

COURSE STRUCTURE (Three Years B.Sc. Biotechnology- 2009-2010)

SEMESTER-I

Course No.	Course Name	T	I.A	Total
BT 101	Communicative English	50	5	55
BT 102	Plant Diversity I and Bioprospecting	50	5	55
BT-103	Cell Biology	50	5	55
BY-104	Biochemistry and Metabolism	50	5	55
BT 105	Physical Chemistry	50	5	55
BT-106	Inorganic Chemistry	50	5	55
BT-107	Organic Chemistry	50	5	55
BT 108	Seminar on Biosystematics and Taxonomy and Term Paper writing			25
BT-109	Lab Course-I Plant Diversity and Cell Biology Biochemistry and Matabolism			90
	Total			500

SEMESTER-II

Course No.	Course Name	T	I.A	Total
BT 201	Biostatistics	50	5	55
BT 202	Microbiology	50	5	55
BT-203	Genetics	50	5	55
BT 204	Animal Diversity & Economic Zoology	50	5	55
BT-205	Physical Chemistry	50	5	55
BT 206	Organic Chemistry	50	5	55
BT-207	Inorganic Chemistry	50	5	55
BT 208	Seminar and term paper writing on evolution/ Environment/Genetics			15
BT-209	Lab Course I Chemistry II Microbiology, Genetics, Animal Diversity , Biostatistics			100 100
	Total			600

The Practical examination Chemistry of Ist semester will be held alongwith IInd Semester annually.

The Course contents of Chemistry will be the same as that of Chemistry of B.Sc.(Medical)

COURSE STRUCTURE (Three Years B.Sc. Biotechnology- 2009-2010)

SEMESTER-III

Course No.	Course Name	T	I.A	Total
BT 301	Medical Microbiology	50	5	55
BT 302	Bioanalytical Tools	50	5	55
BT 303	Plant Physiology	50	5	55
BT 304	Plant Diversity II & Genetics resourcing	50	5	55
BT-305	Physical Chemistry	50	5	55
BT-306	Organic Chemistry	50	5	55
BT-307	Inorganic Chemistry	50	5	55
BT 308	Seminar and term paper writing on Bio-Analytical techniques			25
BT-309	Lab Course- I Bioanalytical Tools, Plant Physiology, Plant Diversity & Medical Microbiology			90
	Total			500

SEMESTER-IV

Course No.	Course Name	T	I.A	Total
BT 401	Animal Diversity II & Bioprospecting	50	5	55
BT 402	Molecular Biology	50	5	55
BT-403	Developmental Biology	50	5	55
BT 404	Mammalian Physiology	50	5	55
BT-405	Physical Chemistry	50	5	55
BT-406	Organic Chemistry	50	5	55
BT-407	Inorganic Chemistry	50	5	55
BT 408	Seminar and term paper writing on Impact of Biotechnology			15
BT-409	Lab Course- I Chemistry.			100
	II Molecular Biology & Animal Diversity, Developmental and Mammalian Physiology			100
	Total			600

The practical exams. Chemistry of IIIrd semester will be held alongwith IVth Ssemester annually.

The Course contents of Chemistry will be the same as that of Chemistry of B.Sc.(Medical)

COURSE STRUCTURE (Three Years B.Sc. Biotechnology- 2009-2010)

SEMESTER-V

Course No.	Course Name	T	I.A	Total
BT 501	Bioinformatics	50	5	55
BT 502	Recombinant DNA Technology	50	5	55
BT-503	Animal Biotechnology	50	5	55
BT 504	Plant Biotechnology & Environmental Biotechnology	50	5	55
BT-505	Physical Chemistry	50	5	55
BT-506	Organic Chemistry	50	5	55
BT-507	Inorganic Chemistry	50	5	55
BT 508	Seminar and term paper writing on Tissue Culture			25
BT 509	Lab Course- I Animal Biotechnology & Recombinant DNA Technology Bioinformatics, Plant Biotech. , Environmental Biotech.			90
	Total			500

SEMESTER-VI

Course No.	Course Name	T	I.A	Total
BT 601	I.P.R. Entrepreneurship Bio ethics & Bio safety	50	5	55
BT 602	Genomic & Proteomics	50	5	55
BT-603	Diagnostic tools and Technology	50	5	55
BT 604	Immunology	50	5	55
BT-605	Physical Chemistry	50	5	55
BT-606	Organic Chemistry	50	5	55
BT-607	Inorganic Chemistry	50	5	55
BT 608	Seminar and term paper writing on diagnostic Techniques			15
BT-509	Lab Course- I Chemistry II Immunology & Diagnostic Genomic & Proteomics, and IPR & Entrepreneurship			100 100
	Total			600

The practical exams. Chemistry of Vth semester will be held along with VIth Semester annually.

The Course contents of Chemistry will be the same as that of Chemistry of B.Sc.(Medical)

IST SEMESTER

BT-101 COMMUNICATIVE ENGLISH

MM 50+5 IA

The syllabus for English is same as that for B.A./ B.Sc I

BT-102 PLANT DIVERSITY I AND BIOPROSPECTING

MM 50+5 IA

Note: Examiner is requested to set one compulsory and eight other questions at least two from each unit. The compulsory question should be of 10 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

UNIT I

Algae:

General character, classification and economic importance. Life histories of algae belonging to various classes :

- Chlorophyceae – Volvox, Oedogonium
- Xantho phyceae –Vaucheria
- Phaeophyceae – Ectocarpus
- Rhodophyceae-Polysiphonia

UNIT II

Fungi:

General characters, classification & economic importance.

Life histories of Fungi-

- Mastigomycontina- Phytophthora
- Zygomycotina-Mucor
- Ascomycotina- Saccharomyces
- Basidomycotina-Agaricus
- Deutromycotina-Colletotrichum

UNIT III

Lichens :

Classification, general structure, reproduction and economic importance.

