrins & Nucleic Acids **15h**

1. Fate of dietary lipids, apo-lipoproteins
2. Fatty acid biosynthesis, desaturation of fatty acids
3. Beta oxidation and its regulation, breakdown of odd chain fatty acids and energy yield
4. ω-oxidation and α – oxidation pathway and their regulation
5. Metabolism of phospholipids and sphingolipids
6. Biosynthesis of cholesterol and other steroids and their regulation
7. Fate of acetyl CoA, formation of ketone bodies and ketosis
8. Biosynthesis of prostaglandins, prostacyclins, thromboxanes and leukotrienes
9. Metabolism of porphyrins
10. Biosynthesis of purines
11. Degradation of purines
12. Biosynthesis of pyrimidines
13. Degradation of pyrimidines
14. *de novo* purine and pyrimidine synthesis
15. Salvage pathway of purine and pyrimidine synthesis

References:

1. Lehninger Principles of Biochemistry, David L. Nelson, Michael M. Cox; Publisher: W.H.Freeman.
2. Biochemistry – Jeremy M Berg, JohnLTymoczko, and Lubert Stryer.; Publisher: WH Freeman
3. Biochemistry, 4th Edition – Donald Voet, Judith G. Voet. – Publisher John Wiley & Sons.
4. Principles of Biochemistry Mammalian Biochemistry: Smith EL, Hill RL., White A Publisher: McGraw Hill

COURSE OUTCOMES:

At the end of the course students will be able to:

BI201.CO1 correlate the genetic defects with impaired amino acid metabolism.
BI201.CO2 relate various metabolic events of carbohydrates and their significance.
BI201.CO3 illustrate various metabolic pathways of lipids, porphyrins and nucleic acids

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2025-26
COURSE NAME: METABOLISM

PAPER CODE: BI201P **PPW: 4**
YEAR/SEMESTER: I/II **NO OF CREDITS: 2**

CREDIT WISE COURSE OBJECTIVES

COb4 To explain the quantitative estimation of Protein metabolites in biological samples
COb5 To discuss the quantitative determination of Carbohydrates, Lipids and Nucleic Acids in biological samples

CREDIT 4 Metabolism of Amino acids, Proteins and Porphyrins **30 h**
1. Estimation of dietary proteins
2. Estimation of urea
3. Estimation of creatinine (urine)
4. Estimation of bilirubin
5. Fractionate BSA by salt precipitation

CREDIT 5 Metabolism of Carbohydrates, Lipids and Nucleic Acids **30 h**
1. Estimation of blood glucose
2. Estimation of sucrose and starch
3. Estimation of serum cholesterol
4. Estimation of nucleic acids by spectrophotometry
5. Estimation of phospholipids and lecithin

References:

1. An introduction to practical biochemistry. By: David T Plummer. Publisher Tata McGraw- Hill
2. Experimental Biochemistry: A Student companion- Sashidhar Rao, B and Deshpande, V. IK International (P) Ltd
3. Introductory Practical Biochemistry (ed) Sawhney, S. K. Randhir Singh-Narosa Publications House
4. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern
5. Biochemical Methods- Sadasivam, S and Manickam, A. New Age International Publishers.

COURSE OUTCOMES:
At the end of the course students will be able to:
BI201P.CO4 analyze proteins and their metabolites in research labs/industries.
BI201P.CO5 determine quantitatively the content of carbohydrates, lipids and nucleotides in biological samples in research and food industry.

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Department of Biochemistry & Nutrition
PROGRAM NAME: M.Sc. BIOCHEMISTRY
2025-26
COURSE NAME: ENZYMOLOGY

PAPER CODE: BI202 **PPW: 4**
YEAR/SEMESTER: I/II **NO OF CREDITS: 3**

COURSE OBJECTIVE: To explain the concepts of enzyme catalysis, their role in cellular homeostasis and industrial applications.

CREDITWISE COURSE OBJECTIVES:

COb1 To explain enzyme catalysis, coenzymes and active site residues.
COb2 To discuss enzyme kinetics, enzyme inhibitors and industrial importance of enzymes.
COb3 To explain various catalytic and regulatory mechanisms of enzyme activity.

