UTTARKHAND TECHNICAL UNIVERSITY
DEHRADUN

SYLLABUS
w.e.f. 2010 - 11

MASTER OF SCIENCE
IN
BIOCHEMISTRY

COURSE STRUCTURE & ORDINANACES FOR M.Sc. BIOCHEMISTRY

1. Course duration : Four semester (two years)
2. Objectives and Rules: Four semesters (two years) M.Sc. Programme is formulated for developing competent Biochemists, who are confident enough to take up various jobs. The course is based on interdisciplinary nature of Biochemistry, Chemistry, Quantitative Biology, Genetics, Microbiology and Biophysics. The programme obliges students to read original publications and envisages significant inputs in laboratory work, communication skill, creativity, planning, execution and critical evaluation of the scientific data. The specializations introduced in the four semester course of Biochemistry are; Organic Chemistry, Biomolecules, Metabolism-I, Enzymology, Methods in Biochemistry, Molecular biology – I, Cell Biology & Physiology, Metabolism-II, Plant Biochemistry, Microbial Biochemistry, Molecular biology – II, Clinical Biochemistry, Immunology, Nutritional Biochemistry, Bio membranes, Biostatistics & Bioinformatics.

2 Eligibility for admission: Graduates in Biochemistry, Chemistry, Microbiology, Life Sciences and Medical Sciences as principal subject or Biochemistry as subsidiary subject are eligible for admission to the course.

Marks requirement : Minimum 55% of aggregate (General Category),
Minimum 50% of aggregate (SC, ST Category)
or as per University / Government norms.

3 There shall be five theory papers (Paper I, II, III, IV & V), two lab. Courses (Paper VI & VII) and a seminar & internal assessment in M.Sc. First semester.

4 There shall be five theory papers (Paper VIII, IX, X, XI & XII), two lab. Courses (Paper XIII & XIV) and a seminar & internal assessment in M.Sc. Second semester.

5 There shall be five theory papers (Paper XV, XVI, XVII, XVIII & XIX), two lab. Courses (Paper XX & XXI) and a seminar & internal assessment in M.Sc. Third semester.

4 There shall be one theory papers (Paper XXII), a dissertation (Paper XXIII), a seminar & internal assessment in M.Sc. Fourth Semester.

5 Student will be assigned dissertation under the supervision of a competent faculty member (having Ph.D. degree) of the Institute in the fourth semester at the beginning of the semester which will continue till the end of the session. In some special cases where the department decides then a major topic may be assigned for maximum two students for dissertation work. The dissertation work will be evaluated by the examiners appointed by the University.

6 Evaluation of seminar will be done as per given Performa. Evaluation of seminar will be done separately by individual teachers & average of all the assessment by all the teachers will be considered as final marks. Dissertation will be evaluated on the basis of Thesis Writing, Presentation & Defense.

7 The minimum passing marks shall be 50% in aggregate and 40% in each individual paper of theory, practical, seminar & internal assessment and dissertation / project work.

8 The division shall be determined on the basis of aggregate marks of all the papers (theory, practical, seminar, internal assessment and dissertation / project work) of both previous and final year prescribed for the degree.

9 Conduct of examination and award of division will be as per following :-

a) First division 60% and above
b) Second division 48% and above but less than 60%
c) Third division 40% and above but less than 48%

10 The details of papers and scheme of examination is given on following pages.

UTTARAKHAND TECHNICAL UNIVERSITY, DEHRADUN
(UTTARAKHAND)

CURRCULUM FOR M. Sc. BIOCHEMISTRY
(TWO YEAR (FOUR SEMESTER) COURSE)
SEMESTER SYSTEM

SCHEME OF EXAMINATION

M. Sc. FIRST SEMESTER

S. No.	Paper No.	Paper Code	Nomenclature	Periods / Weeks	Max. Marks (70 + 30 = 100)			Credits
					Univ. Exam	Class Test	Total Marks	
1	I	MBC - 111	Organic & Bio-physical Chemistry	4	70	30	100	3
2	II	MBC - 112	Biomolecules	4	70	30	100	3
3	III	MBC - 113	Metabolism-I	4	70	30	100	3
4	IV	MBC - 114	Plant Biochemistry	4	70	30	100	3
5	V	MBC - 115	Cell Biology & Physiology	4	70	30	100	3
6	VI	MBC – 111P	Lab Course – 1	8	70	30	100	4
7	VII	MBC – 112P	Lab Course – 2	8	70	30	100	4
Total					490	210	700	23

Seminar & Internal Assessment : 20 + 30 (10 + 10 + 10) = 50
(Attendance, Practical & overall performance)
Total marks of M. Sc. First Semester = 750

M. Sc. SECOND SEMESTER

S. No.	Paper No.	Paper Code	Nomenclature	Periods / Weeks	Max. Marks (70 + 30 = 100)			Credits
					Univ. Exam	Class Test	Total Marks	
	VIII	MBC - 121	Advance Molecular biology – I	4	70	30	100	3
	IX	MBC - 122	Biochemical Techniques	4	70	30	100	3
	X	MBC - 123	Metabolism-II	4	70	30	100	3
	XI	MBC - 124	Enzymology	4	70	30	100	3
	XII	MBC - 125	Nutritional Biochemistry	4	70	30	100	3
	XIII	MBC – 121P	Lab Course – 3	8	70	30	100	4
	XIV	MBC – 122P	Lab Course – 4	8	70	30	100	4
Total					490	210	700	23

Seminar & Internal Assessment : 20 + 30 (10 + 10 + 10) = 50
(Attendance, Practical & overall performance)
Total marks of M. Sc. Second Semester = 750

M. Sc. THIRD SEMESTER

S. No.	Paper No.	Paper Code	Nomenclature	Periods / Weeks	Max. Marks (70 + 30 = 100)			Credits
					Univ. Exam	Class Test	Total Marks	
	XV	MBC - 211	Advance Molecular biology-II	4	70	30	100	3
	XVI	MBC - 212	Clinical Biochemistry	4	70	30	100	3
	XVII	MBC - 213	Immunology	4	70	30	100	3
	XVIII	MBC - 214	Microbial Biochemistry	4	70	30	100	3
	XIX	MBC - 215	Molecular & Immunological Techniques	4	70	30	100	3
	XX	MBC – 211P	Lab Course – 5	8	70	30	100	4
	XXI	MBC – 212P	Lab Course – 6	8	70	30	100	4
Total					490	210	700	23

Seminar & Internal Assessment : 20 + 30 (10 + 10 + 10) = 50
(Attendance, Practical & overall performance)
Total marks of M. Sc. Third Semester = 750

M.Sc. FOURTH SEMESTER

S. No.	Paper No.	Paper Code	Nomenclature	Periods / Weeks	Max. Marks (70 + 30 = 100)			Credits
					Univ. Exam	Class Test	Total Marks	
1	XXII	MBC - 221	Biostatistics & Bioinformatics	4	70	30	100	3
2	XXIII	MBC - 222	Dissertation	2/students	150	50	200	17
Total					220	80	300	20

Seminar & Internal Assessment : 20 + 30 (10 + 10 + 10) = 50
(Attendance, Practical & overall performance)
Total marks of M. Sc. Fourth Semester = 350

Grand Total Marks: Total Marks of M. Sc. Semester I + II +III+IV= Total Marks of M. Sc. Final 750 + 750 + 750 + 350 = 2600

Dissertation: Two periods (equivalent to theory) per week per student

CERTIFICATE

(To be used in Dissertation Thesis)

This is to certify that the Dissertation entitled "……". Submitted by ……. Enrollment no. …… University roll no…..……in partial fulfillment of the degree of Master of Science in Biochemistry (Name of the Institute) of Uttarakhand Technical University, Dehradun, Uttarakhand is a bonafide and original research work carried out by her/him under my / our supervision and guidance during the academic year …… No part of this dissertation has been submitted to any other university for any other degree or diploma.