Plant diseases:

Casual organism, symptoms and control of following plant diseases.

- Rust & Smut of Wheat.
- White rust of Crucifers.
- Late blight of Potato.
- Red rot of Sugarcane.
- Citrus Canker.

UNIT IV

Bryophytes-

General characters, classification & economic impotence.

Life histories of following:

- Marchantia.
- Funaria.



PRACTICALS

- 1) Comparative study of thallus and reproductive organs of various algae mentioned in theory
- 2) Comparative study of vegetative and reproductive parts of various fungi mentioned in theory
- 3) Study and section cutting and lectophenol mount of plant disease materials studied in theory.
- 4) Study of various types of lichens.
- 5) Study of external features & anatomy of vegetative and reproductive parts of Marchantia and Funaria.
- 6) Collection of algae, fungi, plant diseases materials and bryophytes available locally.

BT-103

CELL BIOLOGY

MM 50+5 IA

Note: Examiner is requested to set one compulsory and eight other questions at least two from each unit. The compulsory question should be of 150marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

UNIT I

Cell : An introduction and classification of organisms by cell structure, cytosol, compartmentalisation of eukaryotic cells, cell fractionation.
Cell Membrane and Permeability: Chemical components of biological membranes, organization and Fluid Mosaic Model, membrane as a dynamic entity, cell recognition and membrane transport.

UNIT II

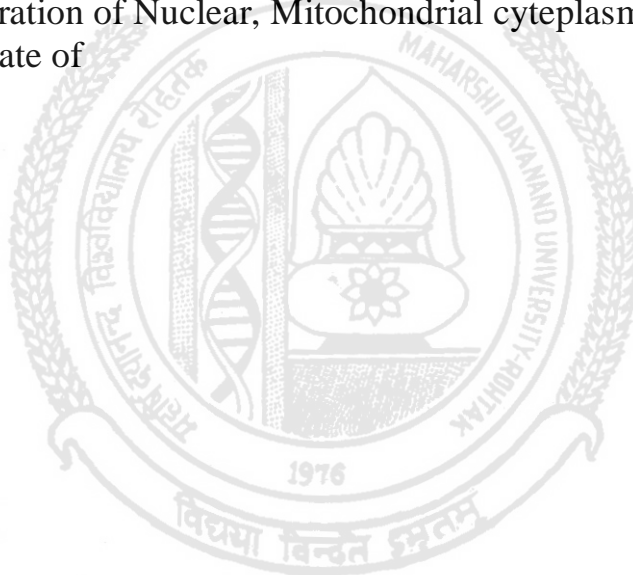
Membrane Vacuolar system, cytoskeleton and cell motility: Structure and function of microtubules, Microfilaments, Intermediate filaments.
Endoplasmic reticulum: Structure, function including role in protein segregation
Golgi Complex : Structure, biogenesis and functions including role in protein secretion
Lysosomes : Vacuoles and microbodies : Structure and functions
Ribosomes : Structures and function including role in protein synthesis.
Mitochondria : Structure, Genomes, biogenesis
Chloroplasts: Structure, genomes, biogenesis

UNIT III

Nucleus: Structure, Cell cycle (Interphase & M Phases), regulation of cell cycle.
Extracellular Matrix: Composition, molecules that mediate cell adhesion, membrane receptors for extra cellular matrix, macromolecules, regulation of receptor expression and function.
Cancer: Carcinogenesis, agents promoting carcinogenesis, characteristics of cancer cells, molecular basis of cancer.

PRACTICAL

1. Study the effect of temperature, organic solvent on semi permeable membrane.
2. Demonstration of dialysis.
3. Study of plasmolysis and deplasmolysis.
4. Cell fractionation and determination of enzyme activity in organelles using sprouted moong or rat or any suitable source.
5. Microscopy : Structure of Prokaryotic and Eukaryotic cell, Fixation.
6. Microtomy of various organ systems, Mitochondrial staining and enzyme localization (Histo-chemistry)xxxxxxx
7. Cell division in onion root tip/ insect gonads.
8. Preparation of Nuclear, Mitochondrial cytoplasmic fractions.
9. Estimate of



BT-104 BIOCHEMISTRY and METABOLISM

MM 50+5IA

Note: Examiner is requested to set one compulsory and eight other questions at least two from each unit. The compulsory question should be of 10 marks and should cover entire syllabus. Student should attempt four other questions i.e. one from each unit.

UNIT I

1 Introduction to Biochemistry: a historical prospective.

2 amino acids & Proteins – Structure & Function. Structure and properties of Amino acids, Types of proteins and their classification, Forces stabilizing protein structure and shape.

Different Level of structural organization of proteins, Purification of proteins and criteria of their purity. Denaturation and renaturation of proteins. Fibrous and globular proteins.

3 Carbohydrates – Structure and Function : Structure and properties of Monosaccharides, Oligosaccharides and Polysaccharides. Homo & Hetero Polysaccharides, Mucopolysaccharides, Bacterial cell wall polysaccharides, Glycoprotein's and their biological functions.

UNIT II

Lipids - Structure and functions – Classification, structures, nomenclature and properties of fatty acids, essential fatty acids. Phospholipids structure and properties of different types of phospholipids, sphingomyelins, glycolipids, cerebrosides, gangliosides, Prostaglandins cholesterol – its structure and biological properties, utilization of cholesterol.

Nucleic acids - Structure and functions: Physical & chemical properties of Nucleic acids. Structure and properties of purines & pyrimidines

Nucleosides & Nucleotides. Biologically important nucleotides, Double helical model of DNA structure and forces responsible for its A,B, & Z – DNA, denaturation and annealing of DNA.

