

**M. Sc. Zoology (Semester Pattern)
Examination Scheme**

First Semester

Code	Course	Total MARKS
MSCZ -101	Biosystematics, Taxonomy and Evolution	100
MSCZ -102	Structure and function of Invertebrates	100
MSCZ -103	Quantitative biology, Biodiversity and Wild Life	100
MSCZ -104	Biomolecules and Structural Biology	100
MSCZ -105	Related to Ist and IInd Theory Paper	50
MSCZ -106	Related to IIIrd and IVth Paper	50
	Total Marks	500

Second Semester

Code	Course	Total MARKS
MSCZ -201	General and Comparative animal physiology and Endocrinology	100
MSCZ -202	Population Ecology and Environmental physiology	100
MSCZ -203	Tools and Techniques for Biology	100
MSCZ -204	Molecular cell biology and	100
MSCZ -205	Related to I and II theory paper	50
MSCZ -206	Related to III and IV theory paper	50
	Total Marks	500

Third Semester

Code	Course	Total MARKS
MSCZ -301	Comparative anatomy of Vertebrates	100
MSCZ -302	Gamete Biology, Genes, development & differentiation	100
MSCZ -303	Optional	100
MSCZ -304	Optional	100
MSCZ -305	Related to I and II theory paper	50
MSCZ -306	Related to III and IV theory paper	50
	Total Marks	500

Fourth Semester

Code	Course	Total MARKS
MSCZ -401	Animal Behaviors and Neurophysiology	100
MSCZ -402	Ecotoxicology	100
MSCZ -403	Optional	100
MSCZ -404	Optional	100
MSCZ -405	Related to I and II theory paper	50
MSCZ -406	Related to III and IV theory paper	50
	Total Marks	500

M.Sc. Zoology
Semester I
Paper I
Biosystematics, Taxonomy and evolution

Unit I

. Definition and basic concepts of biosystematics taxonomy and classification.

- History of Classification

Trends in biosystematics : Chemotaxonomy cytotaxonomy and molecular taxonomy

Dimensions of speciation and taxonomic characters.

Species concepts : species category, different species concepts, subspecies and other infra-specific categories.

Theories of biological classification: hierarchy of categories.

Unit II

- Taxonomic Characters – Different kinds.
- Origin of reproductive isolation, biological mechanism of genetic incompatibility.
- Taxonomic procedures: Taxonomic collections , preservation ,cureting, process of identification.
- Taxonomic keys,different types of keys, their merits and demerits.
- International code of Zoological Nomenclature (ICZN):
Operative principles, interpretation and application of important rules: Formation of Scientific names of various Taxa.

Unit III

- Taxonomic categories.
- Evaluation of biodiversity indices.

- Evaluation of Shannon – Weiner Index.
- Evaluation of Dominance Index.
- Similarity and Dissimilarity Index.

Unit-IV

- Concepts of evolution and theories of organic evolution.
- Neo Darwinism and population genetics:
 - A- Hardy-Weinberg law of genetic equilibrium.
 - B – A detailed account of destabilizing forces:
 - i- Natural selection
 - ii- Mutation
 - iii- Genetic Drift
 - iv- Migration
 - v- Meiotic Drive.
 - Trends in Evolution
 - Molecular Evolution
 - a) Gene evolution
 - b) Evolution of gene families
 - c) Assessment of molecular variation

Unit – V

- Origin of higher categories
- Phylogenetic – gradualism and punctuated equilibrium.
- Major trends in the origin of higher categories
- Micro and macro evolution.

Molecular population genetics

- Pattern of changes in nucleotide and amino acid sequence.
- Ecological significance of molecular variations (genetic polymorphism)
 - Phylogenetic and biological concept of species.
 - Patterns and mechanism of reproductive isolation.
 - Modes of speciation (allopatry & sympatry)

Origin and Evolution & Economically important microorganisms and animals.

MSc Previous
Subject: Zoology
SEMESTER -I
Paper-I List of Books

SUGGESTED READING MATERIAL

1. M. Koto-The. Biology of biodiversity-Springer
2. E.O. Wilson-Biodiversity-Academic Press Washington.
3. G.G.-Simpson-Principle of animal taxonomy Oxford IBH Publication company.
4. E-Mayer-Elements of Taxonomy
5. Bastchelet-F-Introduction to mathematics for life scientists Springer Verlag, Berling.
6. Skoal R.R. and F.J.Rohiff Biometry-Freeman, San-Francisco.
7. Snecdor, G.W. and W.G. Cochran Statisical Methods of affiliated-East-West Press, New Delhi.
8. Murry J.D. Mathematical Biology-Springer, Verlag, Berlin.

Class - M.Sc.
Subject - Zoology
Paper Title - Paper II STRUCTURE AND FUNCTION OF INVERTEBRATES
Semester - I

UNIT –I

1. Origin of metazoa
2. Organization of Coelom
 - A. Acoclomates
 - B. Pscudocoelomates
 - C. Coclomates
3. Locomotion.
 - A. Amoeboid flageller and cillary movement in protozoa
 - B. Hydrostatic movement in Coelenterata
 - C. Annelida and Echinodermata

UNIT –II

A: NUTRITION AND DIGESTON

Patterns of Feeding and digestion in lower metazoa, Mollusea, Echinodermata Filter feeding in polychaeta. B: Respiration

Organs of respiration : Gills, lungs and trachea, respiratory pigments.
Mechanism of respiration.

UNIT – III

EXCRETION

Excretion in lower invertebrates.
Excretion in higher invertebrates.
Mechanism of Osmoregulation.

UNIT – IV

NERVOUS SYSTEM.

- A. Primitive Nervous systems-Coelenterata and Echinodermata.
- B. Advanced nervous system in Annelida, Arthropoda (Crustacea and Insecta) and Mollusa (Cephalopoda)

UNIT – V

A. INVERTEBRATES LARVAL FORMS AND THEIR EVOLUTIONARY SIGNIFICANCE.

- A. Trematoda and Cestoda
- B. Larval forms of Crustacea
- C. Larval forms of Mollusea
- D. Larval forms of Echinodermata.

