

**COURSES OF STUDIES  
FOR  
THE M.SC. LIFE SCIENCES EXAMINATION**

**Full Marks:**

**SEMESTER- I**

Paper-711 : Biophysics and Biochemistry	50 (40+10)
Paper-712 : Cell Biology & Genetics.	50 (40+10)
Paper-713 : Microbiology and Immunology	50 (40+10)
Paper-714 : Practical	50
Paper-715 : Practical	50

**SEMESTER- II**

Paper-721 : Ecology & Biostatistics	50 (40+10)
Paper-722 : Mol. Biology & Instrumental Techniques	50 (40+10)
Paper-723 : Biotechnology and Genetic Engineering	50 (40+10)
Paper-724 : Practical	50
Paper-725 : Practical	50

**SEMESTER- III**

**(PLANT SCIENCE)**

Paper-731 : Plant morphology, structure & reproduction	50 (40+10)
Paper-732 : Plant Physiology	50 (40+10)
Paper-733 : Metabolism	50 (40+10)
Paper-734 : Practical	50
Paper-735 : Practical	50

**OR**

**(ANIMAL SCIENCE)**

Paper-731 : Biology of Non-chordata	50 (40+10)
Paper-732 : Biology of Chordata	50 (40+10)
Paper-733 : Ethology & Embryology	50 (40+10)
Paper-734 : Practical	50
Paper-735 : Practical	50

**SEMESTER- IV**

**(PLANT SCIENCE)**

Paper-741 : Plant Anatomy, Evolution, Embryology and Development Biology	50 (40+10)
Paper-742 : Practical	50

**OR**

**(ANIMAL SCIENCE)**

Paper-741 : Animal Physiology, Evolution and Taxamomy	50 (40+10)
Paper-742 : Practical	50

**(BOTH PLANT SCIENCE & ANIMAL SCIENCE)**

Paper-743 : Special Paper (Biotechnology)	50 (40+10)
Paper-744 : Project & Seminar	50
Paper -745: Practical Special Paper	50

The course shall comprises of four Semester to be completed in two years duration having two semesters in each year. Each Semester will consist of three theory papers and two practical paper. Each theory paper will carry 50marks (40marks for final Examination and 10 marks for internal assessment) and each practical paper will carry 100marks. The duration of examination for each theory paper shall be of 3 hours and for each practical paper of 6 hours. In IV Semester practical papers shall be of 3hours carrying 50 Marks.

1st & 2nd Semester will be common for all the students of the M.Sc. Lifescience. In 3rd Semester a student will be allowed to take either Plant science or Animal Science stream according to his/her choice opted at the time of joining in the 1st semester of the M.Sc. Life science course. Similarly in the 4th Semester the student will take either a Plant Science or an Animal Science theory paper (according to his/her selected stream) and any one special paper theory and its related Project & Seminar to complete the course.

**1ST AND 2ND SEMESTER :** Courses are common to both the plant science and Animal Science streams of the M.Sc. Lifescience.

**3RD SEMESTER :** Courses are separate for plant science and Animal science stream.

**IN 4TH SEMESTER :** Courses only one theory paper is separate for plant science and Animal science stream. The other two papers (one theory & one Project & Seminar) are special papers which are common to both the Plant Science and Animal Science Streams.

Both the Plant science and Animal Science streams of the M.Sc. Life Science course will be examined for a total of 1000marks in four semesters, with a total of 250 marks examination in each semester.

**Each theory paper shall have three units. Two alternative questions will be set in each unit. Thus in each theory paper three questions with two alternative will be set.**

2014

**SEMESTER-I**  
**M.SC. LIFE SCIENCES**  
**PAPER-711**  
**BIO-PHYSICS & BIOCHEMISTRY**

Time : 3 Hours

Full Marks: 50 (40 + 10)

**UNIT – I: BIOPHYSICS-I**

1. Intermolecular forces: Dipoles, dielectric constants, dipole movement, induced dipole, change dipole, Ionic bonding, Hydrogen bonds & Vander Wall's force.
2. Colloidal system, properties of colloids, Ultrafiltration , Emulsion & Suspension, Adsorption.
3. Membrane Composition, Membrane transport, Diffusion, active transport.
4. Structure and ionisation of water, acid and bases, Relationship of pH and pK in a buffer.
5. Principles of thermo dynamics in relation to living organisation. Concept of steady state, enthalpy, entropy and energy changes.