UNIT III

Nomenclature and classification of Enzymes, Holoenzyme, apoenzyme, Cofactors, coenzyme, prosthetic groups, metalloenzymes, monomeric & oligomeric enzymes, activation energy and transition state, enzyme activity,

specific activity, common features of active sites, enzyme specificity: types & Theories, ribozymes, abzymes Biocatalysts from extreme thermophilic and hyperthermophilic archaea and bacteria. Role of cofactors in enzyme catalysis: NAD⁺, NADP⁺, FMN/FAD, coenzymes A, thiamine pyrophosphate, pyridoxal phosphate, lipoic-acid, biotin vitamin B12 tetrahydrofolate and metallic ions.

UNIT IV

Carbohydrates Metabolism : Glycolysis : reactions, energetics and regulation, Fate of pyruvate under aerobic and anaerobic conditions. Pentose phosphate pathway and its significance, Gluconeogenesis, Glycogenolysis and glycogenesis.

TCA cycle: ETC, Oxidative phosphorylation.

Beta – oxidation of fatty acids

Practicals

1. Effect of pH, temperature on the activity of salivary amylase enzyme activity.
2. To study activity of enzyme pancreatic trypsin under optimum conditions.
3. Estimation of blood glucose - glucose oxidase method.
4. Determination of - pH optimum, Temperature optimum, Km value, Vmax value, Effect of inhibitor (Inorganic phosphate) and measurement of K.
5. Principles of Colorimetry
 - i. Verification of Beer's law, estimation of protein and phosphate.
 - ii. Finding out Xmax. Relation between O.D. and % transmission. pH, pK, Henderson's equation. Preparation of buffer.
6. Separation of Amino acids by paper chromatography.
7. Isolation of phospholipids from liver and their separation on thin layer chromatography (TLC).
8. Isolation of enzyme Acid Phosphatase from germinating lentils (moong) using (NH₄)₂SO₄ precipitation and its assay using p-nitrophenyl phosphate and calculation of specific activity.

BT-105

PHYSICAL CHEMISTRY

MM 50+5 IA

The Course contents of Chemistry will be the same as that of Chemistry of B.Sc. (Medical)

BT-106

INORGANIC CHEMISTRY

MM 50+5 IA

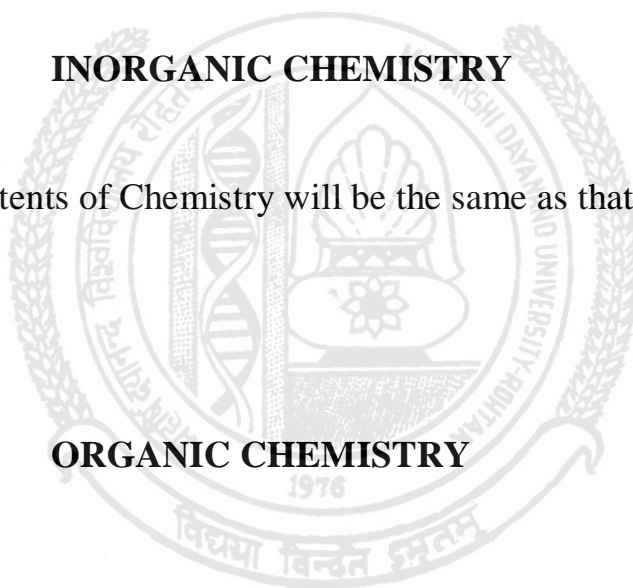
The Course contents of Chemistry will be the same as that of Chemistry of B.Sc. (Medical)

BT-107

ORGANIC CHEMISTRY

MM 50+5 IA

The Course contents of Chemistry will be the same as that of Chemistry of B.Sc. (Medical)



IIND SEMESTER

BT-201

BIOSTATISTICS

MM 50+5 IA

Note: Examiner will set one compulsory and eight other questions at least two from each unit. The compulsory question will be of 10 marks and should cover entire syllabus. Students will attempt four other questions i.e. one from each unit

UNIT I

Relations between roots and coefficients of algebraic equations, Solution of cubic equations
Permutation and Combination, Binomial theorem of integer, Logarithm (definition and laws of logarithm, use of log table), Trigonometric Identities. Matrices and their elementary operations.

UNIT II

Functions, Limits of functions, (basic idea of limits of functions without analytic definition), derivatives of functions, differentiation, integration (general introduction, significance and application for simple algebraic and trigonometric functions). Applications of Differentiation and Integration.

UNIT III

Types of Data, Collection of data; Primary & Secondary data, Classification and Graphical representation of Statistical data. Measures of central tendency and Dispersion. Measures of Skewness and Kurtosis. Probability (classical & axiomatic definition of probability, Theorems on total and compound probability), Elementary ideas of Binomial, Poisson and Normal distributions.

UNIT IV

Methods of sampling, confidence level, critical region, testing of hypothesis and standard error, large sample test and small sample test. Problems on test of significance, t-test, chi-square test for goodness of fit and analysis of variance (ANOVA)

Practical

1. **Based on graphical Representation**
2. **Based on measures of Central Tendency & Dispersion**
3. **Based on Distributions Binomial Poisson Normal**
4. Based on t,F,Z and Chi-square



BT-202

MICRO-BIOLOGY

MM 50+5IA

Note: Examiner will set one compulsory and eight other questions at least two from each unit. The compulsory question will be of 10 marks and should cover entire syllabus. Students will attempt four other questions i.e. one from each unit

UNIT I

Fundamentals of microbiology, History and Evolution of Microbiology. Classification of microorganisms - Microbial taxonomy, criteria used including molecular approaches, Microbial phylogeny and current classification of bacteria

Microbial Diversity: Distribution and characterization Prokaryotic and Eukaryotic cells, Morphology and cell structure of major groups of microorganisms eg – bacteria, algae, Fungi, Protozoa and Unique features of viruses.