B. 1. Structure affinities and life history of the following minor noncoelomate Phyla -

- A. Rotifera
- B. Entoprocta

2. Structure affinities and life history of the following minor Phyla

- A. Phoronida
- B. Ectoprocta

Suggested Reading Material –

1. Hyman, L.H. The invertebrates, Nol. I. protozoa through Ctenophora, McGraw Hill Co., New York
2. Barrington, E.J.W. Invertebrate structure and function. Thomas Nelson and Sons Ltd., London.
3. Jagerstein, G. Evolution of Metazoan life cycle, Academic Press, New York & London.
4. Hyman, L.H. The Invertebrates. Vol. 2. McGraw Hill Co., New York.
5. Hyman, L.H. The Invertebrates. Vol. 8. McGraw Hill Co., New York and London.
6. Barnes, R.D. Invertebrates Zoology, III edition. W.B. Saunders Co. Philadelphia.
7. Russel-Hunter, W.D. A biology of higher invertbrates, the Macmillan Co. Ltd., London.
8. Hyman, L.H. The Invertebrates smaller coelomate groups, Vol. V. McGraw Hill Co., New York.
9. Read, C.P. Animal Parasitism. Parasitism. prentice Hall Inc., New Jersey.
10. Sedgwick, A.A. Student text book of Zoology. Vol. I, II and III. Central Book Depot, Allahabad.
11. Parker, T.J., Haswell W.A. Text book of Zoology, Macmillan Co., London.



P.K. University
Shivpuri (M.P.)

M.Sc. Previous

I Sem III Paper

Quantitative biology, biodiversity and wildlife

Unit – I Quantitative biology

- Basic mathematics for biologists
- matrices and vectors
- Exponential functions
- Differential equations integration
- Periodic functions
- Sprobability distribution properties and probability theory

Unit – II

- Experimental designing and sampling theory
- Completely randomized design and randomized block design
- Analysis of variance
- Co-relation- types of correlation
- Karl persons coefficient correlation
- Regression

Unit – III Biodiversity

- concept and principal of biodiversity
- causes for the lose of biodiversity
- Biodiversity conservation method
- Medicinal uses of forest plant

Unit – IV Wildlife of India, types of wildlife

- Values of wildlife positive and negative
- Wildlife protection Act
- Conservation of wildlife in India
- Endangered and threatened spices

Unit – V Wildlife and conservation

- National Parks and Sanctuaries
- Project Tiger
- Project Gir lion ang Crocodile breeding project
- wildlife in M.P. with references to Reptiles Birds and mammals
- Biospheres reserves

- Bataschelet. E. Introduction to mathematics for site scientist springer-verlag, berling
- Jorgenserr, S.E. Fundamental of Ecological modling E. sevier New York
- Lenderen D. Modelling in behavioral ecology. Chapman & Hall London U.K.
- Sokal, R.R. and F. J. Rohit Biometry Freeman San Francisco
- Snedecor, G.W. and W.G. cochran, stactical methods, Affilited East, West Press New Delhi (Indian ed.)
- Muray , J.D. Methamatical Biology, Springer Verlag Berlin

- Pelon, E.C. The interpretation of ecological data : A primer on classification and ordination.
- A. Lewis – Biostatistics
- B.K. Mahajan Methods in Biostatistics
- V.B. Saharia wildlife in India
- S.K. Tiwari wildlife in central India
- J.D. Murrey Mathematical Biology
- Georger & Wilians Startical method
- R.K. Tondon Biodiversity Taxonomy & Ecology
- M.P. Arora An Introduction to prevantology
- P.C. Kotwal Biodiversity and conservation

Ist Semester

Suggested reading materials:

1. M. Koto : The Biology of Biodiversity. Springer.
2. E. O. Wildon : Biodiversity. Academic Press Washington.
3. G.G. Simpson : Principles of Animal Taxonomy. Oxford IBH Publication Company.
4. E. Mayer : Elements of Taxonomy.
5. Dobzansky : Biosystematics.
6. Dallela and Sharma : Animal Taxonomy and Museology.
7. Dodzhansky: The Genetics and origin of species. Columbia University Press.
8. Futuyama D.I. Evolutionary Biology. INC Publishers Dunderland.
9. Jha A.P. : Genes and Evolution – John Publication, New Delhi.

Class: M.Sc.
SEMESTER - I
Paper: IVth Paper
BIOMOLECULES AND STRUCTURAL BIOLOGY

Unit – I

Chemical Foundation of biology

- PH, PK, acids bases, buffers, weak bonds
- Free energy, resonance, isomerisation
- Acid soluble pool of living tissues – aminoacids, monosaccharides, oligosaccharides, nucleotides, peptides.
- Nanoparticles
- Biomaterials

Unit – II

1. Primary, Secondary, tertiary and quaternary structures of proteins, protein folding and denaturation
 2. DNA & RNA: Double helical structure of DNA, Structure of RNA, role of RNA in gene expression
 3. DNA replication, recombination and repair
 4. Functional importance of lipid storage and membrane lipids
 5. Membrane channels and pumps
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1. Basic concepts of metabolism: Coupled and interconnecting reactions of metabolism cellular energy resources and ATP synthesis
 2. Glycolysis and gluconeogenesis
 3. Citric acid cycle
 4. Oxidative phosphorylation : Protein and its regulation
 5. Fatty acid metabolism: Synthesis and degradation of fatty acids
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1. RNA synthesis and splicing
 2. Biosynthesis of amino acids
 3. Biosynthesis of nucleotides
 4. Biosynthesis of membrane lipids and steroids
 5. Protein synthesis

Unit – V

1. Enzymes: Terminologies, classification and basics of enzyme kinetics
2. Mechanism of enzyme catalysis
3. Regulation of enzyme action
4. Concept of free energy and thermodynamic principals in biology
5. Energy rich bonds, compound and biological energy transducers

Suggested Readings:

1. Voet, D. and J.G. Voet. Biochemistry John Wiley & Sons.
2. Freifelder, D. Physical Biochemistry W.H. Freeman & Co.
3. Segal, I.H. Biochemical calculations John Wiley and Sons
4. Creighton, T.E. Protein Structure and Molecular Properties W.H. Freeman & Co.
5. Freifelder, D. Essentials of Molecular Biology
6. Wilson, K. and K.H. Goulding A Biologists Guide to Principals and Techniques of Practical Biochemistry
7. Cooper, T.G. Tools of Biochemistry
8. Hawk, Practical Physiological Chemistry
9. Garret, R.H. and C.M. Grisham. Biochemistry. Saunders college Publishers.