**UNIT – II : BIOMOLECULES**

1. Structure of amino acids and proteins (primary, secondary, tertiary and quaternary structures) Domain structure of protein, Ramachandran plot.
2. Structure of polysaccharides, structure and significance of glycolipids, glycoproteins and peptidoglycons. A broad outline classification of lipids.
3. Classification of enzymes and coenzymes. Mechanism of enzyme action. Regulation of enzyme activity: Constitutive and regulatory enzymes.

**UNIT - III : BIOCHEMISTRY**

1. Gluconeogenesis, Hexose Monophosphate shunt, Glyoxylate cycle.
2.  $\alpha$ -oxidation, Fatty acid biosynthesis, General reactions of amino acid metabolism.
3. Electron transport in mitochondria and chloroplast. Oxidative phosphorylation & Photophosphorylation, proton pump.

**Internal Assessment**

10

**SEMESTER-I**  
**M.SC. LIFE SCIENCES**  
**PAPER-712**  
**CELL BIOLOGY & GENETICS**

2014

Time : 3 Hours

Full Marks: 50 (40 + 10)

**UNIT – I : CELL BIOLOGY & GENETICS**

1. Ultra structure of Cell, Structure and function of Mitochondria, Chloroplast, ER, Golgi body, Centrosome and Lysosome.
2. Molecular organisation, structure, behaviour and involvement of ribosomes in protein synthesis.
3. Cell – Cell interaction, Cell – Cell adhesion, Cell signaling.
4. Cytoskeleton : Micro tubule, Micro filaments, Intermediate filaments.

**UNIT – II : GENETICS**

1. Neo mendalism.
2. Linkage, crossing over and recombination. Gene interaction
3. Structural and numerical changes in chromosome (including polyploidy) and its impact on cytotaxonomy.
4. Principles of population genetics and Hardy-Weinberg Law.

**UNIT – III : CELL CYCLE & APOPTOSIS**

1. Cell cycle, cellular reproduction, Cell cycle check points.
2. Cell cycle control mechanising, cycling & CDK
3. Apoptosis : Mechanism of PCD, genetic control.
4. Cytological & Morphological abnormalities of cancer cell.

**Internal Assessment**

10

**SEMESTER-I**  
**M.SC. LIFE SCIENCES**  
**PAPER-713**  
**MICROBIOLOGY & IMMUNOLOGY**

Time : 3 Hours

Full Marks: 50 (40 + 10)

**UNIT – I : MICROBIOLOGY**

1. Virus – General Expression, properties and classification, Reproduction in Virus with special reference to lysogeny and lytic cycle.
2. Bacteria– Molecular organisation, growth, nutrition, and reproduction in bacteria, elementary idea of antibiotics.
3. Other Microbes –A brief outline survey of other Microbes such as protozoa, Mycoplasma Slime molds, actinomycetes, Yeasts and cyanobacteria and their use in industry (fermentation, alcohol, antibiotics, vitamins, food production, organic acids, enzymes, steroid transformation, food preservation) and agriculture.

**UNIT – II : MICROBIAL GENETICS**

1. Bacteriophage genome genetic recombination in phase.
2. Genetic transformation & transduction.
3. Virus as a tool for genetic Engineering.

**UNIT – III : IMMUNOLOGY**

1. Types of Immunity: Innate, acquired, passive, active, Humeral and Cell-mediated immunity-specificity and memory.
2. Lymphoid organs : Origin, development and function,
3. Immunoglobulins:- Structure, distribution and function.
4. Major Histocompatibility Complexes, and their role in Antigen-Antibody recognition Presentation. some common Human immune deficiency diseases.

\* Internal Assessment

10

2014

**SEMESTER-I**  
**M.SC. LIFE SCIENCES**  
**PAPER-714 (PRACTICAL)**  
**(BIOCHEMISTRY, CELL BIOLOGY, GENETICS )**

Time : 03 Hours

Full Marks: 50

**Cell Biology**

1. Study of stages of mitosis by squashing technique
2. Karyotype Analysis
3. Micrometry & measurement of Cell size

**GENETICS :**

1. Three point test cross
- 2.
- 3.

**SEMESTER-I**  
**M.SC. LIFE SCIENCES**  
**PAPER-715 (PRACTICAL)**  
**(MICROBIOLOGY & IMMUNOLOGY)**

Time : 03 Hours

Full Marks: 50

**MICROBIOLOGY :**

1. Sterilization of glass ware & Preparation of media
2. Gram stain of bacteria
3. Streak plate culture of bacteria

**IMMUNOLOGY :**

1. Blood grouping by immuno technique
2. Perceptin test
3. Single immuno diffusion Assay

**SEMESTER-II**  
**M.SC. LIFE SCIENCES**  
**PAPER-721**  
**ECOLOGY & BIostatISTICS**

Time : 3 Hours

Full Marks: 50 (40 + 10)