CREDIT 1 Enzymes and Coenzymes **15h**

1. Thermodynamics of catalysis, Energy of activation
2. Relation of ΔG and Keq
3. Coupled reactions (endergonic and exergonic) in biochemical pathways
4. Methods to isolate and purify enzymes
5. Assays, Activity Units, Specific activity
6. Nomenclature and classification of enzymes.
7. Metal, co-factor and co-enzyme requirements
8. Vitamin cofactors: TPP, FMN/FAD
9. NAD/NADP, Pantothenic acid
10. Vitamin cofactors: PLP, Biotin
11. Folate, Cobalamin, Phylloquinone
12. Factors affecting catalysis (pH, temperature, pressure, enzyme and substrate concentration)
13. Chemicals to identify active site residues: Arg, Cys, Lys, His
14. Site–directed mutagenesis to identify active site residues
15. Triose Phosphate Isomerase

CREDIT 2 Enzyme Kinetics **15h**

1. Single substrate assumptions, Michaelis –Menten kinetics (derive equation and transformations)
2. Steady state, Briggs -Haldane equation.
3. Transformation of Michaelis – Menten equation. Lineweaver Burk plot, Eadie- Hofstee plot.

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4. Inhibitors (competitive, uncompetitive, noncompetitive, suicide), effect on kinetic constants
5. Bi-substrate reactions: ordered, random, sequential, Ping - Pong
6. Enzyme inhibitors as drugs: reverse transcriptase and protease inhibitors as anti– HIV drugs
7. Multiple sites; Cooperativity in binding (oxygen binding to hemoglobin)
8. Cooperativity- MWC model, KNF model
9. Slow transition and Hysteretic behavior in enzymes
10. Convergent and divergent evolution of enzymes
11. Enzymes in dairy (Rennin, lipases, lactases) and Food processing technology (invertase, pectinases, papain)
12. Enzymes in detergent (lipases, cellulases, proteases) and paper (cellulases).
13. Enzymes in bioremediation.
14. Enzyme engineering: Designing High –Through put enzyme assays
15. Enzymes as biosensors.

CREDIT 3 Catalytic Mechanisms of Enzymes **15h**

1. Types of catalysis: acid - base catalysis, transition state.
2. Covalent catalysis
3. Metal ion catalysis
4. Reversible and irreversible activation of enzymes (pro-enzymes, phosphorylation)
5. Enzyme activation by ligand binding and dimerization
6. Protein tyrosine kinase receptors
7. Catalytic mechanism of RNase
8. Catalytic mechanism of trypsin and chymotrypsin ,
9. Catalytic mechanism of lysozyme
10. Catalytic mechanism of subtilisin
11. Catalytic mechanism of carboxypeptidase
12. Allosteric regulation of aspartate transcarbamylase
13. Regulation of glutamine synthetase
14. Multi-enzyme complex: fatty acid synthase
15. Abzymes

REFERENCES:

1. Fundamentals of Enzymology, Price.NC. and Stevens. L., Oxford University Press
2. Enzymes- Biochemistry, Biotechnology, Clinical chemistry- Palmer, T., Affiliated East-West press
3. Fundamentals of Enzyme Kinetics, Segel I H; Wiley Inter science,
4. Biochemical calculations, 2nd Edition by Irwin H. Segel. John Wiley & Sons,
5. Lehninger's Principles of Biochemistry, David L. Nelson, Michael M. Cox Publisher: W. H. Freeman

COURSE OUTCOMES:

At the end of the course students will be able to:

BI202.CO1 interpret the concepts of enzyme catalysis in their experimental work.

BI202.CO2 differentiate kinetic behaviour of enzyme reactions and also apply knowledge of enzymes in industries.

BI202.CO3 demonstrate knowledge of enzyme catalytic mechanisms in designing research work.

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PROGRAM NAME: M.Sc. BIOCHEMISTRY
2025-26
COURSE NAME: ENZYMOLOGY

PAPER CODE: BI202P **PPW: 4**
YEAR/SEMESTER: I/II **NO OF CREDITS: 2**

CREDIT WISE COURSE OBJECTIVES:
COb4 To explain the methods for isolation and assay of enzymes from biological sources
COb5 To demonstrate various factors affecting enzyme activity

CREDIT 4 Enzymes and Coenzymes **30 h**

1. Isolation of urease (horse gram /any source)
2. Assay of urease
3. Isolation of beta-amylase (sweet potato)
4. Assay of beta-amylase
5. Isolation and assay of catalase (liver / any source)