UNIT II

Cultivation and Maintenance of microorganisms, Nutritional categories of micro-organisms, methods of isolation, Purification and preservation.

UNIT III

Microbial growth – growth curve, Generation time, synchronous batch and continuous culture, measurement of growth and factors affecting growth of bacteria.

Microbial Metabolism – Metabolic pathways, amphi-catabolic and biosynthetic pathways

Bacterial Reproduction – Transformation, Transduction and Conjugation.

Endospores and sporulation in bacteria

UNIT IV

Control of Microorganisms – by physical, chemical and Chemo-therapeutic Agents

Water Microbiology – Bacterial pollutants of water, coliforms and non-coliforms. Sewage composition and its disposal.

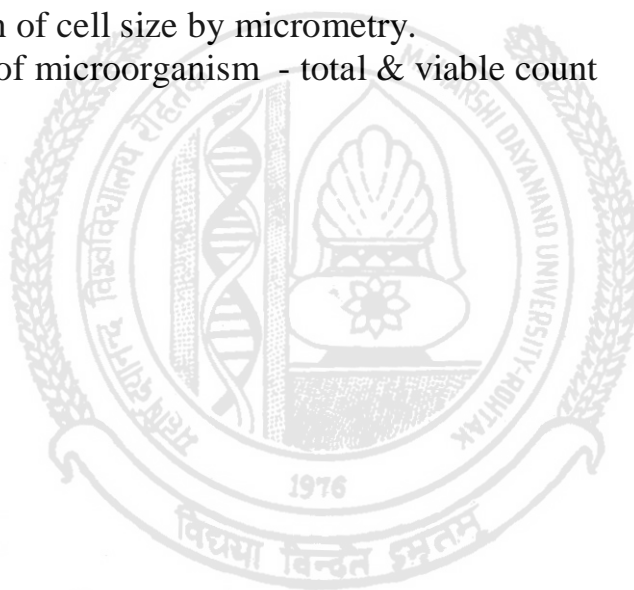
Food Microbiology - Important microorganism in food

Microbiology – moulds, Yeasts, bacteria. Major food born infections and intoxications, Preservation of various types of foods. Fermented Foods

Industrial Microbiology – Bio engineering of micro organism for Industrial purposes, Industrial uses of bacteria, Yeasts, moulds. Petroleum microbiology and Deterioration of materials.

PRACTICAL

- 1 Microscopy & use of Microscope
- 2 Staining method – simple staining, grain staining, spore staining, negative staining
- 3 Preparation of media & sterilization, Methods of Isolation of bacteria from different sources
- 4 Determination of cell size by micrometry.
- 5 Enumeration of microorganism - total & viable count



BT-203

GENETICS

MM 50+5IA

UNIT I

Introduction: Historical developments in the field of genetics. Organisms suitable for genetic experimentation and their genetic significance.

Cell Cycle: Mitosis and Meiosis: Control points in cell-cycle progression in yeast. Role of meiosis in life cycle.

Mendelian genetics : Mendel's experimental design, monohybrid, di-hybrid and trihybrid crosses, Law of segregation & Principle of independent assortment.

Verification of segregates by test and back cross, Chromosome theory of inheritance,

Allelic interactions : Concept of dominance, recessiveness, incomplete dominance, co-dominance, semi-dominance, pleiotropy, multiple allele, pseudo-allele, essential and lethal genes, penetrance and expressivity

UNIT II

Non allelic interactions: Interaction producing new phenotype-complementary genes, epistasis (dominant & recessive), duplicate genes and inhibitory genes

Chromosome and genomic organization: Eukaryotic nuclear genome- nucleotide sequence composition –unique & repetitive DNA, satellite DNA. Centromere and telomere DNA sequences, middle repetitive sequences- VNTRs & dinucleotide repeats, repetitive transposed sequences- SINEs & LINEs, middle repetitive multiple copy genes, noncoding DNA.

Genetic organization of prokaryotic and viral genome.

Structure and characteristics of bacterial and eukaryotic chromosome- chromosome morphology, concept of euchromatin and heterochromatin, packaging of DNA molecule into chromosomes, chromosome banding pattern, karyotype, giant chromosomes, one gene one polypeptide hypothesis, concept of cistron, exons, introns, genetic code, gene function

UNIT III

Chromosome and gene mutations: Definition and types of mutations, causes of mutations, Ames test for mutagenic agents, screening procedures for isolation of mutants and uses of mutants, variations in chromosomes structure - deletion, duplication, inversion and translocation (reciprocal and Robertsonian), position effects of gene expression, chromosomal aberrations in human beings, abnormalities– Aneuploidy and Euploidy.

Sex determination and sex linkage : Mechanisms of sex determination, Environmental factors and sex determination, sex differentiation, Barr bodies, dosage compensation, genetic balance theory, Fragile-X-syndrome and chromosome, sex influenced dominance, sex limited gene expression, sex linked inheritance.

UNIT IV

Genetic linkage, crossing over and chromosome mapping : Linkage and recombination of genes in a chromosome crossing over, Cytological basis of crossing over, Molecular mechanism of crossing over, Crossing over at four-strand stage, Multiple crossing overs Genetic mapping

Extra chromosomal inheritance: Rules of extra nuclear inheritance, maternal effects, maternal inheritance, cytoplasmic inheritance, organelle heredity, genomic imprinting

Evolution and population genetics : Inbreeding and out breeding, Hardy Weinberg law assumption, (prediction, derivation), allelic and genotype frequencies, changes in allelic frequencies, systems of mating, evolutionary genetics, natural selection.