**UNIT – I ECOLOGY:**

1. Concept of Ecosystem (Emergent Properties, Biological levels of Organisation, Structure, Classification of Ecosystems, Ecological energetics, Gaia hypothesis and Cybernetics).
2. Leibig's Law of Minimum and concept of limiting factors, Law of Tolerance.
3. Population Ecology (structure and dynamics).
4. Community Structure, Community dynamics, Ecological niche.

**UNIT – II ENVIRONMENTAL CONCERNS:**

1. Environmental Pollution: sources & control (Air Pollution, Water Pollution, Land Pollution, Noise pollution)
2. Green house effect, Ozone depletion, Global warming, climate change  
Waste Management & Bioremediation, Environmental
3. Management and Auditing, Environmental Education and awareness.
4. Biodiversity & its conservation.

**UNIT – III BIostatISTICS:**

1. Probability distribution (Normal, Binomial & Poisson).
2. Students 't' test
3. Analysis of variance ratio test.
4. Correlation and Regression analysis.
5. Goodness of fit and association analysis by chi-square test.

**SEMESTER-II**  
**M.SC. LIFE SCIENCES**  
**PAPER-722**

2014

**(MOLECULAR BIOLOGY, BIOTECHNOLOGY & GENETIC ENGINEERING)**

Time : 3 Hours

Full Marks: 50 (40 + 10)

**UNIT – I : MOLECULAR BIOLOGY-I**

1. Nucleic acids : Components of DNA & RNA, double helical structure of DNA, Other forms of DNA, Types of RNA.
2. Replication of Double stranded DNA.
3. Gene as recon, muton and cistron, split gene, jumping gene, and over-lapping gene concepts.
4. Regulation of gene expression.  
A) Operon Concept B) Negative and Positive regulations

**UNIT – II : MOLECULAR BIOLOGY-II**

1. Constitution of Eukaryotic genome, C-Value paradox, sequence components i.e., repetitive and non repetitive DNA sequence.
2. In vitro synthesis of DNA.
3. Methods of DNA hybridization and its application.
4. Sequencing of nucleic acids and proteins.

**UNIT – III : INSTRUMENTAL TECHNIQUES**

1. Microscopy –Principles and types : Phase contrast Microscopy, Electron & Scanning Electron Microscope and Fluorescence Microscopy.
2. Chromatography –Principles and types of Chromatography (Paper, Thin layer and Gas )
3. Centrifugation–General Principles and types of centrifugation
4. Spectrophotometry– Principle & Instruction for colorimetry, Spectrophotometry
5. Electrophoresis–Principles and types (Paper, SDS PAGE, immuno electrophoresis).

**Internal Assessment**

10 Marks

**SEMESTER-II**  
**M.SC. LIFE SCIENCES**  
**PAPER-723**  
**BIOTECHNOLOGY**

Time : 3 Hours

Full Marks: 50 (40 + 10)

**UNIT – I : BASIC PRINCIPLES**

1. Basic Principles: Restriction enzymes, Isolation and Purification of DNA types,
2. Blotting technique (Southern, Northern and Western) Dot and Slot bolts.
3. Cloning in prokaryotic cells: Cloning vectors, types and reconstruction of vectors such as PBR 322, Cosmids,
4. Generation of Sticky ends, blunt ends. Bigation, Model cloning experiments.

**UNIT – II : GENETIC ENGINEERING**

1. C-DNA and its synthesis.
2. Gene transfer technology
4. Molecular Probes
5. Gene isolation & sequencing

**UNIT – III : APPLIED BIOTECHNOLOGY**

1. Application of genetic engineering: Hybridoma technology, MAbs and production of transgenic plants and transgenic animals with reference to Agriculture and Animal husbandry.
2. DNA finger-printing.
3. Protoplast fusion and somatic hybridization.