CREDIT 5 Enzyme kinetics **30 h**

1. Effect of time on enzyme activity
2. Effect of enzyme concentration on enzyme activity
3. Effect of pH on enzyme activity
4. Effect of temperature on enzyme activity
5. Effect of [S] on enzyme activity; determination of K_m and V_{max}

References:

1. An introduction to practical biochemistry. By: David T Plummer. Publisher Tata McGraw- Hill
2. Experimental Biochemistry: A Student companion- Sashidhar Rao, B and Deshpande, V. IK International (P) Ltd
3. Introductory Practical Biochemistry (ed) Sawhney, S. K. Randhir Singh-Narosa Publications House
4. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern
5. Biochemical Methods- Sadasivam, S and Manickam, A. New Age International Publishers.
6. Enzyme Assays- A practical Approach: Eisenthal, R and Dawson, M. l., IRI. Press.

COURSE OUTCOMES:
At the end of the course students will be able to:
BI202P.CO4 choose appropriate methods for isolation of enzymes from biological samples in research/industries.
BI202P.CO5 determine optimal conditions and various factors influencing the enzyme activity and apply in research/ industry.

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Department of Biochemistry & Nutrition
PROGRAM NAME: M.Sc. BIOCHEMISTRY
2025-26
COURSE NAME: MOLECULAR BIOLOGY

PAPER CODE: BI203 **PPW: 4**
YEAR/SEMESTER: I/II **NO OF CREDITS: 3**

COURSE OBJECTIVE: To describe mechanisms related to replication, repair, transcription, translation and protein targeting in prokaryotic and eukaryotic cells.

CREDITWISE COURSE OBJECTIVES:
COb1 To explain the mechanism of prokaryotic and eukaryotic DNA replication and DNA repair mechanisms.
COb2 To describe prokaryotic and eukaryotic transcription and translation mechanisms.
COb3 To discuss protein targeting and degradation mechanisms

CREDIT 1 DNA Replication and Repair **15h**

1. Models of replication – random, conservative, semi conservative
2. Replication of circular chromosomes by theta model –φ X174, E.coli
3. Replication of circular chromosomes by rolling circle (lambda phage) Strand displacement models (mt-DNA)
4. Prokaryotic and eukaryotic DNA polymerases, helicases, ligases, topoisomerases
5. Initiation – primosome, ori - sequences, accessory proteins
6. Elongation –replisome, leading and lagging strands, Okazaki fragments
7. Termination, Inhibitors of replication
8. Replication of linear chromosomes, telomeres, telomerase
9. Amplification –Polytene and double minute chromosomes
10. Types of DNA damage –oxidation, deamination, alkylation, adducts, breaks
11. Direct repair – MGMT, photo - reactivation, AlkB
12. Base Excision Repair (Short and Long Patch) and Nucleotide Excision Repair, Mismatch Repair
13. Mechanism of Recombination
14. Repair of DSBs by NHEJ and Homologous recombination
15. SOS repair

CREDIT 2 Transcription and Translation **15h**

1. Prokaryotic and eukaryotic RNA polymerases
2. Initiation: prokaryotic and eukaryotic promoter sequences
3. Elongation, Termination – rho dependent and independent

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4. Post – transcriptional modifications -capping, Poly A addition
5. RNA Splicing
6. RNA editing
7. Inhibitors of transcription
8. Structure of ribosome
9. Genetic code , Wobble hypothesis
10. Initiation of translation (role of cap, IRESIFs)
11. Elongation of translation (role of EFs) and Termination of translation (role of RFs)
12. Post translational modifications of proteins: Phosphorylation, Acetylation, Ubiquitylation, Methylation, Glycosylation
13. Post translational modifications of proteins: SUMOylation, Palmitoylation, Myristoylation, Prenylation, Sulfation
14. Protein splicing of inteins
15. Inhibitors of protein synthesis

CREDIT 3 Protein Targeting and Degradation **15h**

1. Post translational modifications of proteins, role in targeting (isoprenylation)
2. Signal peptide
3. Signal recognition particle(SRP)
4. Nuclear Localization Signal (NLS)
5. Mitochondrial and chloroplast localization signal
6. Chaperones and HSPs in protein folding
7. Vesicular trafficking
8. Lysosomal pathways : endocytosis and crinophagy
9. Lysosomal pathways: macroautophagy and microautophagy
10. Lysosomal storage diseases
11. Ubiquitin – proteasome pathway
12. Immuno proteasome
13. Misfolded proteins in neurodegenerative diseases
14. PEST sequences and proteolysis
15. Action of cytotoxic, hemotoxic, myotoxic & hemorrhagic venoms