SUPERVISOR

DEPARTMENT OF BIOCHEMISTRY

SEMINAR ASSESSMENT FORMAT

Sr.	Name of Student	Class	Topic	Evaluation				Average
				Topic Impact	Topic Grasp	Presentation	Ans to Que	

Remarks (if any):

Date:----------

(Name & Sig. of Teacher)

DETAILED SYLLABUS

M. Sc. BIOCHEMISTRY (FIRST SEMESTER)
Paper - I: ORGANIC & BIO-PHYSICAL CHEMISTRY (Code - MBC 111)

MAX. MARKS: 70 **TIME: 3 HRS**

Note:
1. Eleven questions will be set in all.
2. Question No. 1, which will be objective type / short - answer type covering the entire syllabus, will be compulsory.
3. The remaining ten questions Shall be set Unit wise with two questions from each Unit I, II, III, IV & V. The candidates shall be required to attempt Question No. 1 & five more selecting one question from each Unit. As far as possible, the questions shall be short answer type and not essay type.
4. Each question will be subdivided into 2 - 4 parts & the distribution of marks will be indicated part - wise.

UNIT – I

Organic Chemistry & Reaction Mechanisms: The hydrogen bond and hydrophobic interactions. Reactive intermediates formation, structure, stability and reactions of carbonium ions, carbanions. Free radicals in biological systems, oxygen as free radical in auto-oxidation of fats, free radical inhibitors in the cells like vitamin E, vitamin A, vitamin C.

UNIT – II

Types of reactions catalyzed by enzymes: Nucleophilic displacement reactions, displacement reactions of carbonyl groups, displacement on a phosphorus atom, multiple displacement reactions and the coupling of ATP cleavage to endergonic reactions, conjugative elimination, enolic intermediates in isomerization reactions, beta cleavage and condensations, some isomerization and rearrangement reactions.

UNIT – III

Stereo chemistry: Structural isomerism, stereoisomerism, geometrical isomerism (E & Z nomenclature) Optical isomerism, optical activity and chirality, the chiral centre, enantiomers, configuration, specification, of configuration, DL, RS threo and erythro notations, sequence rules, stereoselective and stereospecific reactions, enantiotopic and diastereotopic ligands and faces.

UNIT – IV

Isotopic tracer techniques: Types of radiation, measurement, scintillation & gamma counters. Back ground noise quenching, applications. Autoradiography.

UNIT – V

Molecular spectroscopy: Basic concepts & applications of IR, 1H - NMR, Mass ORD, CD, X - ray diffraction & crystallography.

Suggested Reading:

1. Stereo chemistry of organic compounds (1994) by E.L. Ellel & SHW Awley, Inter Science Pub. 30, Wiley and Sons. Inc.
2. Organic Chemistry (6th ed. 2000) by R.T. Morrison & R.N. Boyd, Prentice Hall of India, New Delhi.
3. Organic Chemistry Vol. 1 Fundamental Principle (6th Ed. 1985) by IL Finar, ELBS. Vol. 2 Stereo Chemistry and the Chemistry of Natural Products (5th ed. 1985) by I.L. Finar, ELBS.
4. Principles and Techniques of Practical biochemistry (4th ed 1999) by K. wilson and J. walker (eds) Cambridge Univ. Press.

M. Sc. BIOCHEMISTRY (First Semester)

Paper -II: BIOMOLECULES (Code – MBC 112)

MAX. MARKS: 70 **TIME: 3 HRS**

Note:

1. Eleven questions will be set in all.
2. Question No. 1, which will be objective type / short - answer type covering the entire syllabus, will be compulsory.
3. The remaining ten questions Shall be set Unit wise with two questions from each Unit I, II, III, IV & V. The candidates shall be required to attempt Question No. 1 & five more selecting one question from each Unit. As far as possible, the questions shall be short answer type and not essay type.
4. Each question will be subdivided into 2 - 4 parts & the distribution of marks will be indicated part - wise.

UNIT – I

Carbohydrates: Structures and properties of monosaccharides. Anomeric forms and derivatives of monosaccharides (reactions of carbohydrates), Glycosidic bonds, Biological importance of monosaccharides, disaccharides, trisaccharides and polysaccharides. Ring structure and mutarotation. Homo and heteropolysaccharides. Structural polysaccharides (cellulose, chitins, starch, dextrans, inulin, pectins, agar and glycogen). Mucopolysaccharides, sialic acids, bacterial cell wall polysaccharides, glycoproteins, membrane glycoproteins and their biological functions, Blood group substances.

UNIT - II

Proteins: Structure and properties of amino acids and peptide bond, double bond character. Basic concepts of theoretical conformational analysis of proteins, free rotation about bonds and highly restricted rotations, torsional angles. Types of proteins and their classification. Forces stabilizing protein structure and shape. Different levels of structural organization of proteins. Purification of proteins and criteria of their purity. Denaturation and renaturation of proteins.

UNIT - III

Structure and biological functions of fibrous proteins (keratin, collagen, elastin). Globular proteins (Hemoglobin and myoglobin). Sickel cell Hb, lipoproteins, metalloproteins, glycoproteins, nucleoproteins.

Chemical synthesis of polypeptides: Protection of N-terminal and C-terminal ends and functional groups in the side chains, formation of peptide bond, strategy of chemical synthesis and solid phase peptide synthesis of Merrifield. Methods of sequencing proteins

UNIT - IV

Lipids: Classification, structures, nomenclature and properties of fatty acids, essential fatty acids, Glycerides. Hydrolysis of fats, saponification value, rancidity of fats, iodine number. Reichert - Meissel number. Phospholipids structures & properties of different

types of phospholipids, sphingomyelins, glycolipids, cerebrosides, gangliosides. Terpenes, Prostaglandins, prostacyclins, thromboxanes, leukotrienes. Basic structure of steroids, cholesterol its structure and biological properties. Structure of bile acids.

UNIT -V

Nucleic Acids: Structure and properties of purines, pyrimidines, nucleosides and nucleotides.