PRACTICALS

- (1) Permanent and temporary mount of mitosis
- (2) Permanent and temporary mount of meiosis
- (3) Mendelian deviations in dihybrid crosses
- (4) Demonstration of - Barr Body
--*Rhoeo* translocation.
- (5) Karyotyping with the help of photographs

BT-204

ANIMAL DIVERSITY ECONOMIC ZOOLOGY

MM 50+5 IA

Note: Examiner will set one compulsory and eight other questions at least two from each unit. The compulsory question will be of 10 marks and should cover entire syllabus. Students will attempt four other questions i.e. one from each unit

UNIT I

- a) Outline of classification of Non- Chordates upto subclasses. Coelomata, Acoelomata, Symmetries, Deutrostomes, Protostomes.
- b) Protozoa: Locomotion, Reproduction, evolution of Sex, General features and life history of Paramecium and Plasmodium. Pathogenic protozoans
- c) Porifera: General characters, outline of Classification ; skeleton , Canal System

UNIT II

- a) Coelenterata: General Characters, Outline of classifications Polymorphism, Various types of stinging cells; Metagenesis, coral reefs and their formation.
- b) Platyhelminthes- General Characters; Outline of classification; Pathogenic flatworms: Parasitic adaptations. Important Larval forms.
- c) Aschelminthes: General features, Outline of classification, Pathogenic roundworms and their vectors in relation to man: Parasite adaptation.

UNIT III

- a) Annelida: - General features, Outline of classification, Coelom: Metameric segmentation, General features and life history of Earthworm, Vermicomposting.
- b) Arthropoda: General Features, Outline of Classification; Larval forms of crustacean, Respiration in Arthropoda; Metamorphosis in insects; Social insects; Insect vectors of diseases; Apiculture, Sericulture.

UNIT IV

- a) Mollusca : general features, Outline of classification, Shell Diversity; Torsion in gastropoda, Life history of Pila.

- b) Echinodermata: General features, Outline of Classification, Life history of starfish (Asterias) Larval forms
 c) Hemichordata: Phylogeny: Affinities of Balanoglossus

PRACTICAL

Q No 1 Identification and Classification of Any these of the following -
 6 Marks

Porifera: Scypha, Leucosolenia, Euspongia, Hylonema, Euplectella
 Cnidaria: Medrepora, Millepora, Physalia, Porpita, Varella, Aurelia, Metridium
 Platyhelminthes: Taenia, Fasciola,
 Aschelminthes: Ascaris, Ancylostoma, Enterobius
 Annelida: Pheretima, Hirudinaria, Chaetopterus, Nereis, Aphrodite
 Arthropoda: Julus, Scolopendra, Peripatus, Carcinus, Limulus, Lepisma, Dragonfly, Musca, Acheta
 Mollusca: Pila, Unio, Mytilus, Loligo, Sepia, Octopus, Solen
 Echinodermata: Asterias, Ophiothrix, Echinus, Holothuria, Astrophyton
 Hemichordata: Balanoglossus

Q No 2 Identification of slides with two points of identification.
 4Marks

Amoeba, Paramoecium, Ceratium, Plasmodium, Opalina, L.S. Sponge, Spicules of sponges, L.S. Hydra, Obelia, Bougainvillia, Larvae of Fasciola, Seta of Earthworm, Radula

Q No 3 Ecological Note – On any of the specimens in Q No 1
 2 Marks

Q No 4 Dissection of Earthworm, Cockroach
 6 Marks

Earthworm: Digestive, Nervous System,
 Cockroach: Digestive Reproductive, Nervous System

Q No 5 Pratical Record 3 marks

Q No 6 Viva Vice 4 marks

106- Seminar & term paper writing on taxonomy & Biosystematics

BT-205

PHYSICAL CHEMISTRY

MM 50+5 IA

The Course contents of Chemistry will be the same as that of Chemistry of B.Sc. (Medical)

BT-206

INORGANIC CHEMISTRY

MM 50+5 IA

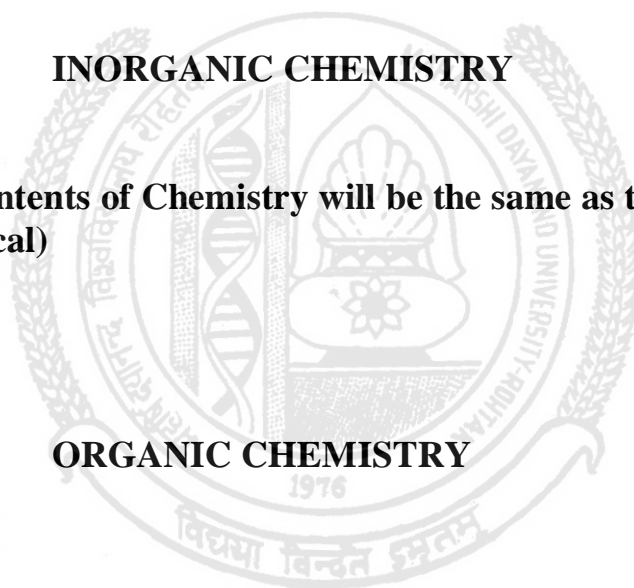
The Course contents of Chemistry will be the same as that of Chemistry of B.Sc. (Medical)

BT-207

ORGANIC CHEMISTRY

MM 50+5 IA

The Course contents of Chemistry will be the same as that of Chemistry of B.Sc. (Medical)



B.Sc. III Semester

MEDICAL MICROBIOLOGY (301)

MM 50+5 IA

Unit I

Introduction: Normal microflora of human body, nosocomial infections, carriers, septic shock, septicemia, pathogenicity, virulence factors, toxins, biosafety levels

Morphology, pathogenesis, symptoms, laboratory diagnosis, preventive measures and chemotherapy caused by gram positive bacteria: *S. aureus*, *S. pyogenes*, *B. anthracis*, *C. perferinges*, *C. tetani*, *C. botulinum*, *C. diphtheriae* *M. tuberculosis* *M. leprae*