Class: M.Sc.
SEMESTER - I
Practical : Ist

1. Spotting – Classification and identification of various phylum. 8
2. One major dissection of various systems of invertebrates –
Squilla, Prawn, Sepia, Loligo. 8
3. One minor dissection- Grasshopper, Honeybee, Echinus, Starfish, Aplysia. 8
4. Mounting material - permanent balsum mount
5. Spottings related with Adaptation. Homologies, Analogies and modification of
month parts : 8
6. Viva Voice 5
7. Pratical Records, collection 5

Total Marks

50 Marks

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Class: M.Sc.
SEMESTER - I
Practical : IInd

	M,M, 50
1. Problem based on Biodiversity and wild life. Mammals and Fishers group (Spots 5 +5)	20
2. Exercise on mean, mode, & Median.	5
3. Cell division preparation of slid on Meiosis & Mitosis.	5
4. Preparation of different types of chromosomes.	5
5. Viva – Voce	10
6. Practical Record and collection.	5
Total Marks	<u>50</u>

Class: M.Sc.
SEMESTER - II
Paper: Ist Paper
GENERAL AND COMPARATIVE ANIMAL PHYSIOLOGY AND
ENDOCRINOLOGY

Unit – I

- 1. Respiratory pigments through different phylogenic groups**
- 2. Transport of oxygen and carbon dioxide in blood and body fluids**
- 3. Regulation of respiration**
- 4. Physiology of impulse transmission through nerves and synapses**
- 5. Autonomic nervous system, neurotransmitters and their physiological functions**

Unit – II

- 1. Patterns of nitrogen excretion in different animal groups**
- 2. Comparative physiology of digestion**
- 3. Osmoregulation in different animal groups**
- 4. Thermoregulation in homeotherms, poikilothermas and hibernation**
- 5. Physiology of pregnancy, placental hormones, pregnancy diagnosis tests, parturition and breast and lactation**

Unit – III

- 1. Comparative study of mechanoreception**
- 2. Comparative study of photoreception**
- 3. Comparative study of phonoreception**
- 4. Comparative study of chemoreception**
- 5. Comparative study of equilibrium reception**

Unit – IV

- 2. Bioluminescence as means of communication among animals**
- 3. Pheromones and other semiochemicals as means of communication among animals**
- 4. Chromatophores and regulation of their function among animals**
- 5. Hormones, their classification and chemical nature**
- 6. Mechanisms of hormone action**

Unit –V

- 1. Phylogeny of endocrine glands (pituitary, pancreas, adrenal, thyroid)**
- 2. Ontogeny of endocrine glands**
- 3. Neuroendocrine system**
- 4. Hormone receptors – signal transduction mechanisms**
- 5. Hormones and reproduction**
 - a. Seasonal breeders**
 - b. Continuous breeders**

MSc Previous
Subject: Zoology
SEMESTER -II
Paper-I List of Books

SUGGESTED READING MATERIAL

1. EJW Barrington-General & comparative
Endocrinology-Oxford, Clarendon Press
2. R.H. Williams-Text Book of Endocrinology-W.B. Saunders
3. C.R. Martin- Endocrine Physiology-Oxford University Press.
4. Molecular CellBiology-J. Darnell, H. Lodish and D. Baltimore-Scientific
American Book USA
5. Molecular Biology of the cell-B. Alberts, D-Bray, J.Lewis, M. Raff, K.
Roberts and J.D. Watson, Garland Pub. New York.

M. Sc. Previous

Zoology

Semester II

Paper II

Population Ecology and Environmental physiology

Unit I

1. Populations and their characters.
2. Demography : Life tables, generation time, reproductive value.
3. Population growth: Growth of organisms with non-overlapping generations, stochastic and time lag models of population growth, stable age distribution.
4. Population regulation: Extrinsic and intrinsic mechanisms.

1. Adaptations : Levels of adaptations, significance of body size.
2. Aquatic environments : Fresh water, marine, shores and estuarine environments.
3. Eco-physiological adaptations to fresh water environments.
4. Eco-physiological adaptations to marine environments.
5. Eco-physiological adaptations to terrestrial environments.

1. Environmental limiting factors.
2. Inter and intra-specific relationship.
3. Predatory- prey relationship, predator dynamics, optimal foraging theory (patch choice, diet choice, prey selectivity, foraging time).
4. Mutualism , evolution of plant pollinator interaction.

1. Conservation management of natural resources .
2. Environmental impact assessment.
3. Sustainable development.

Unit V

1. Concept of homeostasis.
2. Endothermi and physiological mechanism of regulation of the body temperature.
3. Physiological response to oxygen deficient stress.
4. Physiological response to body exercise.
5. Meditation, yoga and their effects.

Suggested Readings:

1. Cherrett, J.M. Ecological Concepts. Blackwell Science Publication, Oxford, U.K.
2. Elseth, B.D. and K.M. Baumgartner, population Biology, Van Nostrand Co., New York.
3. Jorgensen, S.E. Fundamentals of ecological modeling. Elsevier, New York.
4. Krebs, C.J. Ecology. Harper and Row, New York.
5. Krebs, C.J. Ecological Methodology. Harper and Row, New York.
6. Eckert, R. Animal Physiology: Mechanism and Adaptation. W.H. Freeman and Co., New York.
7. Hochachka, P.W. and G.N., Somero. Biochemical adaptation. Priceton, New Jersey.