**Internal Assessment**

10 Marks

**SEMESTER-II**  
**M.SC. LIFE SCIENCES**  
**PAPER-724 (PRACTICAL)**  
**(ECOLOGY, BIOSTATISTICS)**

2014

Time : Hours

Full Marks: 50

**ECOLOGY :**

1. Species - Area curve
2. Frequency, Density and abundance - Community study
3. Ecological anatomy

**BIOSTATISTICS :**

1. Central Tendency - Measurement of mean, median, mode.
2. Measurement of dispersion
3. Student t<sup>1</sup> test
4. X<sup>2</sup> test

**SEMESTER-II**  
**M.SC. LIFE SCIENCES**  
**PAPER-725 (PRACTICAL)**

INSTRUMENTAL TECHNIQUES, MOL. BIOLOGY & BIOTECHNOLOGY

Time : Hours

Full Marks: 50

**INSTRUMENTAL TECHNIQUES:**

1. Spectrocolori meter - Instrumentation & Principle
2. Centifugation - Principle & Instrumentation
3. P<sup>H</sup> Meter - Principle & Instrumentation

**MOL. BIOLOGY & BIOTECHNOLOGY :**

1. Extraction and estimation of DNA & RNA
2. Estimation of protien content
3. Agarose Gel electrophoresis
5. paper Electrophoresis

**SEMESTER-III**  
**M.SC. LIFE SCIENCES**  
**PAPER-731 (PLANT SCIENCE)**  
**PLANT MORPHOLOGY, STRUCTURE AND REPRODUCTION**

Time : 3 Hours

Full Marks: 50 (40 + 10)

**UNIT - I**

An outline classification of cryptogams up to order. Algae-Range of thallus structure and reproduction in Cyanophyta, Chlorophyta, Phaeophyta and Rhodophyta. Fungi-Organisation of thallus structure and reproduction. Economic importance of Phycomycetes, Ascomycetes and Basidiomycetes. Degeneration of sexuality in Fungi.

Bryophytes - Evolution of gametophyte and sporophyte in Marchantiales, Evolution of sex organs in bryophyta. Degeneration of Sporogenous tissues Bryophyta.

**UNIT - II**

Pteridophyta-Origin of land plants, evolution of vascular tissues, Origin of Heterospory and its significance. Fillicales as the most advanced group of Pteridophyta.

Gymnosperms - Origin and outline classification upto order. Characteristic features in the structure and reproduction of up to the orders. Cycadofillicales as intermediate group between bryophytes and pteridophyta, Cycadas as relic of ancient Gymnosperms, Phylogenetic position of Ginkgoales. Wood anatomy and embryogeny of coniferales, angiospermic character of Gnatales, Palaecobotany-Geological era, process of fossilization. Fossil Gymnosperms of India.

**UNIT - III**

Angiosperms - Origin and evolution of angiosperms. Different systems of classification upto order. International code of Botanical Nomenclature (ICBN), Range of floral structure, affinities and phylogeny of monocot and dicots with special reference to Glumiflorae, Liliiflorae, Scitaminae, Microspermae, Ranales, Malvales, Tubiflorae and Umbelliferae.

**Internal Assessment**

10 Marks

**SEMESTER-III**  
**M.SC. LIFE SCIENCES**  
**PAPER-732 (PLANT SCIENCE)**  
**PLANT PHYSIOLOGY**

2014

Time : 3 Hours

Full Marks: 50 (40 + 10)

**UNIT - I : WATER RELATION**

Water relations in plants: Concepts of water potential principles of absorption of water, ascent of sap, transpiration, stomatal mechanism and transpiration ratio, Mineral nutrition - Essential elements, hydroponics, absorption of elements, passive and active transport role of essential elements and deficiency symptoms, Translocation of organic materials in phloem.

**UNIT - II SIGNAL TRANSDUCTION & SENSORS:**

1. Phytochromes and their photochemical & biochemical properties
2. Photophysiology of light induced responses
3. Signal transduction overview & receptors
4. Mechanism, Sensor & regulatory systems

**UNIT - III : PHOTOSYNTHESIS :**

Photosynthesis- Principles of light absorption in chloroplast, Organisation of light absorbing systems, mechanism of electron flow  $C_3$ ,  $C_4$  and CAM pathway for carbon reduction. Photorespiration.

**Internal Assessment**

10 Marks

**SEMESTER-III**  
**M.SC. LIFE SCIENCES**  
**PAPER-733 (PLANT SCIENCE)**  
**METABOLISM**

Time : 3 Hours

Full Marks: 50 (40 + 10)

**UNIT - I:**

1. Lipid metabolism : fatty acid biosynthesis, catabolism of lipids.
2. Sulfur metabolism, sulphur uptake , transports & assimilation.