Nucleic acid as genetic material: experimental evidences. Chargaff's rule, Structure of DNA, various forces responsible for stability of DNA, various forms of DNA, various classes of DNA, highly repetitive, moderately repetitive and unique sequence, DNA organization in chromatin, C-value paradox, denaturation and Renaturation, RNA structure and types.

Suggested Reading:

1. Lehninger's Principles of Biochemistry (2nd Ed 2000) D.L Nelson and M.M. Cox, Macmillan Worth Pub. Inc. NY.
2. Biochemistry (4th edn. 1992) by Lubert Stryer WH Freeman & Co., NY.

M.Sc. BIOCHEMISTRY(First Semester)

Paper -III: METABOLISM – I (Code - MBC 113)
MAX. MARKS: 70 TIMES: 3 HRS

Note:

1. Eleven questions will be set in all.
2. Question No. 1, which will be objective type / short - answer type covering the entire syllabus, will be compulsory.
3. The remaining ten questions Shall be set Unit wise with two questions from each Unit I, II, III, IV & V. The candidates shall be required to attempt Question No. 1 & five more selecting one question from each Unit. As far as possible, the questions shall be short answer type and not essay type.
4. Each question will be subdivided into 2 - 4 parts & the distribution of marks will be indicated part - wise.

UNIT - I

Principles of thermodynamics: open, closed and isolated thermodynamic systems, thermodynamic state functions, first and second laws of thermodynamics, concept of free energy, standard free energy, equilibrium constant, relationship between standard free energy change and equilibrium constant.

High energy compounds: Introduction and group transfer potential.

UNIT - II

Structural basis of free energy of hydrolysis of phosphoric acid anhydrides, phosphoric carboxylic anhydrides (acyl phosphates), enol phosphates and guanidinium phosphates, dependence of free energy of ATP hydrolysis on pH. ATP as the universal currency of free energy in biological system, ATP-ADP cycle. Coupling of reactions. Biological oxidation-reduction reactions: Oxidation reduction half reactions, the Nernst equation, redox potential, calculation of ΔG from standard reduction potentials.

UNIT - III

Approaches for studying metabolism, Metabolic inhibitors, mutants, use of isotopic tracers and isolated organs, cells & sub - cellular organelles.

Carbohydrate metabolism, Glycolysis: Historical perspective, reactions, energetics and regulation. Fate of pyruvate under aerobic and anaerobic conditions. Pasteur effect. Feeder path ways: entry of starch, fructose, mannose, galactose, glycerol, sucrose and lactose into glycolysis. Petose phosphate pathway and its significance, TCA cycle reactions, regulation and amphibolic nature. Anaplerotic reactions. Glyoxalate cycle.

UNIT – IV

Gluconeogenesis: pathway and its regulation. Cori cycle, Petose phosphate pathway and its significance. Inter conversion of sugars. Biosynthesis of lactose, sucrose and starch. Glycogenolysis and glycogenesis. Control of glycogen metabolism. Maintenance of blood glucose levels. Pyruvate Dehydrogenase multenzyme complex and its significance. Biosynthesis of glycoproteins.

UNIT - V

Mitochondrial Electron transport chain and oxidative phosphorylation: Mitochondrial transport systems. Nature, order and organization of carriers of electron transport chain, transfer of electrons through protein complexes of ETC and inhibitors of electron transport chain. Oxidative phosphorylation: Coupling between oxidation and phosphorylation (Chemiosmotic, hypothesis including evidences supporting this hypothesis). Proton gradient generation. ATP synthase, Binding change mechanism for proton driven ATP synthesis, uncoupling of oxidative phosphorylation, control of ATP production, P/O and H / P ratios.

Suggested Reading:

1. Lehinnger's Principles of Biochemistry (2nd edn. 2000) by D.L. Nelson and M.M. Cox, Macmillan, worth Pub. Inc., NY.
2. Biochemistry (4th edn. 1992) by Lubert Stryer WH Freeman & Co., NY.
3. Harper's Biochemistry (25th ed.) by R.K. Murray and others. Appleton and Lange, Stanfor.

M.Sc. BIOCHEMISTRY(First Semester)

Paper - IV: PLANT BIOCHEMISTRY (Code –MBC- 114)
MAX. MARKS: 70 TIME: 3 HRS

Note:
1. Eleven questions will be set in all.
2. Question No. 1, which will be objective type / short - answer type covering the entire syllabus, will be compulsory.
3. The remaining ten questions Shall be set Unit wise with two questions from each Unit I, II, III, IV & V. The candidates shall be required to attempt Question No. 1 & five more selecting one question from each Unit. As far as possible, the questions shall be short answer type and not essay type.
4. Each question will be subdivided into 2 - 4 parts & the distribution of marks will be indicated part - wise.

UNIT - I

Plant cell: Structure of plant cell, Chemical and physical composition. Isolation of cell organelles, plant cell wall.
Photosynthesis: Structure of photosynthetic machinary of plant and bacteria (chloroplast, thylakoid, bacteriorhodopsin), Light and dark reaction, Photophosphorylation: Cyclic and non -cyclic; Z-Scheme of photophosphorylation, Photolysis of water, Inhibitors of cyclic and non-cyclic electron transport, Structure and reaction mechanism of electron transport through the intermediates of photophosphorylation cylcle viz., plastocyanin, plastoquinones, cytochromes, PS-I and PS-II complex; Theory of electron transport coupled with ATP synthesis in thylakoid membrane and their resemblance with mitochondrial electron transport chain. Structure of LHC (Light harvesting complex) and RC (reaction centre),
Energy transduction: Florescence, phosphorescence,ground stage, singlet, doublet and triplet stages.

UNIT - II

C3, C4 and CAM cycle; Compartmentation of C3, C4 and CAM pathways. Structure and action of RUBISCO (Ribuloase 1,5-bisphosphate corboxylase oxygenase),

UNIT - III

photorespiration: Pathway and significance.
Sucrose and starch biosyntehsis and regulation.
Biological N2 fixation: N2 fixing organisms structure and mechanism of action of nitrogenase, role of leghaemoglobin. nif genes of Klebsiella pneumoniae and their role in nitrogen fixation.

UNIT - IV

Nitrate Assimilation: Nitrate uptake structure and function of nitrate reductase and nitric reductase and their role in regulation in assimilation of nitrate.
Sulphate assimilation. Free and bound pathways of assimilation of sulphate into cysteine. Glutathione and its role in sulfur metabolism.

UNIT - V

Plant hormones/growth regulators: Physiological effects of different plant hormones. Mechanism of action of auxins, giberellins, cytokinins, ABA and ethylene.
Secondary plant metabolism: Biosynthetic pathways (I) Classical acetate-mavalonate and (ii) novle alternative non-mevalonate pathway of isoprenoid biosynthesis. Biosynthesis of porphyrins, chlorophylls, carotenoids (lycopene & β-carotene), sterols (Brassinosteroids), alkaloids (conine, codeine and morphine), phenolics and flavoridiods.
Role of secondary metabolism in chemical defence.
Interaction between primary and secondary metabolic pathways.