Unit II

Morphology, pathogenesis, symptoms, laboratory diagnosis, preventive measures and chemotherapy caused by gram negative bacteria: *E. coli*, *N. gonorrhoea*, *N. meningitidis*, *P. aeruginosa*, *S. typhi*, *S. dysenteriae*, *Y. pestis*, *B. abortus*, *H. influenzae*, *V. cholerae*, *M. pneumoniae*, *T. pallidum* *M. pneumoniae*, *Rickettsiaceae*, *Chlamydiae*

Unit III

Diseases caused by viruses- Picornavirus, Orthomyxoviruses, Paramyxoviruses, Rhabdoviruses, Reoviruses, Pox virus, Herpes virus, Papova virus, Retro viruses (including HIV/AIDS) and Hepatitis viruses

Unit IV

Fungal and Protozoan infections

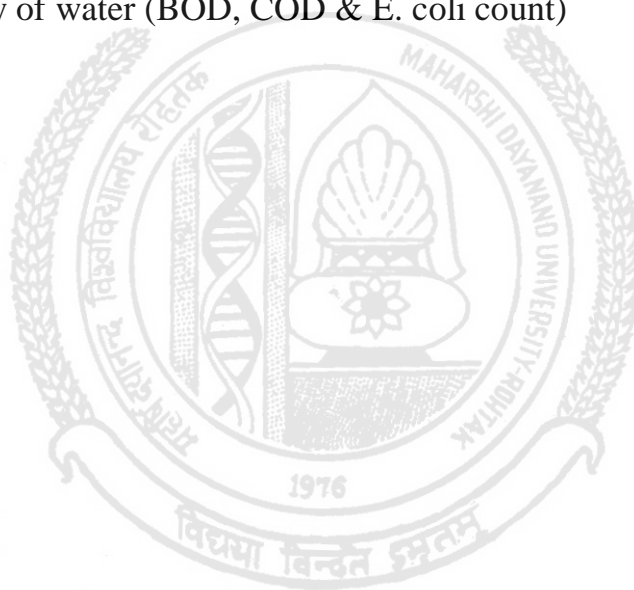
Dermatophytoses (*Trichophyton*, *Microsporun* and *Epidermophyton*) Subcutaneous infection (*Sporothrix*, *Cryptococcus*), systemic infection (*Histoplasma*, *Coccidoides*) and opportunistic fungal infections (*Candidiasis*, *Aspergillosis*)

Gastrointestinal infections (Amoebiasis, Giardiasis), Blood-borne infections (Leishmaniasis, Malaria)

PRACTICAL

MM 25

- 1 Isolation of bacteria & their biochemical characterization.
- 2 Growth curve of bacteria
- 3 Antibiotic sensitivity of microbes, use of antibiotic disc
- 4 Testing quality of water (BOD, COD & E. coli count)



BIOANALYTICAL TOOLS (302)

MM 50+5 IA

UNIT I: Instrument 1

Simple microscopy, phase contrast microscopy, fluorescence and electron microscopy (TEM and SEM), pH meter, absorption and emission spectroscopy

UNIT II: Instruments, basic principles and usage

Principle and law of absorption fluorimetry, colorimetry, spectrophotometry (visible, UV, infra-red), centrifugation, cell fractionation techniques, isolation of sub-cellular organelles and particles

UNIT III: Chromatography techniques

Paper chromatography, thin layer chromatography, column chromatography: silica and gel filtration, affinity and ion exchange chromatography, gas chromatography, HPLC

UNIT IV: Electrophoresis and Fermentation Technology

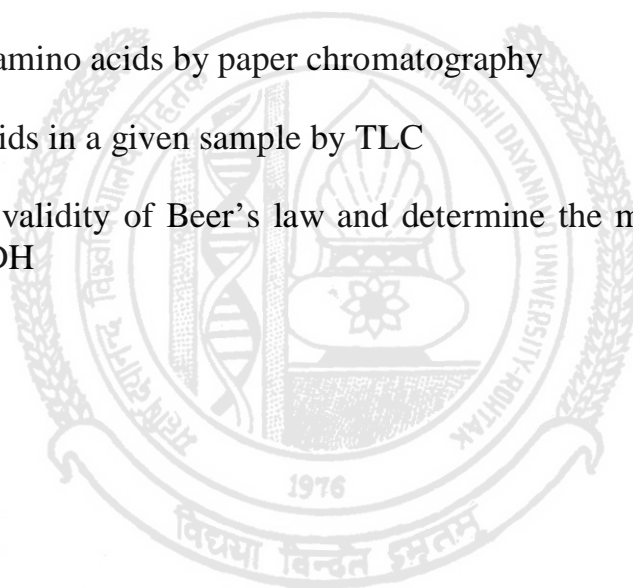
Starch-gel, polyacrylamide gel (native and SDS-PAGE), agarose-gel electrophoresis, immuno electrophoresis, isoelectric focusing, western blotting

Different types of fermenters: principles operating characteristics of fermenters, air lift, continuous stirred tank, fluidized and photofermenter, aeration and agitation system, antimicrobial agents, pH, temperature and dissolved oxygen measurements and control, computer and automation

PRACTICAL

MM 25

- 1 Native gel electrophoresis of proteins
- 2 SDS-polyacrylamide slab gel electrophoresis of proteins under reducing conditions
- 3 Preparation of the sub-cellular fractions of rat liver cells
- 4 Preparation of protoplasts from pea leaves
- 5 Separation of amino acids by paper chromatography
- 6 To identify lipids in a given sample by TLC
- 7 To verify the validity of Beer's law and determine the molar extinction coefficient of NADH



PLANT PHYSIOLOGY (303)

MM 50+5 IA

UNIT I: Anatomy

The shoot and root apical meristem and its histological organization, simple & complex permanent tissues, primary structure of shoot & root, secondary growth, growth rings, leaf anatomy (dorsi-ventral and isobilateral leaf)