**UNIT - II NITROGEN METABOLISM:**

Nitrogen metabolism - Bio-chemical metabolism of Nitrogen fixation in free living and symbiotic organisations, nitrogen cycle.

**UNIT - III : RESPIRATION :**

Respiration - Aerobic and anaerobic respiration, respiratory quotient, energetics of respiration electron transport system, action uncouplers, cyanide resistant respiration. HMP pathway. - Oxidation of fatty acids.

**Internal Assessment**

10 Marks

**SEMESTER-III**  
**M.SC. LIFE SCIENCES**  
**PAPER-PS-734 (PRACTICAL)**  
**(PLANT MORPHOLOGY, PLANT REPRODUCTION)**

2014

Time : 3 Hours

Full Marks: 50

1. Algal mixture separation
2. Study of diseased plant samples- identification of Fungi with symptoms of disease.
3. Anatomical studies of Bryophyta
4. Anatomical studies of pterodophyta
5. Anatomical studies of Gymnosperm
6. Floral characters & Identification of families : Graminae, cyperaceae, Ranunculaceae, Umbelliferae, Malvaceae , Apocynaceae etc.

**SEMESTER-III**  
**M.SC. LIFE SCIENCES**  
**PAPER-PS-735 (PRACTICAL)**  
**(PLANT PHYSIOLOGY & METABOLISM)**

Time : 6 Hours

Full Marks: 50

1. Osmotic potential - calculation using potato tuber-Rhoeo leaf.
2. Estimation of chlorophyll pigment in various leaf .
3. Comparison of chlorophyll and carotenoid content.
4. Stomatal Index / Stomatal frequency.
5. Identification of Aminoacids by paper chromatography.

**SEMESTER-III**  
**M.SC. LIFE SCIENCES**  
**PAPER-731 (ANIMAL SCIENCE)**  
**BIOLOGY OF NON-CHORDATA**

Time : 3 Hours

Full Marks: 50 (40 + 10)

**Unit – I : Nonchordata**

1. Locomotion in protozoa.
2. Reproduction in protozoa.
3. Parasitism in protozoa.
4. Reproduction in Porifera.
5. Polymorphism in Coelentrata.
6. Structure and affinities of Ctenophora.
7. Structure and affinities of Archiannelida.

**Unit – II : Nonchordata**

1. Helminth Parasites with special reference to man.
2. Metamerism in Annelida.
3. Vision in insects.
4. Larval forms in crustacea.
5. Respiration in Arthropoda.
6. Structure and affinities of peripetus.
7. Respiration in Mollusca.

**Unit – III : Nonchordata**

1. Larval forms in Echinodermata.
2. Water vascular system in Echinodermata.
3. Structure and affinities of Hemichordata.
4. Structure and affinities of Lobophorates.
5. Structure and affinities of brochiopods.
6. Structure and affinities of Gastrotricha.
7. Economic Zoology: Apiculture, Sericulture, Lacculture, Pearlculture.

**Internal Assessment**

10 Marks

**SEMESTER-III**  
**M.SC. LIFE SCIENCES**  
**PAPER-732 (ANIMAL SCIENCE)**  
**BIOLOGY OF CHORDATA**

2014

Time : 3 Hours

Full Marks: 50 (40 + 10)

**Unit – I :**

1. Origin of Chordata.
2. Inter relationship of Cephalochordata and Urochordata.
3. Structure and affinities of Cyclostomata.
4. Distribution, structure and affinity of Dipnoi.
5. Origin of Tetrapoda.

**Unit – II :**

1. Structure & General account of Gymnophiona
2. Parental care in fishes
3. Parental care in amphibia
4. Structure & affinities of sphenodon
5. Mammal like reptiles

**Unit – III :**

1. Flight adaptations and perching mechanism in birds.
2. General account of prototheria and metatheria.
3. Dentition in mammals.
4. Adaptive radiation in mammals.
5. Comparative anatomy of Integument and Jaw-suspensorium in Vertebrates

**Internal Assessment**

10 Marks



**SEMESTER-III**  
**M.SC. LIFE SCIENCES**  
**PAPER-733 (ANIMAL SCIENCE)**  
**ETHOLOGY & DEVELOPMENT BIOLOGY**

Time : 3 Hours

Full Marks: 50 (40 + 10)

**Unit – I : Ethology**

1. Instinct, Learning, types of learning, Neural mechanism of learning and learning in Vertebrates.
2. Biochemical approach to problem of memory.
3. Orientation and navigation in animals.
4. Migration behaviour in fishes and birds.
5. Reproductive behaviour in vertebrates (Courtship and Mating).
6. Biological clocks.
7. Social behaviour in insects and primates.