REFERENCES:

1. Lehninger Principles of Biochemistry, David L. Nelson, Michael M. Cox Publisher: W. H. Freeman.
2. Molecular Biology of the Cell, 3rd edition. Bruce Alberts, Dennis Bray, Julian Lewis, Martin Raff.
3. Biochemistry, 4th Edition - Donald Voet, Judith G. Voet – Publisher John Wiley & Sons.
4. The Cell: A Molecular Approach, by Geoffrey M. Cooper and Robert E. Hausman, pub. ASM Press.

COURSE OUTCOMES:

At the end of the course students will be able to:

BI203.CO1 differentiate between prokaryotic and eukaryotic DNA replication and use the concepts of DNA repair mechanisms to maintain genetic stability.

BI203.CO2 compare the role of proteins involved in prokaryotic and eukaryotic transcription and distinguish the different types of translation and translational systems.

BI203.CO3 relate the significance of protein targeting and degradation in storage and neurodegenerative diseases.

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PROGRAM NAME: M.Sc. BIOCHEMISTRY
2025-26
COURSE NAME: MOLECULAR BIOLOGY

PAPER CODE:BI 203P **PPW: 4**
YEAR/SEMESTER: I/II **NO OF CREDITS: 2**

CREDIT WISE COURSE OBJECTIVES

COb4 To explain the methods for isolation and separation of DNA and chromosomes from different sources.
COb5 To discuss the methods for analysis of glycoproteins and subcellular fractions from eukaryotic cells.

CREDIT 4 DNA replication and repair **30 h**

1. Isolation of DNA from plant source (Onion)
2. Isolation of DNA from animal source
3. Isolation of DNA from microbial source (Plasmid)
4. Agarose gel electrophoresis: separation of super coiled, linear and circular DNA
5. Amplification of DNA by PCR

CREDIT 5 Transcription, Translation and Protein targeting **30 h**

1. Determination of glycoproteins (Total sugar by Phenol Sulphuric acid and protein by Lowry method)
2. Isolation of RNA from yeast
3. Cell fractionation: Isolation of cell organelles
4. Mitochondrial fraction (Identification using a Marker)
5. Nuclear fraction (Identification using a Marker)

References:

1. An introduction to practical biochemistry. By: David T Plummer. Publisher Tata McGraw- Hill
2. Experimental Biochemistry: A Student companion- Sashidhar Rao, B and Deshpande, V. IK International (P) Ltd
3. Introductory Practical Biochemistry (ed) Sawhney, S. K. Randhir Singh-Narosa Publications House
4. Biochemical Methods- Sadasivam, S and Manickam, A. New Age International Publishers.

COURSE OUTCOMES:

At the end of the course students will be able to:

BI203P.CO4 execute isolation, amplification and analysis of DNA in molecular biology/biotech labs.
BI203P.CO5 utilize cell fractionation methods to isolate specific organelles for further studies in research.

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Department of Biochemistry & Nutrition
PROGRAM NAME: M.Sc. BIOCHEMISTRY
2025-26
COURSE NAME: BIOCHEMICAL GENETICS

PAPER CODE: BI204
YEAR/SEMESTER: I/II

PPW: 4
NO OF CREDITS: 3

COURSE OBJECTIVE: To familiarize the students with the concepts of inheritance, linkage, bacterial genetics and use of model organisms.

CREDITWISE COURSE OBJECTIVES:

COb1 To discuss the patterns of inheritance and types of mutations.
COb2 To explain the concept of linkage, mapping and pedigree analysis
COb3 To describe mapping of genes and use of model organisms to study various biological processes.