Suggested Reading:

1. Handbook of photosynthesis (ed) Mohammad Pe sarakle, Marcel Dekkar, Inc. NY Basel, Hong Kong 1997.
2. Introduction to plant biochemistry (1983) T.W. Goodwin and EI Mercer. Pergaman Press, Oxford, NY, Toronto, Sydney, Paris, Frankfurt.
3. Seed: physiology of development and germination (2nd ed. 1994) J.D. Bewley and M. Black Plenum Press NY.
4. Biochemistry of energy utilization i plants D.T. dennis Blackie, Glasgow and Lodnon 1987.
5. Plant Biochemistry by P.M. Dey and J.B. Harborne. Harcourt Asia PTE Ltd., Singapore.

M.Sc. BIOCHEMISTRY(First Semester)

Paper - V: Cell Biology & Physiology (Code MBC 115)
MAX. MARKS: 70 **TIME: 3 HRS**

Note:
1. Eleven questions will be set in all.
2. Question No. 1, which will be objective type / short - answer type covering the entire syllabus, will be compulsory.
3. The remaining ten questions Shall be set Unit wise with two questions from each Unit I, II, III, IV & V. The candidates shall be required to attempt Question No. 1 & five more selecting one question from each Unit. As far as possible, the questions shall be short answer type and not essay type.
4. Each question will be subdivided into 2 - 4 parts & the distribution of

marks will be indicated part - wise.

UNIT - I

Cell Biology: Cellular and subcellular differences between prokaryotes and eukaryotes,structure and functions of cell membrane, endoplasmic reticulum, Golgi apparatus, lysosomes, vacuoles, microbodies, cytoskeleton (microtubules, microfilaments, intermediate filaments) cilia and flagella. Mitochondria and Chloroplast: structure, genomes and biogeneses,. Nucleus: structure, karyotype, polytene and lamp brush chromosomes, structural and numerical rearrangements of chromosomes

UNIT – II

Cell cycle: interphase and M phases - mitosis and meiosis with special reference to spindle formation, movement of chromosomes, synaptosomal complex; regulation of cell cycle. The extra cellular matrix cell-cell interactions.

UNIT – III

Cancer: Carcinogenesis, characteristics of cancer cells, cancer causing agents, protooncogenes, oncogenes and tumor suppressor genes, Apoptosis.

UNIT – IV

Blood: Components, functions, physical characteristics, clotting, fabrinolysis, blood groups & blood types. Blood disorders: anaemia, polycythemia, leukemia. Composition, function, and regulation of saliva, gastric, pancreatic, intestinal and bile secretions digestion and absorption of carbohydrates, lipids, proteins. Nephron as filtration system, tubular re-absorption of glucose, water and electrolytes, regulation of water and electrolyte balance.

UNIT – V

Various endocrine secretions and their physiological roles, mechanism of signal transduction. Biochemistry of muscle contraction, Biochemistry of Vision. Neuron and neurotransmission.

Suggested Reading:

1. Molecular Biology of the Cells (3rd edn 1994) by Alberts et al., Garland Publications Inc. NY and London
2. Cell biology (1993) by E.S. Sedava, Jones and Barlett Publishers Boston, London.
3. Cell and Molecular Biology (8th ed. 2001) by E.D.P. de Robertis & E.M.F. de Robertis (Jr) Lippincott Williams & willkins, Philadelphia.
4. Principles of Cell Biology (1988) by Klein Smith and M. Kish, Harper-Cellins PUb. Inc. New Delhi.
5. Text book of Medical Physiology (10th ed. 2001) by A.C. Guyton and J.E. Hall, Harcourt Asia.

M.Sc-BIOCHEMISTRY. (Second Semester)

Paper –VIII: ADVANCE MOLECULAR BIOLOGY – I (Code – MBC-121)
MAX. MARKS: 70 TIME: 3 HRS

Note:
1. Eleven questions will be set in all.
2. Question No. 1, which will be objective type / short - answer type covering the entire syllabus, will be compulsory.
3. The remaining ten questions Shall be set Unit wise with two questions from each Unit I, II, III, IV & V. The candidates shall be required to attempt Question No. 1 & five more selecting one question from each Unit. As far as possible, the questions shall be short answer type and not essay type.
4. Each question will be subdivided into 2 - 4 parts & the distribution of marks will be indicated part - wise.

UNIT – I

DNA Replication: Possible modes of DNA replication, Meselson - Stahl experiment, DNA polymerases and other enzymes involved in DNA replication, Okazaki fragments, Mechanism of replication in prokaryotes and eukaryotes, inhibitors of DNA replication, different types of mutations and molecular basis of mutations,DNA repair mechanisms.

UNIT – II

Transcription: RNA polymerase/s in prokaryotes and eukaryotes, initiation, elongation and termination of transcription in prokayotes and eukaryotes, inhibitors of transcription. RNA replicases, reverse transcriptase, Post transcriptional modifcations. Overlapping genes and split genes.

UNIT – III

Translation: Characteristics of the genetic code, biological significance of degeneracy, decoding the code, wobble hypothesis. Aminoacyl tRNA synthetases, anticodon loop, ribosomes structure and function in prokaryotes and eukaryotes. Polyribosomes, various factors and steps involved in protein synthesis in prokaryotes and eukaryotes Post translational processing, signal hypothesis and protein targeting.

UNIT – IV

Gene regulation in prokaryotes: A brief description of various levels of control of gene expression in prokaryotes, lac operon, trp operon, regulation of gene expression of lambda phage. Interaction between DNA and DNA binding proteins in prokaryotes.

UNIT – V

Gene regulation in eukaryotes: A brief description of various levels of centrol of gene expression in eukaryotes including molecular aspects. Interaction between DNA and DNA binding proteins in eukaryotes. Short term and long term regulation of gene expression including genetic regulation of development in Drosophila.
Transposable genetic elements: Prokaryotic transposable genetic elements and mechanisms of transposition. Eukaryotic transposable genetic elements various transposable elements in yeast, drosophila and maize. Significance of transposable elements.

Suggested Reading:

1. Biochemistry (2nd ed 1995) by Donald Voet and Judith Voet.
2. Molecular Biology of the gene (IV ed 1987) J. watson NH Hopkin J.W. Roberts J.P. Stertz a m Weiner, Freeman PUb., San Francisco.
3. Genes VII Benjamin Lewin (2000) Oxford Univ Press. London.
4. Biochemistry (4th edn. 1992) by Lubert Stryer WH Freeman & Co., NY.

M.Sc-BIOCHEMISTRY. (Second Semester)

Paper -IX: BIOCHEMICAL TECHNIQUES (Code - MBC 122)
MAX. MARKS: 70 TIME: 3 HRS

Note:
1. Eleven questions will be set in all.
2. Question No. 1, which will be objective type / short - answer type covering the entire syllabus, will be compulsory.
3. The remaining ten questions Shall be set Unit wise with two questions from each Unit I, II, III, IV & V. The candidates shall be required to attempt Question No. 1 & five more selecting one question from each Unit. As far as possible, the questions shall be short answer type and not essay type.
4. Each question will be subdivided into 2 - 4 parts & the distribution of marks will be indicated part - wise.