**Unit – II : DEVELOPMENTAL BIOLOGY**

1. Molecular events during fertilization.
2. Cleavage.
3. Morphogenic movements and mechanism of gastrulation.
4. Differentiation and differential gene activity.
5. Concept of organizer and embryonic induction.
6. Totipotency and tissue culture in animals..
7. Regeneration.

**Unit – III : DEVELOPMENTAL BIOLOGY**

1. Foetal membranes and their development..
2. Placentation.
3. Development of notochord and Heart in chick.
4. Oestrous and Menstrual cycle.
5. Infertility and Artificial insemination.
6. In vitro fertilisation.
7. Birth control.

**Internal Assessment**

10 Marks

**SEMESTER-III**  
**M.SC. LIFE SCIENCES**  
**PAPER-AS-734 (PRACTICAL)**  
**(NON-CHORDATA & CHORDATA )**

2014

Time : Hours

Full Marks: 50

**Non-Chordata:**

1. Nervous system of Pila
2. Nervous system of Sepia
3. Nervous system of Prawn

**Chordata:**

1. Arterial system of Calotes
2. Venous system of Calotes
3. Brain of Toad

**SEMESTER-III**  
**M.SC. LIFE SCIENCES**  
**PAPER-AS-735 (PRACTICAL)**  
**(EMBRYOLOGY & DEVELOPMENT BIOLOGY, ANIMAL**  
**PHYSIOLOGY)**

Time : 6 Hours

Full Marks: 50

**Embryology & Development Biology:**

1. Study of Blastula, gastrula of Frog
2. Tadpole larva of Frog
3. Study of 18hrs, 20hrs, 24hrs, 33hrs, 36hrs, 42hrs, 48hrs chickembryo

**Animal Physiology:**

1. Test for carbohydrate
2. Test for Protein
3. Test for Fat
4. Action of salivary amylase on starch

## SEMESTER-IV

### M.SC. LIFE SCIENCES

#### PAPER-741 (PLANT SCIENCE)

#### (PLANT ANATOMY, EVOLUTION, EMBRYOLOGY, DEVELOPMENT BOTANY)

Time : 3 Hours

Full Marks: 50 (40 + 10)

#### Unit – I

Secondary growth in Plants, anomalous secondary growth of principles of arrangement of mechanical tissues.

Concept of Organic evolution, Geological era, Age of Earths, Origin of life, Geographical distribution of plants, isolation and isolating mechanisms, sympatric and allopathic populations.

#### Unit – II

Microsporogenesis, Megasporogenesis, types of endospus, Apomixis, Development of Dicot and Monocot embryos.

Concept of totipotency in plants, protoplast culture an somatic hybridization.

#### Unit – III

Germination, physiology of flowering photoperiodism, sene-scene, Regulation of plant growth and Development – phutohormones, molecular mechanism of responses of plants to Auxens, Gibberelleins, Cytokinins, Aba and Ethylene.

**Internal Assessment**

10 Marks

## SEMESTER-IV

2014

### M.SC. LIFE SCIENCES

#### PAPER-742 (PLANT SCIENCE) PRACTICAL (PLANT ANATOMY, EVOLUTION, EMBRYOLOGY, DEVELOPMENT BOTANY)

Time : 6 Hours

Full Marks: 50

#### Plant Anatomy

1. Study of abnormal secondary growth in-adaptive type Dicot Stem
2. Study of abnormal secondary growth in-adaptive and nonadaptive types
3. Embryological slides
4. Anatomy of Anther of different stages of microsporengensis
5. Pollen germination by hanging drop method
6. Pollen wall morphology

**SEMESTER-IV**

**M.SC. LIFE SCIENCES**

**PAPER-741 (ANIMAL SCIENCE)**

**(ANIMAL PHYSIOLOGY, EVOLUTION AND TAXONOMY)**

Time : 3 Hours

Full Marks: 50 (40 + 10)

**Unit – I : Animal Physiology**

1. Digestion and absorption of food.
2. Cardiac cycle and its regulation.
3. Breathing and gaseous exchange; Transportation of gases,
4. Muscle contraction.
5. Mechanism of Nerve impulse conduction, synaptic transmission.
6. Physiology of excretion.