UNIT II: Plant water relations and micro & macro nutrients

Plant water relations: Importance of water to plant life, diffusion, osmosis, plasmolysis, imbibition, guttation, transpiration, stomata & their mechanism of opening & closing

Micro & macro nutrients: criteria for identification of essentiality of nutrients, roles and deficiency systems of nutrients, mechanism of uptake of nutrients, mechanism of food transport

UNIT III: Carbon and nitrogen metabolism

Photosynthesis- Photosynthesis pigments, concept of two photo systems, photophosphorylation, calvin cycle, CAM plants, photorespiration, compensation point

Nitrogen metabolism- inorganic & molecular nitrogen fixation, nitrate reduction and ammonium assimilation in plants

UNIT IV: Growth and development

Growth and development: definitions, phases of growth, growth curve, growth hormones (auxins, gibberlins, cytokinins, abscisic acid, ethylene), seed dormancy and seed germination, concept of photo-periodism and vernalization

PRACTICAL

MM 25

1. Preparation of stained mounts of anatomy of monocot and dicot's root, stem & leaf.
2. Demonstration of plasmolysis by *Tradescantia* leaf peel.
3. Demonstration of opening & closing of stomata.
4. Demonstration of guttation on leaf tips of grass and garden nasturtium.
5. Separation of photosynthetic pigments by paper chromatography.
6. Demonstration of aerobic respiration.
7. Preparation of root nodules from a leguminous plant.



PLANT DIVERSITY II (304)

MM 50+5 IA

UNIT I: Pteridophytes

General characters of pteridophytes, affinities with bryophytes & gymnosperms, classification, economic importance, study of life histories of fossil Pteridophytes – Rhynia

UNIT II: Pteridophytes: type studies

Life histories of Selaginella- (Heterospory and seed habit), Equisetum, Pteris, Lycopodium

UNIT III: Gymnosperms

General characters, classification, geological time scale, theories of fossil formation, types of fossils, fossil gymnosperms- Williamsonia & Glossopteris, telome and steel concept

UNIT IV: Gymnosperms: type studies

Life histories of Cycas & Pinus, economic importance of gymnosperms

PRACTICAL

MM-25

1. Examination of morphology and anatomy of vegetative and reproductive parts of Selaginella, Equisetum & Pteris.
2. Examination of morphology and anatomy of vegetative & reproductive parts of - Cycas & Pinus
3. Plant collection (pteridophytes & gymnosperms)

ANIMAL DIVERSITY II (401)

MM 50+5 IA

UNIT I: Proto-chordates, Pisces and Ambhibia

Proto-chordates: Outline of classification, General features and important characters of Herdmania, Branchiostoma

Origin of Chordates

Pisces: Migration in Pisces, Outline of classification

Amphibia: Classification, Origin, Parental care, Paedogenesis

UNIT II: Reptelia, Aves and Mammalia

Reptelia : Classification, Origin

Aves: Classification, Origin, flight- adaptations, migration

Mammalia: Classification, Origin, dentition

UNIT III: Comparative anatomy of vertebrates I

Comparative anatomy of various systems of vertebrates: Integumentary, digestive respiratory systems.

UNIT IV: Comparative anatomy of vertebrates II

Comparative Anatomy of vertebrates – Heart, Aortic arches, Kidney & urino-genital system, Brain, Eye, Ear

Autonomic Nervous system in Mammals

PRACTICAL

MM 25

1. Identification & Classification upto order of the following:
Proto-chordata: Salpa, Doliolum, Herdmania, Branchiostoma
Cyclostomata: Myxine, Petromyzon
Chondrichthyes: Scoliodon, Zygnea, Pristis, Trygon, Raja, Chimaera
Ostiechthyes: Labeo, Mystus, Catla, Hippocampus, Anabas, Echeineis, Lophius, Polypeterus
Amphibia: Rana, Hyla, Amblystoma, Necturus, Proteus.
Reptiles: Hemidactylus, Calotes, Draco, Phrynosoma, Naja Vipera, Bungarus
Aves: Columba, Alcedo, Passer
Mammalia: Ornithorhynchus, Macropus, Didelphes, Dasypus
2. An Ecological Note on any one of the specimens in Experiment 1
3. Identification of the following slides
Mammalian Histology: Liver, Lung, Intestine, Kidney, Ovary, Testes
Salpa, Doliolum, Spicules of Herdmania, Tadpole of Frog
4. Preparation of a permanent mount of Salpa, Placoid scales, spicules of Herdmania, Pharynx of Amphioxus, Tadpole Larva of frog
5. Identification of endoskeletons of frog and rabbit

MOLECULAR BIOLOGY (402)

MM 50+5 IA

UNIT I: DNA structure and replication

DNA as genetic material, Structure of DNA, Types of DNA, Replication of DNA in prokaryotes and eukaryotes: Semiconservative nature of DNA replication, Bidirectional replication, DNA polymerases, The replication complex: prepriming proteins, primosome, replisome, Rolling circle replication, Unique aspects of eukaryotic chromosome replication, Fidelity of replication

UNIT II: DNA damage, repair and homologous recombination

DNA damage and repair: causes and types of DNA damage, mechanism of DNA repair: Photoreactivation, base excision repair, nucleotide excision repair, mismatch repair, translesion synthesis, recombinational repair, non homologous end joining. Homologous recombination: models and mechanism

UNIT III: Transcription and RNA processing

RNA structure and types of RNA, Transcription in prokaryotes: Prokaryotic RNA polymerase, role of sigma factor, promoter, Initiation, elongation and termination of RNA chains

Transcription in eukaryotes: Eukaryotic RNA polymerases, transcription factors, promoters, enhancers, mechanism of transcription initiation, promoter clearance and elongation