UNIT – I

Measurement of pH: pH glass electrode, pH meter.
Titrimetry: Volumetric analysis, acid base titration, Redox titration, gravimetric and complexometric titration.

UNIT – II

Chromatography: Paper, TLC, GLC, HPLC, gel filtration, ion exchange & affinity chromatography.
UV & Visible Spectrophotometry: Basic Principles.

UNIT - III

Electrophoresis: Zone, Paper, Cellulose acetate, PAGE, Isoelectrofocussing. Pulse field electrophoresis, Molecular weight assay, gradient electrophoresis, Agarose gel electrophoresis. Southern, Northern & Western transfers.

UNIT - IV

Hydrodynamic methods: Sedimentation-Theory, preparatory & analytical ultra centrifuges, factors affecting sedimentation velocity, sedimentation coefficient measurement of S zonal centrifugation, DNA analysis, determination of molecular weight by sedimentation diffusion and sedimentation equilibrium methods.

UNIT - V

Membrance filtration, dialysis & their applications. Partial specific volume, Diffusion coefficient and their measurements. Viscosity: Theory, effect of macromolecules on the viscosity of the solution, measurement, molecular weight determination.

Suggested Reading:

1. Physical Biochemistry 2nd ed (1982) by David Friefelder, W.H. Freeman and Co. NY.
2. Principles and Techniques of Practical biochemistry (4th ed 1999) by K. wilson and J. walker (eds) Cambridge Univ. Press.
3. Physical Biochemistry by Kansal Edward Van Holde (1971) Prentice Hall Inc. New Jersey.

M.Sc-BIOCHEMISTRY. (Second Semester)

Paper -X: METABOLISM –II (Code - MBC 123)
MAX. MARKS:70 **TIME: 3 HRS**

Note:
1. Eleven questions will be set in all.
2. Question No. 1, which will be objective type / short - answer type covering the entire syllabus, will be compulsory.
3. The remaining ten questions Shall be set Unit wise with two questions from each Unit I, II, III, IV & V. The candidates shall be required to attempt Question No. 1 & five more selecting one question from each Unit. As far as possible, the questions shall be short answer type and not essay type.
4. Each question will be subdivided into 2 - 4 parts & the distribution of marks will be indicated part - wise.

UNIT - I

Lipid catabolism: Degradation of triacylglycerols by lipases, Knoop's experiment fatty acid activation, transport of fatty acyl CoA into mitochondria, beta oxidation of saturated fatty acid, oxidation of unsaturated and odd carbon fatty acid, regulation of fatty acid oxidation, alpha and omega oxidation of fatty acid, peroxisomal, formation and utilization of ketone bodies.

Fatty acid biosynthesis: Acetyl CoA carboxylase, transport of acetyl CoA from mitochondrial matrix to cytosol, biosynthesis of saturated fatty acids, elongation and desaturation of fatty acids, biosynthesis of triacylglycerols, regulation of fatty acid metabolism, cholesterol biosynthesis and its regulation, biosynthesis of phosphoglycerides, sphingolipids, prostaglandins.

UNIT -II

Amino acid metabolism: Sources of amino acid pool. General reactions of amino acids: Transamination, Oxidative and non oxidative deamination and decarboxylation. Role of glutamine in ammonia transport. Glucose alanine cycle. Urea cycle: reactions, regulation and its linkage with the citric acid cycle.

UNIT -III

Amino acid biosynthesis: Nitrogen cycle, biosynthesis of essential and non essential amino acids. Regulation of amino acid biosynthesis. Amino acids as biosynthetic precursor, Biosynthesis of Phosphocreatine, glutathione, dopamine, epinephrine GABA, histamine, serotinin, polyamines (spermine and spermidine), D - amino acids, indole 3 acetate from amino acids. Porphyrins: Porphyrin nucleus and classification of porphyrins. Important pigments: chemical nature and their physiological significance. Biosynthesis and degrandation of heme.

UNIT -IV

Nudeotide metabolism: Denovo biosynthesis of purine and primidine nuclcotides. Regulation of purine and pyrimidine nuclcotide biosynthesis, formation of deoxyribonucleotides. Biosynthesis of nicotinamide coenzyme, flavin coenzymes and coenzyme A. Salvage pathways of purines & pyrimidies. Catabolism of purines and pyrimidines.

UNIT –V

Biological membranes and transport: Molecular constituents of membranes, supramolecular architecture of membranes and asymmetric nature of biological membrane. Solute transport across membranes; Fick's law, simple (Passive) diffusion, facilitated diffusion and active transport (primary and secondary). Uniport, symport and antiport transport systems. Ionophores and porins.

ATP - driven active transport: Na^+ - K^+ -ATPase of plasma membrane, Ca^{+2} -ATPase, (H^+ - K^+) ATPase of gastric mucosa and group translocation, ion gradient driven active transport ; Na^+ - glucose symport and ADP - ATP translocase.

Suggested Reading:

1. Lehinnger's Principles of Biochemistry (2nd edn. 2000) by D.L. Nelson and M.M. Cox, Macmillan, worth Pub. Inc., NY.
2. Biochemistry (4th edn. 1992) by Lubert Stryer WH Freeman & Co., NY.
3. Harper's Biochemistry (25th ed.) by R.K. Murray and others. Appleton and Lange, Stanfor.

M.Sc. BIOCHEMISTRY(Second Semester)

Paper - XI: ENZYMOLOGY (Code - MBC 124)
MAX. MARKS: 70 **TIME: 3 HRS**

Note:
1. Eleven questions will be set in all.

2. Question No. 1, which will be objective type / short - answer type covering the entire syllabus, will be compulsory.
3. The remaining ten questions Shall be set Unit wise with two questions from each Unit I, II, III, IV & V. The candidates shall be required to attempt Question No. 1 & five more selecting one question from each Unit. As far as possible, the questions shall be short answer type and not essay type.
4. Each question will be subdivided into 2 - 4 parts & the distribution of marks will be indicated part - wise.

UNIT - I

Enzymes: Introduction, Historical perspectives, general characteristics, nomenclature and classification (rationale, over view and specific examples). Enzyme Terminologies, Measurement and expression of enzyme activity: enzyme assay activity units (I.U. and Katal), turnover number and specific activity. Common features of active sites. Enzyme specificity: types & theories (lock and key, induced fit and three point attachment). Ribozymes and Abzymes.

Enzyme Purification: Isolation and purification of enzymes, criteria of homogeneity of enzymes and characterization of enzymes including determination of their molecular weight.

UNIT - II

Enzyme kinetics: enzyme concentration, substrate concentration, pH and temperature. Arrhenius plot. Effect of pH and temp on enzyme stability. Derivation of Michaelis - Menten equation of unisubstrate reactions. Km and its significance, Kcat/ Km and its importance. Measurement of Km and Vmax. Lineweaver - Burk plot and other linear transformations of MM equation. Bi-substrate reactions : Sequential and Ping Pong mechanisms.