**Unit – II : Evolution**

1. Fossils, Fossilisation and dating of fossils and some Indian fossils.
2. Patterns of evolution – Sequential evolution, convergent and Divergent evolution, micro, macro and mega evolution.
3. Molecular evolution.
4. Synthetic theory of evolution.
5. Natural selection – Hardy-Weinberg's Law.
6. Continental drift and Animal distribution.
7. Animal distribution (Cosmopolitan, Discontinuous, Bipolar and isolated distribution), and factors effecting animal distribution.
8. Speciation.

**Unit – III : Taxonomy**

1. History of Taxonomy.
2. Principles of classification and procedures in Taxonomy.
3. Species concept.
4. Concepts of chemotaxonomy, cytotaxonomy and Numerical Taxonomy.
5. Preservation and Identification of animals.
6. Ecology and physiology in taxonomy.
7. General Classification of Animal Kingdom.

**Internal Assessment**

10 Marks

**SEMESTER-IV**

2014

**M.SC. LIFE SCIENCES**

**PAPER-742 (ANIMAL SCIENCE) PRACTICAL**

**(ANIMAL PHYSIOLOGY, EVOLUTION AND TAXONOMY)**

Time : Hours

Full Marks: 50

**Animal Physiology**

1. Estimation of H6%
2. RBC count of man/any vertebrate
3. WBC count of man
4. Preparation of Haemin crystals
5. Determination of blood type (Blood group)
6. Caesin content of milk
7. O<sub>2</sub> uptake by insect.
8. Determination of Haematocrit value of blood.

**EVOLUTION AND TAXONOMY**

Taxonomical features & phylogenetic study of some selected species.

**SEMESTER-IV**  
**M.SC. LIFE SCIENCES (SPECIAL PAPER)**  
**PAPER-743**

**(A) ENVIRONMENTAL BIOLOGY**

Time : 3 Hours

Full Marks: 50 (40 + 10)

**Unit – I : Stress Physiology**

1. Basic concepts of stress (Stress, Strain, Resistance, Tolerance and Avoidance, Incipient lethal level, Acclimation and acclimatization, Homeostasis.
2. Bioassays, Synergism and Antagonism.
3. Water deficit stress and adaptations of plants and animals to water deficit stress.
4. Ionising radiation, Types and sources of Ionising radiation in environment, effects and radiation standards.
5. Pollution – Oil Pollution and pollution due to agricultural activity and Eutrophication.
6. Pollution in Indian Rivers.

**Unit – II : Production and Conservation Ecology**

1. Primary Production and methods of measurement.
2. Secondary Production and Yield to man.
3. Ecological efficiencies and production in different regions of the world.
4. Natural habitat conservation in Orissa with special reference to Chilika, Bhitarkanika, Similipal, Mahendragiri.
5. Afforestation and forest management.
6. Wild life conservation.
7. Soil conservation.

**Unit – III : Environmental Management**

1. Environmental monitoring and management.
2. Environment protection laws.
3. Environmental education and awareness.
4. Biological control of pests.
5. Sewage and solid waste management.
6. Treatment of effluents in distilleries and paper and pulp industries.

**Internal Assessment**

10 Marks

**SEMESTER-IV**  
**M.SC. LIFE SCIENCES (SPECIAL PAPER)**  
**PAPER-743**

2014

**(B) BIOTECHNOLOGY**

Time : 3 Hours

Full Marks: 50 (40 + 10)

**UNIT – I : BASIC BIOTECHNOLOGY:**

Cloning Vectors for recombinant DNA (Plasmids, Phages, Cosmids, YAC and MAC), Restriction enzymes for cloning; cloning in bacteria and eukaryotes; Southern, Northern and Western blotting; Basic PCR, anchored PCR and asymmetric PCR; isolation of genes; sequencing of gene or a DNA segment: Maxam & Gilbert's and Sanger's method; gene synthesis mechanism, outline concepts on enzymology.

**UNIT – II : APPLIED BIOTECHNOLOGY:**

Scope of animal cell culture, advantages and disadvantages, the gas phase for tissue culture, culture media for animal cells and tissues, culture procedures, maintenance of cultures - cell lines; cloning of cell lines; Gene transfection; targeted gene transfer; transgenic animals;  
Culture media and plant cell culture : Culture media and their constituents (MS, B5 and White's media, cell culture. propagation; somaclonal variation, production of haploids: anther culture, ovule culture, protoplasts, protoplast culture.