RNA splicing and processing: processing of pre-mRNA: 5' cap formation, polyadenylation, splicing, rRNA and tRNA splicing

UNIT IV: Regulation of gene expression and translation

Regulation of gene expression in prokaryotes: Operon concept (inducible and repressible system)

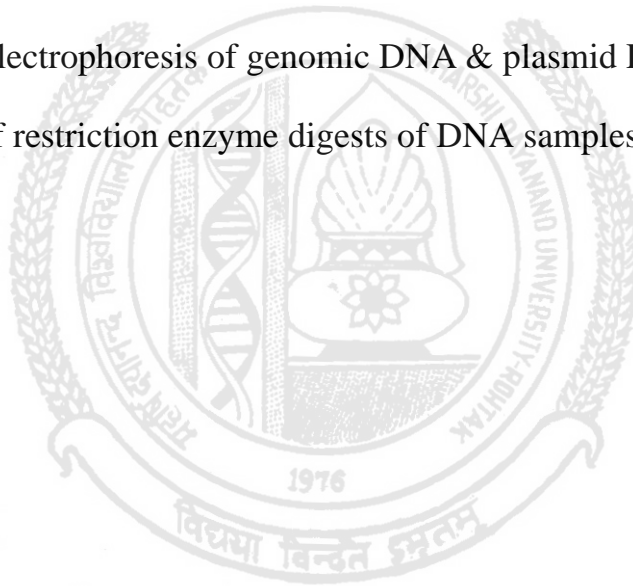
Genetic code and its characteristics

Prokaryotic and eukaryotic translation: ribosome structure and assembly, Charging of tRNA, aminoacyl tRNA synthetases, Mechanism of initiation, elongation and termination of polypeptides, Fidelity of translation, Inhibitors of translation. Posttranslational modifications of proteins

PRACTICAL

MM 25

1. Isolation of DNA from bacterial cells
2. Isolation of Plasmid DNA by alkaline method
3. Agarose gel electrophoresis of genomic DNA & plasmid DNA
4. Preparation of restriction enzyme digests of DNA samples



ANIMAL DEVELOPMENTAL BIOLOGY (403)

MM 50+5 IA

UNIT I: Gametogenesis and Fertilization

Definition, scope & historical perspective of development Biology,
Gametogenesis – Spermatogenesis, Oogenesis
Fertilization - Definition, mechanism, types of fertilization.
Different types of eggs on the basis of yolk

UNIT II: Early embryonic development

Cleavage: Definition, types, patterns & mechanism
Blastulation: Process, types & mechanism
Gastrulation: Morphogenetic movements– epiboly, emboly, extension,
invagination, convergence, de-lamination. Formation & differentiation of
primary germ layers
Fate Maps in early embryos

UNIT III: Embryonic Differentiation

Differentiation: Cell commitment and determination- the epigenetic landscape:
a model of determination and differentiation, control of differentiation at the
level of genome, transcription and post-translation level
Concept of embryonic induction
Primary, secondary & tertiary embryonic induction
Neural induction and induction of vertebrate lens

UNIT IV: Organogenesis

Neurulation, notogenesis, development of vertebrate eye.
Fate of different primary germ layers
Development of behaviour: constancy & plasticity
Extra embryonic membranes, placenta in Mammals

PRACTICAL

MM 25

1. Identification of developmental stages of chick and frog embryo using permanent mounts
2. Preparation of a temporary stained mount of chick embryo
3. Study of developmental stages of *Anopheles* mosquito



MAMMALIAN PHYSIOLOGY (404)

MM 50+5 IA

UNIT I: Digestion and Respiration

Digestion: Mechanism of digestion & absorption of carbohydrates, Proteins, Lipids and nucleic acids. Composition of bile, Saliva, Pancreatic, gastric and intestinal juice

Respiration: Exchange of gases, Transport of O₂ and CO₂, Oxygen dissociation curve, Chloride shift

UNIT II: Circulation

Composition of blood, Plasma proteins & their role, blood cells, Haemopoiesis, Mechanism of coagulation of blood

Mechanism of working of heart: Cardiac output, cardiac cycle, Origin & conduction of heart beat

UNIT III: Muscle physiology and osmoregulation

Structure of cardiac, smooth & skeletal muscle, threshold stimulus, All or None rule, single muscle twitch, muscle tone, isotonic and isometric contraction, Physical, chemical & electrical events of mechanism of muscle contraction

Excretion: modes of excretion, Ornithine cycle, Mechanism of urine formation.

UNIT IV: Nervous and endocrine coordination

Mechanism of generation & propagation of nerve impulse, structure of synapse, synaptic conduction, saltatory conduction, Neurotransmitters

Mechanism of action of hormones (insulin and steroids)

Different endocrine glands– Hypothalamus, pituitary, pineal, thymus, thyroid, parathyroid and adrenals, hypo & hyper-secretions

PRACTICAL

MM 25

1. Finding the coagulation time, blood groups, RBC count, TLC, DLC
2. Demonstration of action of an enzyme
3. Determination of Haemoglobin



Instructions

Lab course 1: 90 marks

- Practical exam shall be conducted in two sessions of 4 hrs each
- Each student will be given two major and one minor exercises in examination

Major exercises- Microbiology and Analytical tools (25+25=50 marks)

Minor exercise- Plant diversity II and Plant physiology (15 marks)

Viva - 15 marks

Practical record- 10 marks

Total - 90 marks

Lab course 2: 100 marks

- Practical exam shall be conducted in two sessions of 4 hrs each
- Each student will be given two major and one minor exercises in examination

Major exercises- Molecular Biology and Mammalian Physiology (30+30=60 marks)

Minor exercise- Development Biology and Animal diversity-II (15 marks)

Viva - 15 marks

Practical record- 10 marks

Total - 100 marks