UNIT - III

Enzyme inhibition: Types of reversible inhibitors (competitive Non Competitive and uncompetitive) derivation of equations for different types of inhibitors, determination of Ki and irreversible inhibitors (affinity labels and suicide inhibitors). Significance of inhibition.

UNIT - IV

Enzyme regulation: Control of enzyme activity, Coarse control: Enzyme induction and repression; fine control: feed back inhibition, Allosteric control with asparate transcarbamoylase as an example, sigmoidal kinetics and their importance concerted and sequcntial models for action of allosteric enzymes. Reversible and irreversible covalent modifications of enzymes. Regulation by the binding of stimulatory and inhibitory proteins.

UNIT - V

Protein ligand interaction: Binding of a ligand to a protein having a single ligand binding site and two ligand binding sites. Co-operativity phenomenon. Hill and Scatchard plots.

Enzyme Turnover: Introduction, methods for measurement of rates of enzyme turnover, mechanisms of protein degradation and significance of enzyme turnover.

Enzyme Technology: Preparation of immobilized enzymes. Properties and industrial applications of immobilized enzymes. Enzyme therapy. Use of isolated enzymes in industrial processes.

Suggested Reading:

1. The chemical kinetics of enzyme action by K.J. Laidler and P.S. Bunting, Oxfor University Press, London.
2. Enzymes by M. Dixon, E.C. Webb, CJR Thorne and K.F. Tipton, Longmans, London.
3. Enzyme structure and mechanism (1977) by Alan Fersht, Reading, USA.
4. Enzymatic reaction mechanism (1979) by christopher Walsh, Freeman PUb., San Francisco.
5. Immobilized enzymes(1978) by inhiro Chibata, Halsted Press Book
Enzyme structure and function by S. Blackburn (1976) Marcel Dekker, Inc., NY.

M. Sc. BIOCHEMISTRY (Second Semester)

Paper - XII: NUTRITIONAL BIOCHEMISTRY (Code-MBC-125)
MAX. MARKS: 70 TIME: 3 HRS

Note:
1. Eleven questions will be set in all.
2. Question No. 1, which will be objective type / short - answer type covering the entire syllabus, will be compulsory.
3. The remaining ten questions Shall be set Unit wise with two questions from each Unit I, II, III, IV & V. The candidates shall be required to attempt Question No. 1 & five more selecting one question from each Unit. As far as possible, the questions shall be short answer type and not essay type.
4. Each question will be subdivided into 2 - 4 parts & the distribution of marks will be indicated part - wise.

UNIT - I

Basic Concepts: Composition of human body. Energy content of foods. Measurement of energy expenditure. Direct & indirect calorimetry. Definition of BMR and SDA and factors affecting these.

UNIT - II

Thermogenic effects of foods. Antinutrients: Naturally occuring food born toxicants, Protease inhibitors, Hemagglutin, hepatotoxins, allergens, oxalates, toxin from mushrooms, animal food stuffs and sea foods.
Food additives: Antioxidants, antimicrobial agents, non-nutritive and low calorie sweetners, stabilizers and thickners.

UNIT III

Protein energy malnutrition: etiology, clinical features, metabolic disorders and management of Marasmus and kwashiorkar diseases.
Starvation; Techniques for the study of starvation. Protein metabolism prolonged fasting. Protein sparing treatments during fasting. Basic concept of high protein, low caloric weight reduction diets.

UNIT- IV

Obesity: Definition and classification. Genetic and environmental factors leading to obesity. Obesity related diseases and management of obesity. Basic concept of high protein, low caloric weight reduction diets.
Nutritive values of common Indian food: Cereals and millets, sugar and starch foods, pulses and legumes, oil seeds and nuts, food of animal origin.

UNIT – V

Clinical Nutrition: Role of diet & nutrition in the prevention and treatment of disease : dental caries. Fluorosis, Renal failure, hyperlipidemia, Atherosclerosis & rheumatic disorders, inherited metabolic disorders Phenylketonuria, Maple syrup urine disease, hoymocystinuria, Gout.

Suggested Reading:

1. Tietz Fundamentals of Clinical Chemistry - (5th edn.) C A Burtis, E R Ashwood (eds.) Saunders WB Co.
2. Notes on Clinical Chemistry - Whitby L G, A F Smith, G J Beckett, S M Walker, Blackwell Sci Inc.
3. Principles of Internal Medicine (1983) Harrison T R, McGraw Hill, NY.
4. Text book of Medical Physiology (10th ed. 2001) by A.C. Guyton and J.E. Hall, Harcourt Asia.
5. Nutrition: An integrated approach (3rd edn. 1984) R L Pike and M L Borwn, Willey & Sons Inc., Ny.
6. Text Book of Biochemistry and Human Biology G P Talwar, Prentice Hall.
7. Mechanism and Theory in Food Chemistry (1996) DWS Wong, CBS, New Delhi.
8. Text Book of Human Nutrition (1996) M S Bamji N Pralhad Rao and V Raddy, Oxford & IBH Publishers.
9. Principles of Food Science - I (Food Chemistry) Fennemone D R
10. Human Nutrition and Dietetics (8th Ed. 1982) by Davidson and Passmore ELBS.
11. Modern Nutrition in Health and Diseases (7th ed. 1988) by Maurice E Skills and V R Young K M Varghese Co. Bombay.

M.Sc. BIOCHEMISTRY (Third Semester)

Paper - XV: ADVANCED MOLECULAR BIOLOGY-II (Code –MBC-211)
MAX. MARKS: 70 TIME: 3 HRS

Note:
1. Eleven questions will be set in all.
2. Question No. 1, which will be objective type / short - answer type covering the entire syllabus, will be compulsory.
3. The remaining ten questions Shall be set Unit wise with two questions from each Unit I, II, III, IV & V. The candidates shall be required to attempt Question No. 1 & five more selecting one question from each Unit. As far as possible, the questions shall be short answer type and not essay type.
4. Each question will be subdivided into 2 - 4 parts & the distribution of marks will be indicated part - wise.

UNIT – I

Recombinant DNA Technology: Introduction, restriction endonucleases and their types Cloning vectors for E. coli: Plasmids: properties of an ideal plasmid cloning vector, use of pBR 322 and pUC plasmids as vectors, phages - use of phage lambda and M13 as vectors, cosmids.

UNIT –II

Expression vectors, Cloning vectors for organisms other than E. coli: Cloning vectors for yeast and animal cells. Formation of chimeric plasmids: Cutting DNA molecules using restriction endonucleases, ligation of DNA, molecules by using synthetic linkers, adaptors and homopolymer tailing, construction of genomic DNA library and cDNA library, Selection and screening of recombinants: Various methods like genetic, immunochemical, nucleic acid hybridization.

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UNIT – III

DNA transfer: Vector mediated; Transformation, Transduction, Transfection & in vitro packaging. Non vector mediated; Direct DNA uptake, electroporation, microinjection and microprojectile.
Animal cell culture: Primary culture, primary cell lines, established cell lines and applications of animal cell culture.
Transgenic animals: development and uses.