CREDIT 1 Mendelian Genetics **15h**

1. Mendel's laws of inheritance
2. Importance of meiosis in heredity
3. Non – Mendelian Inheritance: Cytoplasmic inheritance
4. Maternal effect, Maternal influence
5. Gene interactions - Epistasis, Expressivity, Penetrance
6. Polygenic inheritance
7. Sex linked, sex limited, and sex influenced inheritance
8. Mutations: spontaneous/ induced, somatic/ germinal
9. Forward/ reverse, transition/ transversion
10. Silent, missense, nonsense and frame shift mutations
11. Leaky and conditional mutations
12. Reversion and suppression of mutations
13. Detection, selection and isolation of microbial mutants, Estimation of mutation rates
14. Mutagens – physical, chemical
15. Transposon mutagenesis, site – directed mutagenesis

CREDIT 2 Linkage and Mapping **15h**

1. Discovery of linkage, Morgan's experiments
2. Cytological proof of crossing over

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3. 2 – and 3 – point crosses
4. Recombination and Interference
5. Tetrad analysis
6. Mapping human genes by pedigree analysis
7. Fundamentals of population genetics (HW Law)
8. Pedigrees of autosomal dominant and autosomal recessive inherited traits
9. Pedigrees of X-linked recessive and X-linked dominant traits
10. Mobile genetic elements – Discovery,
11. Structure of transposons, Zea Ac/ Ds and Spm elements
12. Mechanism of transposition replicative and conservative
13. *Drosophila* copia, Yeast Ty elements
14. CRISPR-Cas9 gene editing
15. Using recombination to make knockout cells / organisms

CREDIT 3 Bacterial genetics and Model organisms **15h**

1. Discovery of conjugation
2. Mapping bacterial genes by conjugation
3. Discovery of transformation
4. Mapping bacterial genes by transformation
5. Discovery of transduction
6. Mapping bacterial genes by transduction
7. Mapping phage genes – Fine structure of rII locus: Complementation analysis
8. Fine structure of rII locus: Deletion mapping
9. *Dictyostelium* to study cell – cell communication and differentiation.
10. *Neurospora* to study one gene – one enzyme hypothesis
11. *Arabidopsis* to study flower development
12. *Drosophila* to study embryonic development (homeotic mutations)
13. *Danio* to study vertebrate development
14. *Xenopus* to study embryogenesis
15. *Mus* inbred and knockout strains, NOD and nude mice

REFERENCES:

1. Microbiology – Prescott L M, Harley JP. & Klein DA, McGraw - Hill
2. Principles of Genetics by Eldon John Gardner, Michael J.Simmons,D.Peter Snustad;John Wiley
3. Modern Genetic Analysis Anthony JF Griffiths, William M Gilbert, Jeffrey H Miller, and Richard C Lewontin. Pub.W.H.Freeman

COURSE OUTCOMES:

At the end of the course students will be able to:

BI204.CO1 interpret the chemical basis of heredity and the importance of mutations.
BI204.CO2 demonstrate the concept of linkage and mapping genes by pedigree analysis.
BI204.CO3 predict bacterial gene mapping to different gene transfer mechanisms and relate the biological processes of a model organism to higher organisms.

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24/4/25
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(Reaccredited with 'A' grade by NAAC)
Department of Biochemistry & Nutrition
PROGRAM NAME: M.Sc. BIOCHEMISTRY
2025-26
COURSE NAME: BIOCHEMICAL GENETICS

PAPER CODE: BI204P **PPW: 4**
YEAR/SEMESTER: I/II **NO OF CREDITS: 2**

CREDIT WISE COURSE OBJECTIVES

COb4 To explain Mendelian genetics, pedigree analysis and population genetics.
COb5 To demonstrate mitosis, meiosis, karyotyping and transformation.

CREDIT 4 Mendelian Genetics and Linkage and Mapping **30 h**

1. Problem solving: 2 and 3 point crosses
2. Problem solving: tetrad analysis
3. Problem solving: pedigree analysis
4. Problem solving: Hardy Weinberg equilibrium
5. Cytological proof of crossing over

CREDIT 5 Bacterial genetics and Model organisms **30 h**

1. Demonstration of stages of mitosis (onion root tip)
2. Demonstration of stages of meiosis (anthers)
3. Study of flower development : *Arabidopsis*
4. Karyotyping
5. Transformation of Bacterial cells.

References

1. Problems on Genetics, Molecular genetics, Evolutionary genetics and Immunogenetics, Pranab Kumar banerjee, 3rd edition.

COURSE OUTCOMES

At the end of the course students will be able to:

BI204P.CO4 analyse the inheritance of traits in plants and animals in research labs.
BI204P.CO5 execute cytogenetics and transformation techniques in research/biotech labs.

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