Class: M.Sc.
SEMESTER - II
Paper: IIIrd Paper
Tools and techniques in Biology

Unit – I

1. Microscopy, principle & applications
 - Light microscope and phase contrast microscope
 - Fluorescence microscope
 - Electron microscope
 - Confocal microscopy
2. General Principle and applications of
 - Colorimeter
 - Spectrophotometer
 - Ultra centrifuge
 - Flame photometer
 - Beer and Lambert's law.
3. Microbiological techniques
 - Media Preparation and sterilization
 - Inoculation and growth monitoring.
 - Microbial assays.
 - Microbial identification (cytological staining methods for bacterial and fungal strains)
 - Use of fermentors

1. Computer aided techniques for data presentation data analysis, statistical techniques.
2. Cryotechniques
 - Cryopreservation of cells, tissues, organs and organisms.
 - Cryosurgery
 - Cryotomy
 - Freeze fracture and freeze drying.
3. Separation techniques. Chromatography, principle type and applicants.
 - Electrophoresis, Principles, types and applications PAGE and agarose gel electrophoresis.
 - Organelle separation by centrifugation.

Unit – III

1. Radioisotope and man isotope techniques in biology.

- a. Sample preparation for radioactive counting
- b. Autoradiography.
 2. Immunological techniques
 - Immunodiffusion (Single & Double)
 - Immuno electrophoresis
 3. Techniques immuno detection
 - Immunocyto / histochemistry
 - Immunoblotting, immunodetection, immunofluorescence.
 4. Surgical techniques.
 - Organ ablation (eg. Ovariectomy, adrenalectomy)
 - Perfusion techniques
 - Stereotaxy
 - Indwelling catheters
 - Biosensors.

Unit –IV

1. Histological techniques
 - Principles of tissue fixation
 - Microtomy
 - Staining
 - Mounting
 - Histochemistry
2. Cell culture techniques.
 - Design and functioning of tissue culture laboratory
 - Culture media, essential components and Preparation
 - Cell viability testing.

Unit – V

1. Cytological techniques
 - Mitotic and meiotic chromosome preparations from insects and vertebrates.
 - Chromosome banding techniques (G.C.Q. R. banding)
 - Flowcytometry.
2. Molecular cytological techniques
 - In site hybridization (radio labeled and non-radio labeled methods)
 - Fish
 - Restriction banding
3. Molecular biology techniques -
Southern hybridization
 - Northern hybridization -DNA Sequencing
 - Polymerase chain reaction (PCR)

MSc Previous
Subject Zoology
SEMESTER -II
Paper-III Tools & Technique Books

SUGGESTED READING MATERIAL

1. Introduction to instrumental analysis-Robert Braun-McGraw Hill.
2. A biologist Guide to principles and Techniques of Practical Biochemistry- K, Wilson and K.H. Goulding EIBS Edn.
3. Clark & Swizer. Experimental Biochemistry. Freeman, 2000.
4. Locquin and Langeron. Handbook of Microscopy. Butterwaths, 1983
5. Boyer. Modern Experimental Biochemistry. Benjamin, 1993
6. Freifelder. Physical Biochemistry. Freeman, 1982.
7. Wilson and Wlaker. Practical Biochemistry. Cambridge, 2000.
8. Cooper. The Cell-A Molecular Approach. ASM, 1997
9. John R.W. Masters. Animal Cell culture- A practical approach. IRL Press.
10. Robert Braun. Introduction to instrumental analysis. McGraw Hill

M.Sc. Previous Zoology

II Sem IV Paper

Topic – Molecular Cell Biology and genetics

Unit – I Biomembrane

- Molecular composition arrangement and functional consequences
- Transport across cell membrane diffusion active transport, pumps, uniports, symports and antiports
- Micro filaments and microtubules structure and dynamics
- Cell movements intracellular transport, role of kinesin and dynein

- Cell surface receptors
 - Second messenger system
 - Signaling from plasma membrane to nucleus
 - Gap junctions and connexins
 - Desmosomes

 - Ca^{++} dependent homophilic cell – cell adhesion
 - Ca^{++} independent homophilic cell – cell adhesion
 - Gap junctions and connexins
 - Genome organization, hierarchy in organization

- Chromosomal organization of genes and non-coding DNA

Unit –IV Sex determination

- Sex determination in Drosophila
- Sex determination in mammals
- Basic concept of dosage compensation
- Cytogenetic of human chromosomes
- Human genome project (HGP) purpose & implications
- Human gene therapy
- Prenatal diagnosis & genetic counseling
- Genetic screening
- Structural Genomics
- Functional Genomics
- Gene libraries
- Transgenic animals & their applications

Suggested Readings

- J. Darnell, H. Lodish and D. Baltimore molecular cell biology scientific American book. Inc. USA
- B. Alberts D. Bray, J. Lewis, M. Raff, K. Roberts and J.D. Watson. molecular biology of the cell. Garland Publishing Inc. New York.
- John R. W. animal cell culture A practical approach masters. Irl. Press
- Alberts et. al. Essentials cell biology garland publishing Inc. New York 1998
- J.M. Barry molecular biology
- Philip E. Hartman Gene Action
- L.C. Dunn, principals of Genetics
- A.M. Winchester genetics

- Edgar Alterbrg Genetics
- L.C. Dunn genetics and the oregon of species
- Bengt A. Kihlman actions of chemicals of dividing cells

Class: M.Sc.
SEMESTER - II
Practical : Ist

M,M, 50

General & Comarative Physiology and Endocrinology
Population Ecology and Environmental Physiology.

Exercise :

1. Experiment on Hematology Blood group, Total and different counts.	5
2. Demonstration of Enzyme Action, and chromatography	10
3. Estimation of pH.	5
4. Detection of protein carbohydrate and fats.	5
5. Endocrinological spots comments on prepared histological slides.	10
6. Detection of Nitrogenous products in given samples.	5
7. Viva Voce	5
8. Practical Records and collection.	5
Total Marks	<u>50</u>

Class: M.Sc.
SEMESTER - II
Practical : IInd

M,M, 50

Tools and Techniques for biology.
Molecular cell Biology and Genetics

1. Comments upon the structure and application of analytical instruments	10
i. Colorimeter	
ii. Spectrophotometer	
iii. Ultracentrifuge	
iv. ESR and NMR spectrometer	
v. Microtomy	
vi. Chymographic Instruments	
2. Problem and based on genetics	10
3. Estimation techniques based for RNA and DNA	10
4. Estimation of Gene and Genotypic frequencies in light of hardy weinbecey law based on facial traits.	5
5. Demonstration of chromosome polymorphism isozyze polymorphism in some insect population.	5
6. Viva – Voce	5
7. Practical Record	5
Total Marks	<u>50</u>

Class: M.Sc.
SEMESTER - III
Paper: Ist Paper
Comparative Anatomy of Vertebrates

Unit – I

1. Origin of Chordata : Concept of Protochordata
2. Origin and classification of vertebrates.
3. Vertebrates morphology : Definition, scope and importance.
4. Development, structure and functions of vertebrates integument and its derivatives (glands, scales, feathers and hairs)
5. Respiratory system : Characters of respiratory tissue, external and internal respiration, comparative account of respiratory organs.