**UNIT – III : INDUSTRIAL AND ENVIRONMENTAL BIOTECHNOLOGY:**

Engineering of macromolecules-basic outline of protein engineering, drug designing, Isolation and culturing of micro-organisms; production of organic compounds by microbial fermentation: Biotechnology in paper industry, pollution Control: Cleaner technologies, reducing environmental impact of industrial effluents, biosensors; Renewable sources of energy, energy and fuel using micro-organisms, use of biotech tools for biodiversity conservation.

**Internal Assessment**

10 Marks

**SEMESTER-IV**  
**M.SC. LIFE SCIENCES (SPECIAL PAPER)**  
**PAPER-743**  
**(C) BIOCHEMISTRY**

Time : 3 Hours

Full Marks: 50 (40 + 10)

**Unit – I :**

Macromolecular structure and metabolism:

Physical properties, chemical structure, isolation and purification of proteins, molecular and biological heterogeneity of proteins, (with special reference to hormones and iso-enzymes, structural collagen) and contractile protein. Classification and intracellular distribution of enzyme & proteins, metabolism of individual essential aminoacids.

Chemical structure and biological significance of polysaccharides, starch, glycogen, inulin, dextrin, cellulose, hemicellulose, lignin, mucopolysaccharides and glycoproteins) path of carbon in photosynthesis, glycogen metabolism, glyoxalic shunt, uronic acid pathway, gluconeogenesis, fixation of carbon dioxide (in darkness) in plants, photorespiration in plants. Chemical structure and biological significations for phospholipids & glycolipids, lipoprotein and steroid metabolism (biosynthesis and degradation of phospholipids, sphingolipids and cholesterol).

**Unit – II :**

A general account of plant alkaloids and pigments, photosynthetic pigments (anthocyanins and anthoxanthine biosynthesis and metabolism of auxins in plant structure) and classification of vitamins and hormones in animals and their roles in metabolism.

The concept of free energy, high energy bonds and the key position of ATP, phosphorylation, mitochondria as a biological transducer mechanism of electron transport and oxidative phosphorylation; evolution of energy transforming mechanism, energy transduction in cell, characteristic features and types of transducer role of ATP in active transport.

The mechanism of enzymatic analysis catalyzed reaction and the plausible models for reaction mechanism, substrate and product inhibition of enzyme action feed back modulation of the activity of kinetics of action. Regulation of enzyme synthesis in microbial organisation and critical estimation of the regular operon model control enzyme synthesis in higher organisms.

**Unit – III:**

Thermodynamic equilibrium and metabolic control regulation of glycolysis and TCA cycle, basterut and krahtress effects, regulation of glycogen metabolism control of lipid metabolism in a cell and in the body (animal) regulation of nucleic acid metabolism inborn errors of metabolism, antibody and interferon, their synthesis. Molecular mechanism of hormone action with reference to epinephrine, insulin, thyroxine and plant auxins, biochemistry of senescence.

**Internal Assessment**

**10 Marks**

**SEMESTER-IV**  
**M.SC. LIFE SCIENCES**  
**PAPER-744**

2014

**(SEMINAR PRESENTATION AND PROJECT REPORT)**

Time : 03 Hours

Full Marks: 50

**A) SEMINAR PRESENTATION (20)**

1. Students are required to participate in weekly seminar activities and present papers under guidance of a teacher.
2. The best presentation of each student will be evaluated by an external examiner on the date of exam.
3. Marks will be awarded on the basis of total performance in the whole semester by both External and Internal examiner.

**B) PROJECT REPORT / FIELD STUDY REPORT (30)**

1. Each student is required to take up a small research project under the guidance of a teacher, to be completed within a period of 4 weeks and the report be submitted at the end for examination.

Or

The student prepare a scientific review of any current topic in biotechnology / molecular biology under the guidance of a teacher and the report be submitted for evaluation.

Or

The student prepare a field study report on distribution of plants/ animal or vegetation of floristic aspects of a locality visited and report be submitted for evaluation.

**SEMESTER-IV**  
**M.SC. LIFE SCIENCES**  
**PAPER-745**  
**(SPECIAL PAPER PRACTICAL)**

Time : 06 Hours

Full Marks: 50

**PRACTICAL TOPICS AND LAB. EXPERIMENTS RELATED TO SPL. PAPER STUDIED.**