UNIT – IV

Genetics: Brief history of genetics, Basic principles of heredity, linkage, Recombination and Eukaryotic gene mapping, Population genetics.
GENOMICS: an overview correlated genetic, cytological and physical maps of chromosomes, map position based cloning of genes. The human genome project, RNA and protein assays of genome function, evolution of genomes.

UNIT – V

Introduction to plant tissue and organ culture; Preparation of explants, formation of callus and suspension cultures and plant regeneration from cells.

Plant genetic engineering; methods of delivering foreign genes Agrobacterium mediated and microprojectile bombardment mediated transformations; Transgenic plants: health and ecological risks associated with it; application of Bt genes in cereal crops.

Suggested Reading:

1. Biochemistry (2nd ed 1995) by Donald Voet and Judith Voet.
2. Molecular Biology of the gene (IV ed 1987) J. watson NH Hopkin J.W. Roberts J.P. Stertz a m Weiner, Freeman PUb., San Francisco.
3. Genes VII Benjamin Lewin (2000) Oxford Univ Press. London.
4. Biochemistry (4th edn. 1992) by Lubert Stryer WH Freeman & Co., NY.

M. Sc. BIOCHEMISTRY (Third Semester)

Paper - XVI: CLINICAL BIOCHEMISTRY (Code-MBC-212)
MAX. MARKS: 70 TIME: 3 HRS

Note:
1. Eleven questions will be set in all.
2. Question No. 1, which will be objective type / short - answer type covering the entire syllabus, will be compulsory.
3. The remaining ten questions Shall be set Unit wise with two questions from each Unit I, II, III, IV & V. The candidates shall be required to attempt Question No. 1 & five more selecting one question from each Unit. As far as possible, the questions shall be short answer type and not essay type.
4. Each question will be subdivided into 2 - 4 parts & the distribution of marks will be indicated part - wise.

UNIT- I

Disorders of carbohydrates metablolism: Type I &Type II Diabetes mellitus, Glycohemoglobins Hypoglycemias, ketone acidosis, ketonuria, various types of glucose tolerance tests, Glycogen storage diseases and Galactosemia.
Disorders of lipid metablism: Sphingolipidosis, atherosclerosis, Hypolipoproteinemia & Hyperlipoproteinemia.

UNIT II

Disorders of amino acids metabolism: Phenylalaninemia, homocystinuria, tyrosinemia and related disorders, aminoacidurias.

Disorders of nucleic acid metabolism: Disorders of purine and pyrimidine metabolism.

UNIT – III

Blood components and their functions plasma proteins blood coagulation mechanism and regulation, Biochemical aspects of hematology: Thalassemias and anaemias. Detoxification mechanism of the body: Phase I and phase II pathways.

UNIT – IV

Hormone disturbances: Disturbances related to thyroid functions, protein hormones, steroid hormones and adrenocortical hormones. Components of respiratory system and their functions, transfer of blood gases oxygen and carbon dioxide role of 2, 3 DPG, Bohr's effect and chloride shift, acid base balance and its regulation, acidosis and alkalosis.

UNIT V

Diagnostic enzymes: Principles of diagnostic enzymology, Clinical singnificance of : Asparate aminotransferase, alanine aminotransferase, creatine kinase, aldolase, lactate dehydrogenase, enzyme tests in determination of myocardial infarction, Enzymes of pancreatic origin, biliary tract. Evaluation of organ function tests: Assessment of liver, kidney, pancreas and G. I. tract functions.

Suggested Reading:

1. Tietz Fundamentals of Clinical Chemistry - (5th edn.) C A Burtis, E R Ashwood (eds.) Saunders WB Co.
2. Notes on Clinical Chemistry - Whitby L G, A F Smith, G J Beckett, S M Walker, Blackwell Sci Inc.

M.Sc. BIOCHEMISTRY (Third Semester)

Paper - XVII: IMMUNOLOGY (Code –MBC-213)
MAX. MARKS: 70 **TIME: 3 HRS**

Note:
1. Eleven questions will be set in all.
2. Question No. 1, which will be objective type / short - answer type covering the entire syllabus, will be compulsory.
3. The remaining ten questions Shall be set Unit wise with two questions from each Unit I, II, III, IV & V. The candidates shall be required to attempt Question No. 1 & five more selecting one question from each Unit. As far as possible, the questions shall be short answer type and not essay type.
4. Each question will be subdivided into 2 - 4 parts & the distribution of marks will be indicated part - wise.

UNIT – I

Brief history of Immunology, Introduction to immune system-memory, specificity diversity, innate and acquired immunity, self vs non self discrimination, structure and functions of primary and secondary lymphoid organs. Phagocytic cells and their killing mechanisms, T & B lymphocytes.

UNIT – II

Antigen vs immunogen, Haptens, Structure and functions of immunoglobulins, isotypic, allotypic and idiotypic variations. Clonal selection theory-concept of antigen specific receptor, Differentiation of stem cells, recent advances in stem cell research

UNIT – III

Humoral and cell mediated immune responses , kinetics of primary and secondary immune responses, complement activation and its biological consequences, antigen processing and presentation, cytokines - role in immune responses. T and B cell interactions.

UNIT –IV

Major histocompatibility complex (MHC) genes and products polymorphism of MHC genes, role of MHC antigens in immune response. MHC antigens in transplantation Development, regulation and evolution of the immune system. Generation of diversity in immune system : Clonal selection theory - concept of antigen specific diversity.

UNIT - V

Immune- tolerance, Immuno-suppression, Hypersensitivity (Types I, II, III & IV). Immune responses to infectious diseases - viral, bacterial and protozoal, Cancer and immune system, immunodeficiency disorders, autoimmunity and autoimmune diseases.

Suggested Reading:

1. Immunology (4th edn. 1998) by Ivan Roitt, J Brostoff and David Mole (4th edn) Mosby Times Mirror Int. Publ. Ltd.,
2. Essential Immunology (9th ed. 1997) by Ivan Roitt Blackwell Science ltd.
3. Immunology (1992) by Janis Kuby W H Freeman and Co. Ltd. USA.
4. Immunology (2nd edn. 1991) by Edwards S Golub, Sinauer Associate, Sunderland.

M. Sc. BIOCHEMISTRY (Third Semester)

Paper - XVIII: Microbial Biochemistry (Code -MBC 214)
MAX. MARKS: 70 **TIME: 3 HRS**

Note:
1. Eleven questions will be set in all.
2. Question No. 1, which will be objective type / short - answer type covering the entire syllabus, will be compulsory.
3. The remaining ten questions Shall be set Unit wise with two questions from each Unit I, II, III, IV & V. The candidates shall be required to attempt

Question No. 1 & five more selecting one question from each Unit.
As far as possible, the questions shall be short answer type and not essay type.

4. Each question will be subdivided into 2 - 4 parts & the distribution of marks will be indicated part - wise.

UNIT- I

History of Microbiology: Discovery of Microorganisms. Spontaneous generation versus biogenesis. Establishment of role of microorganisms in diseases, transformation of organic and inorganic matter and soil transformation. Contribution of various Microbiologists.