Unit – II

1. Evolution of heart
2. Evolution of aortic arches and portal systems
3. Blood circulation in various vertebrates groups
4. Form, function, body size and skeletal elements of the body.
5. Comparative account of jaw suspensorium and vertebral column

Unit – III

1. Comparative account of limbs and girdles.
2. Evolution of urinogenital system in vertebrates.
3. Comparative account of organs of olfaction and taste
4. Comparative anatomy of brain and spinal cord (CNS)
5. Comparative account of peripheral and autonomic nervous system

Unit – IV

1. Comparative account of lateral line system.
2. Comparative account of electroreception.
3. Comparative account of simple receptors.
4. Flight adaptations in vertebrates.
5. Aquatic adaptations in birds and mammals.

Unit – V

1. Origin, evolution general organization and affinities of ostracoderms
2. General organization, specialized, generalized and degenerated characters of cyclostomes.
3. Origin, evolution general organization of early gnathostomes
4. General account of Elasmobranchi, Holocephali, Dipnoi and crossoptergii

Suggested Readings :

1. Carter, G.S. Structure and habit in vertebrate evolution – Sedgwick and Jackson, London.
2. Kingsley, J.S. Outlines of Comparative Anatomy of Vertebrates, Central Book Depot. Allahabad,
3. Kent, C.G. Comparative anatomy of vertebrates
4. Malcom Jollie, Chordata morphology. East – West Pres Pvt. Ltd., New Delhi.
5. Milton I lildergrand. Analysis of vertebrate structure. IV. Ed. John Wiley and Sons Inc., New York.
6. Smith, H.S. Evolution of Chordata structure. Hold Rinchart and Winstoin Inc. New York.
7. Sedgwick, A.A. Students Text Book of Zoology, Vol.II.
8. Walter, H.E. and Sayles, L.D. Biology of vertebrates, MacMillan & Co. New York.
9. Romer, A.S. Vertebrate Body, IIIrd Ed. W.B. Saunders Co., Philadelphia
10. Young J.Z. life of vertebrates. The oxford University Press, London
11. Parker & Haswell to III Rev. by Marshall willians latested Macmillan Co. ltd.
12. Young J.Z. Life of mammals. The Oxford University Press, London
13. Weichert, C.K. and Presch, W. Elements of chordate anatomy, 4th Edn. McGraw Hall Book Co., New York.

M.Sc. Zoology
III Semester
II paper
Gamete Biology, genes development and differentiation

Unit I

1. Comparative account of differentiation of gonads in mammals and invertebrate.
 2. Spermatogenesis : Morphological basis in rodents and in any invertebrates.
Gamete specific gene expression and genomics
 3. Biochemistry of Semen : Semen composition and formation, assessment of sperm function.
 4. Fertilization : Prefertilization events Biochemistry of fertilization post fertilization events.
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1. Ovarion follicular growth and differentiation : morphology, endocrinology, molecular biology oogenesis and vitellogenesis, ovulation and ovum transport in mammals.
 2. Biology of sex determination and sex differentiation a comparative account.
 3. Multiple ovulation and embryo transfer technology : in vitro oocyte maturation, superovulation.

Unit – III

1. Hormonal regulation of ovulation, pregnancy and parturition.
2. Hormonal regulation of development of mammary gland and lactation.
3. Endocrinology and Physiology of placenta.
4. Collection and cryopreservation of gametes and Embryo.
5. Teratological effects of xenobiotics on gametes.

Unit – IV

1. Cell commitment and differentiation.
 2. Germ cell determinants and germ cell migration.
 3. Development of gonads.
 4. Meiosis.
-
1. Creating new cell types, the basic evolutionary mystery.
 2. cell diversification in early embryo, Xenopus, Blastomeres, morphogen gradients, totipotency and pluripotency.
 3. Embryonic stem cells, renewal by stem cells, epidermis.

4. Connective tissue cell family
5. Homopietic stem cells : Blood cells formation, stem cell disorders.

Suggested Readings :

1. Long J.A. Evan H.M. 1922 : the oestrous cycle in the Rat and its associated phenomenon.
2. Nalbandou. A.C. – Reproductive physiology
3. Prakash A.S. 1965-66 Marshall's, Physiology Reproduction (3 Vol.)
4. Gilbert, S.F. Developmental Biology , Sinauer Associated Inc. Massachussetts.
5. Ethan Bier, the cold Spring. The cold spring Harbor laboratory Press, New York.
6. Balinsky B.I. Introduction to Embryology sanders, Phliedelphia.
7. Berril N.J. and Karp. G. Development Biology. McGraw Hill New York.
8. Davidson, E.H. Gene Activity During Early Development. Academic Press, New York.

M.SC. FINAL (ZOOLOGY)

2008-2009

Semester III

PAPER III

Fish Structure & Function

Unit – I

- Structure & Function of fish.
- Structure and function of scales, determination of growth and age.
- Origin and evolution of paired fins and their specific modifications.

Unit – II

- Skeleton in fishes.
- Lokomotion in fish.
- Structure and function of swimbladder.
- Accessory respiratory organs with special reference to Indian fishes.

Unit – III Special reference to Indian fishes.

- Different type of food feeding habits of fish
- Structure function and homologies of weberial ossicles

- Hill stream adaptation in fish
- Deep sea fishes

Unit – IV

- Migration in fishes
- Structure & functions of electric organs and electro receptors
- Structure and function of luminous organs
- Structure and function of sound producing organs and sound reception

Unit – V

- Poisonous & venomous fish
- Sense organs in fishes
- Sex determination in fishes
- Chemical composition of fishes

M.Sc. Zoology
III Semester
IV paper
Fish Morphology Anatomy & Physiology

Unit I

1. Chromatophores, classification, ultra structure and functional significance.
2. Colour changes, Types neural endocrine control mechanism.
3. Respiratory organs – Kinds and physiology of aqueous breathing.
4. Digestive system – Anatomy and Physiology of alimentary canal.

Unit –II

1. Nervous System – Brain its functional organization with ecological bearing.
2. Nervous System – Nerves and their supply.
3. Lateral Line system – structure, modification and significance.
4. Circulatory system in fish, heart venous and arterial system.

Unit –III

1. Neuroendocrine integration in fish.
2. Anatomy and Physiology of pituitary gland,
3. Anatomy and Physiology of thyroid gland.
4. Pineal organ, internal tissue and caudate neurosecretory system.

Unit – IV

1. Environmental and hormonal control of reproduction.
2. Parental care.
3. Early development of a teleost.
4. Osmoregulatory organs mechanisms.

Unit –V

1. Seasonal cycles of gonads in Indian fish.
2. Hormonal and Endocrines control of reproduction in fish.
3. Biochemical composition of fishes.

M.Sc.Final
Suggested Readings:-

1. Leo.S.Berg Classification of fishes (fossilized & Recent).
2. Francis day Vol I & II Fishes of India.
3. C.B.LShrivastava, Fish Biology.
4. K.S.Mishra: An aid to classification of Fishes.
5. Gopalji Shrivastava: Indian of fishes of U.P.& Bihar.
6. B.Qurashi: Identification of fishes.
7. W.D.Rusell: Aquatic Productivity.
8. A.J.K.Mainan: Identification of fishes.
9. K.F.Lagler: Ichthyology.
10. N.R.Rao: An Introduction of fishes.
11. J.F.Norman: An History of fishes.
12. S.S.Khanna: An Introduction of fishes.
13. R.L.Rath: Fresh water Aquaculture.
14. H.R.Singh: Advance in fish Biodiversity.
15. H.D.Kumar: Sustanibility & Management of Aquaculture & Fisheries.
16. Arugun & Natarajan: Fresh water Aquaculture.
17. Arugun & Natarajan: Santanu-Costal Aquaculture.
18. R.Sanatham: A manual of fresh water Aquaculture.

M.Sc. Semester III
Zoology
Paper – III (Optional)
Cell Biology

Unit - I

1. Principle and applications of spectrophotometer.
2. Cell sorting : Principle and applications of flow cytometer
3. Basic idea of MMR and ESR
4. Principle and application fluorimeter
5. Atomic force microscopy

Unit – II

1. Gel Electrophoresis : 2D- page and isoelectric focusing
 2. Stem cells : Embryonic stem cells, culture and application.
 3. General idea of X-ray crystallography and its applications
 4. Immune techniques : Precipitation, Immunodiffusion, immunoelectrophoresis, ELISA and RIA
-
1. Methods in protein purification
 2. DNA – protein interactions : Electrophoretic mobility shift assay
 3. Methods in analysis of gene expression – I : Transformation, transfections and mammalian expression
 4. Methods in gene analysis – II : General idea of site directed mutagenesis, Linker scanning mutations analysis Reporter assay.

Unit – IV

- Recombinant DNA Technology
1. DNA modifying enzymes of RDT.
 2. Properties of RDT
 3. Process of RDT
 4. Uses of RDT (Recombinant DNA Technology)
-
- General Idea of yeast
1. Two hybrid systems
 2. Subtractive hybridization
 3. Chromosome walking
 4. Chromosome jumping
 5. Positional cloning
-
1. General idea of RNA se protection assay.
 2. Primer extension

3. SI nucleus protection assya
4. Run of transcription and RT PCR

Genome Analysis

1. DNA finger printing
2. RAPD and RELP

M.Sc. Semester III
Zoology
Paper – IV (Optional)
Cellular Structure and molecular organization

Unit – I

1. General organization and characterizes of viruses (examples SV40and HIV)
2. Yeast : Structur, reproduction and chrosom organization : Basic idea of its applications as vectors for gene cloning.
3. Molecular organization of respiratory chain assemblies , ATP / ADP Translocase and F_0F_L ATPase.
4. Cell cycle : Cell cycle control in mammalian cells and Xenopus.

Unit – II

1. Cytochemistry of Golgi complex and its role in cell seretion
2. Peroxisomes and targeting of paroxysmal proteins
3. Nucleouls : Structure and biogenesis and functions of lysosomes
4. Intracullular digestion : Ultrastructure and function of lysosmes

Unit – III

1. Synthesis and targeting of mitochondrial proteins
2. Secretary pathways and translocation of secretary proteins across the EPR membrane
3. Genome complexity : C-value [aradox and cot value
4. DNA sequences of different complexity

1. Difference between normal cells and cancer cells.

1. Biochemical changes
2. Cytoskeleton changes
3. Cell surface changes

2. Genetic basis of human cancer
3. Chromosomal abnormalities in human cancer

Unit – V

1. General idea of onchogens and proto onchogens.
- 2- Onchogence and Cancer.
3. Transforming Agents.
- 4- Tumor Supressor geanes.
5. Receptor – ligand interaction and signal transduction
6. Cross – talk among verious Signaling Pathways.

Suggested Readings :

- 1- De Robertis and De Robertis Cell and Molecular Biology. Lea and Febiger.