Microscopy: Light and Electron microscopy

UNIT - II

Morphology and ultra structure of bacteria: General morphology of bacterial cell, morphological types of bacteria. Ultra structure of bacterial cell. Cell wall of gram - negative and gram positive bacteria and archaebacteria. Structure and function of cell membranes flagella, cillia, gas vesicles, bacterial genomes, plasmids, capsule-spore and cysts. Classification of bacteria, Whittaker's five kingdome concept, three domain concept of Carl Woes. Modern bases of classification DNA - DNA hybridization, 16SrRNA sequencing. Bergy's system of classification.

UNIT - III

Bacterial growth and cultivation: Cultivation of aerobic and anaerobic bacteria, nutritional types, culture media. Bacterial growth curve and generation time, growth kinetics, measurement of growth, factors affecting growth, Control of microbial growth: physical and chemical methods, disinfectants and radiations.

UNIT - IV

Viruses, Fungi and Protozoa: Classification and general features, of major fungal divisions, their morphology nutrition and reproductive methods. Protozoa - morphology, nutrition, encystment, locomotory organs and reproduction. Viruses - Morphology and ultra structure, capsids and their arrangements. Chemical composition, viral genome. Bacteriophages.

UNIT - V

Fermentation Technology: Shake flask culture, batch, fed-batch and continuous cultures. Fermenter design - basic stirred tank bioreactor and other different types of fermenters. Instrumentation and control. Aeration and agitation, mass transfer and oxygen transfer. Down stream processing. Primary and secondary metabolites. Industrial production of antibiotics (β-lactam), ethanol, enzymes: lipases, protease, cellulose and amylases.

Suggested Reading:

1. Microbial World (5th edn, 1987) R Y Stanier, Hampshire-Macmillan Press.
2. Medical Microbiology (12th edn. 1973) Cruckishank R and others, ELBS Press, London.
3. Microbiology (1967) B D Davis, R Delbecco, H M Eisent H S Ginsberg, Hoeber Med Divn Ny
4. Microbiology (5th ed 2000) Michael J Pelczar (Jr) ESC Chan, N R Kreig, Tata McGraw Hill.

M.Sc. BIOCHEMISTRY (Third Semester)

Paper –XIX: MOLECULAR AND IMMUNOLOGICAL TECHNIQUES
(Code – MBC-215)
MAX. MARKS: 70 **TIME: 3 HRS**

Note:
1. Eleven questions will be set in all.
2. Question No. 1, which will be objective type / short - answer type covering the entire syllabus, will be compulsory.
3. The remaining ten questions Shall be set Unit wise with two questions from each Unit I, II, III, IV & V. The candidates shall be required to attempt Question No. 1 & five more selecting one question from each Unit. As far as possible, the questions shall be short answer type and not essay type.
4. Each question will be subdivided into 2 - 4 parts & the distribution of marks will be indicated part - wise.

UNIT – I

Methods of studying nucleic acids: Chemical analysis of nucleic acids, molecular weight determination.
Isolation and purification of RNA.
Purification of DNA from living cells (both plasmids and total cell DNA).

UNIT – II

Hybridization of nucleic acids and their labeling methods, determination of nucleic acids sequences, restriction mapping of DNA. Blotting techniques; Southern, Northern, Western and Dot blot. PCR, RFLP, RAPD, DNA fingerprinting.

UNIT – III

Site directed mutagenesis, chemical synthesis of oligonucleotides, cell free systems for transcription and translation.
Antisense - RNA technology.
Introduction of DNA into living cells: Introduction into bacterial cells by transformation, transfection and in vitro packaging.

UNIT – IV

Measurement of antigen antibody interaction : Affinity, avidity and cross-reactivity, production of polyclonal and monoclonal antibodies, principles, techniques and application, agglutination and precipitation techniques, radio immunoassay, ELISA & ELISPOT, Immuno-fluorescence assays, Fluorescence activated cell sorter (FACES) techniques.

UNIT – V

Immunization : active immunization-Role of vaccines in the prevention of diseases. Recent approaches to production of vaccines, immuno-prophylaxis, passive immunization- Passive antibody therapy and serum therapy. Tissue typing, Microarrays to assess gene expression, Preparation and properties of human immune serum globulins.

Suggested Reading:

1. Immunology (4th edn. 1998) by Ivan Roitt, J Brostoff and David Mole (4th edn) Mosby Times Mirror Int. Publ. Ltd.,

2. Essential Immunology (9th ed. 1997) by Ivan Roitt Blackwell Science ltd.
3. Immunology (1992) by Janis Kuby W H Freeman and Co. Ltd. USA.
4. Immunology (2nd edn. 1991) by Edwards S Golub, Sinauer Associate, Sunderland.

M.Sc. BIOCHEMISTRY(FOURTH SEMESTER)

Paper – XXII: BIOSTATISTICS & BIOINFORMATICS (Code –MBC-221)
MAX. MARKS: 70 TIME: 3 HRS

Note:
1. Eleven questions will be set in all.
2. Question No. 1, which will be objective type / short - answer type covering the entire syllabus, will be compulsory.
3. The remaining ten questions Shall be set Unit wise with two questions from each Unit I, II, III, IV & V. The candidates shall be required to attempt Question No. 1 & five more selecting one question from each Unit. As far as possible, the questions shall be short answer type and not essay type.
4. Each question will be subdivided into 2 - 4 parts & the distribution of marks will be indicated part - wise.

UNIT - I

Introduction and scope of biostatistics: Presentation of data, frequency distribution, graphical representation of data by histogram, frequency curve and cumulative frequency curve.
Central tendency and measures of dispersion, mean, median, mode and their properties partition value standard deviation and coefficient of variation.

UNIT - II

Simple correlation coefficient and regression coefficient, regression lines. Tests of significance: t-test, z-test, chi-square tests of heterogeneity and independence of attributes, F-test.
Analysis of variance (ANOVA): Principles of experimental designs, randomized block & latin square designs.

UNIT – III

Introduction to computers: general idea of classification and characteristics of computers, microprocessor input / output devices, internal representation of date (bits & bytes; binary, octal & hexadecimal system), Types of languages: machine, assemble & high level languages.

UNIT- IV

Programming Language (BASIC): BASIC as a high language characters, constants variable names and arithmetic expressions. Programming in C++.
Brief idea of software: M.S. Office (World, Excel, Power Point), DATA bases. Internet uniform resource locator (URL) World wide Web HTPP internet access: Netscape navigators Internet explorer. PDP, NRL - 3D

UNIT – V

BLAST & FASTA : Swiss port, trembl, pir, Special software programs to align sequences. Nucleic acid and protein data resources available on the www. General DNA sequence data, Protein structure data base. Genome project data base. Human Mapping Data base.

Suggested Reading:

1. Biostatistics: a foundation for analysis in the health. (7th ed. 1999) by W W Daniel Jhon Wiley and Sons Inc. New York.
2.