- 2- We Watson Hopking Reberts Steits, Weiner Molecular Biology of the Gene. the Benjamin/ Cummings Publishin Company Inc.
- 3- Bruce Alberts , Bray , Lewis, Raff, Roberts, Watson Molecular Biology of the cell Garland Publishing Inc.
- 4- P.K. Gupta Molecular Cell Biology Rastogi Publications.
- 5- Watson Gilman Witkowski, Zoller Recombinant D,N.A Scientific American Books.
- 6- Gerald Karp. Cell Biology.
- 7- Lewin B. Genes VII,
- 8- King Cell Biology.
- 9- Daniel L. Hartl, Elizabeth W. Jones. Genetics Principles and anylysis. Jones and Bartlett Publisher.
- 10- Lodish, Berk Zipursky, Matsudaira Baltimore Dernel Molecular Cell Biology W. H. Freeman and Company.
- 11- J, Travers Immunology Current Biology limited.
- 12- Kuby Immunology W.H. Freeman and Company
- 13- Riott, Male Snustad Principles of Genetics John Weley and Sons Inc.
- 14- Gardner Simmons Snustad Principles of Genetics John Wiley and Sons INC.
- 15- Gibson Muse A Primer to Genome Science Siauer Associates Inc. Publishers
- 16- S.M. Brown Bioinformatics Eaton Publisher.
- 17- Pelczar Chan Kreig Microbiology Tata Mc Graw Hill
- 18- Prescott Harley Klein Microbiology Wm C. Brown Publisher.
- 19- T.A. Brown Genomes.
- 20- T.A. Brown Genomes.
- 21- D. Frefielder Physical Biochemistry.
- 22- Sambrook Frisch Maniatis Molecular Cloning Vol I-III.

LIST OF PRACTICAL EXERCISES FOR LABORATORY COURSE

M.C. Zoology Semester III PRACTICAL I CELL BIOLOGY

1. Histology and Histochemistry : Microtomy, staining and detection of cell organelles (e.g. Mitochondria Golgi Bodies, lysosomes nucleus and nucleoli)
2. Histochemical demonstration of lipids, proteins (including enzymes), carbohydrate and nucleic acids (DNA/RNA)
3. Immunocytochemistry : Intracellular localization of specific target molecules by antibody staining.
4. Fluorescence microscopy and immunofluorescence : Application of fluorochromes and fluochrome tagged antibodies in the demonstration of proteins and nucleic acids
5. Gel electrophoresis of proteins : Separation of Proteins on polyacrylamide gel electrophoresis (PAGE)
6. Gel electrophoresis of nucleic acids (DNA/RNA) Isolation and detection of DNA.RNA on agarose gel.
- 7- Preparation of mitotic chromosomes from ret/ mice bone marrow cells and construct karyotype of G-or C-banded chromosomes
8. Short Terms rat/human blood lymphocyte culture and preparation of mitotic chromosomes for karyotyping.
9. Study of permanent slides and electron micrographs

SCHEME OF PRACTICAL EXAMINATION

1.Histology and histochemistry :	6
a. Demonstration of cellular organelles	
b. Demonstration of biomolecules	
2.Electrophoresis (PAGE/agarose)	8
(Demonstration of Biomolecular on gel matrix)	
3.Mitotic chromosome preparations and banding analysis	8
4.Spotting (permanent slides – 3, electron micrographs – 3)	12
5.Viva Voce	8
6.Practical record.	8

TOTAL MARKS	50
DURATION 6 HOURS	

PROJECT	50
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List of Optional Paper (Special) To be opted to the by the Student in Third Semester and

Forth Semester (Paper III and IV). The syllabus of the Optional paper of the Will be formed by the respective. University where the Subject are to opted. Syllabus for same optional papers are is follow.

1. Biology of parasitism and Vertebrate Immune system.
2. Ichthyology (Anatomy and Physiology)
3. Entomology (Applied)
4. Acqua culture and fisheries

6. Endocrinology
7. Wild Life Biology and Conservation
8. Wild Life Conservation and ecotoxicology
9. Microbial Ecology and Biology of Parasitism
10. Limnology
11. Insect Physiology

Sample of optional papers

Ichthyology and Cell Biology

M.Sc. Semester III
Zoology
Practical – I (General)

Time : 5 hour

MM. 50

Comparative anatomy of vertebrates, Gametes Biology of genes, Development and differentiation.

1. Dissect and display of cranial nerves of Vertebrates 10
2. Minor dissection of Herdmania, Accessory respiratory organs perching mechanism. 5
3. Prepare a permanent stained slide of given material. 10
4. Material and comments upon the spots 1 to 5 including slides and Bones. 5
5. Gametes Biology of Fishes, Amphibia, Birds and Mammals. 5
6. Identify and comments upon spots on Embryology 5
7. Viva Voice 5
8. Practical Record. 5

Total Marks

50

M.Sc, Practical III Semester Ichthyology

Marks-50

1. Major dissection Nervous system of walago mystus, labeo & torpedo.	10
2. Minor dissection on Internal ear, accessory, resistors, organ, pituitary, glands, webrian osscelis.	05
3. Mounting preparation of permanent slides.	05
4. Study of different types of scales and fins.	
5. Age determination of fish with the help of scales.	05
6. Spotting of museum specimens, slides and bones.	
7. Viva Voice	10
8. Practical record, collection	10
Project Work	50
Total Marks	<u>100</u>

Class - M.Sc.
Subject - Zoology
Paper Title - Paper I ANIMAL BEHAVIOUR AND NEUROPHYSIOLOGY
Semester - IV

Max. Mark & 50

UNIT I –

1. Introduction :

- Ethology as a branch of biology.
- Animal psychology, classification of behavioral patterns, analysis of behaviour (ethogram)

2. Reflexes and complex behaviour.

3. Preception of the environment: mechanical, electrical, chemical, olfactory, auditory and visual.

4. Evolution and ultimate causation: Inheritance behaviour and relationships.

UNIT II –

1. Neural and hormonal control of behaviour.

2. Genetic and environmental components in the development of behaviour.

3. Motivation: Drive, timing and interaction of drives, physiological basis of motivation, hormones and motivation, aggregation.

4. Communication: Chemical, visual, light and audio, evolution of language (primates).

UNIT III –

1. Ecological aspects of behaviour: Habitar selection, food selection, optimal foraging theory, anti-predator defenses, aggression, homing territoriality, dispersal, host-parasite relations.

2. Biological rhythms: Circadian and circannual rhythms, orientation and navigation, migration of fishes, turtles and birds.

3. Learning and memory: Conditioning, habituation, insight learning, association learning, reasoning.

UNIT IV-

1. Reproductive behaviour. Evolution of sex and reproductive strategies, mating systems, courtship, sexual selection. parental care.
2. Social behaviour. aggregations, schooling in fishes, flocking in birds, herding in mammals, group selection, kin selection, altruism, reciprocal altruism, inclusive fitness, social organization in insects and primates.

UNIT V –

1. Thermoregulation: Homeothermic animals, poikilotherms & Hibernation.
2. Receptor physiology a comparative study –
 - Mechano reception
 - Photo reception
 - Phono reception
 - chemo reception
 - Equilibrium reception
3. Bioluminescence

Suggested Readings -

1. Eibl-Eibesfeldt, I. Ethlogy. The biology of Behaviour. Holt, Rineheart & Winston, New York.
2. Gould, J.L. The mechanism and Evolution of Behaviour.
3. Kerbs, J.R. and N.B. davies : Behaviourable Ecology. Blackwell, Oxford, U.K.
4. Hinde, R.A. Animnal Behaviour : A Synthesis of Ethology and Comparative Psychology. McGraw Hill, New York.
5. Alcock, J. Animal Behaviour : An Evolutionary approach. Sinauer Assoc. Sunderland, Massachsets, USA.
6. Bradbury, J.W. and S.L. Vehrencamp. Principles of Animal Communication. Sinauer Assoc. Sunderland, Massachsets, USA.

M.Sc. Final
Semester IV
Paper III
Eco-Toxicology

Unit – I

1. General principles of environmental Biology with emphasis on their ecosystems.
2. Abiotic and biotic factor of ecosystems.
3. Communities of the environment, their structure and significance
4. Energy flow in environmentl : Ecological energetics

Unit – II

- 1- Productivity, Production and analysis.
- 2- Recycling and reuse technologic for solid and liquid wastes and their role in environmental conservation
- 3- Remote sensing – basic concept and applications of remote secing techniques in environmental conservation.
- 4- Environmental indicators and their role in environmental balance

Unit – III

1. Kinds of environmental pollution due to pollutants and their methods
2. Radioactive compounds and their impact on the environment
3. Vehicular exhaust pollution, causes and remedies.
4. Noise pollution

Unit – IV

1. Toxicology basic concepts, Principles and various types of toxicology agents.
2. Toxicity testing principles, hazards, risk and their control methods
3. Food toxicants and their control methods.
4. Public Health Hazards due to environmental disasters.

Unit – V

1. Pesicids, types nature anf their effects on our environment
2. Important heavy, metals and their role in environment.
3. Agrochemical use and misuse , alternatives
4. Occupational Health Hazasds and their control.

M.Sc. Semester IV
Paper II

List of books-

1. Arora : Fundamentals of environmental
2. Anathakrishnan : Bioresources ecology
3. Bottain : Environmental studies
4. Bouhey : Ecology of populations
5. Clark : Elements of ecology
6. Dowdoswell : An introduction to animal ecology
7. Goldman : Limnology
8. Kormondy : Concepts of ecology
9. May : Model ecosystems
10. Odum : Ecology
11. Perkins : Ecology
12. Simmons : Ecology of estuaries and costal water
13. Pawlosuske : Physico-chemical methods for water
14. South Woods : Ecological methods
15. Trivedi and Goel : Chemical and biological methods for water
pollution studies
16. Willington : Fresh water biology
17. Wetzel : Limnology
18. Weleh : Limnology Vols. I-II

Class: M.Sc.
SEMESTER - IV
Paper: IIIrd Paper
Taxonomy, systematics and ecology of Fishes

Unit – I

1. Outline classification of fishes as proposed by Berg.
2. Classification of Elasmobranches
3. Classification of Crossopterygii
4. Classification Actinopterygii

Unit –II

1. Systematic survey of fish with particular reference to inland fishes of M.P.
2. Exotic fishes and their importance.
3. Larvicidal fishes & their importance in Public health.
4. Predatory fishes and their significance in fish culture.

Unit –III

1. Working and maintenance of fish aquarium.
2. Fish nets and gears and methods of fishing.
3. Fish diseases, symptoms and treatment.
4. Common needs of fish Ponds and their control.

Unit – IV

1. Fish parasites and their control.
2. Physics – chemical characteristics of fish pond.
3. Biological characteristics of fish pond.
4. Culturable species of fishes of inland water and basis of their selection.

Unit – V

1. Plankton and their significance in fish culture.
2. Primary productivity of fish ponds and its significance.
3. Ecology of managed fish farm ponds.
4. Ecology of fresh water marshes.

Class: M.Sc.
SEMESTER - IV
Paper: IVth Paper
Pisciculture and Economic importance of fishes.

Unit – I

1. Collection of fish seed from natural resources.
2. Dry bundh breeding of camps.
3. Wet bundh breeding of camps.
4. Hypophysation and breeding of Indian major camps.

Unit – II

1. Drugs useful in induced breeding of fish.
2. Types of ponds, required for fish culture farms.
3. Management of hatcheries, nurseries and reany ponds.
4. Management of stocking ponds.

Unit- III

1. Composite fish culture.
2. Prawn culture and pearl industry in India.
3. Fisheries resource of M.P.
4. Riverine fisheries.

Unit – IV

1. Coastal fisheries in India.
2. Offshore and deep sea fisher's in India.
3. Role of fisheries in rural development.
4. Sewage fisheries.

Unit- V

1. Methods of fish Preservation
2. Marketing of fish in India.
3. Economic importance and by products of fishes.
4. Shark liver oil industry in India.
5. Transport of live fish & fish seed.

M.Sc. Zoology Semester IV
Paper – III (Optional)
Cell – Biology

NEUROBIOLOGY , AGEING AND IMMUNOLOGY

Unit I

1. Voltage gated channels in electrically excitable membrane.
2. C-AMP and calcium as second messengers and their role in cellular regulatory mechanism.
3. Protein phosphorylation and synapsin – I in relation to neuronal regulation
4. Chemical synaptic transmission : Neurotransmitters and role of synaptic vesicles in nerve transmission.

Unit II

1. Neuron : General Organization and functions of nerve fibers
2. Glial cells : Classification and role in nervous system
3. Chromatophores : Types, Structure Composition and functional significance
4. Autonomic neural Regulation of melanophores and color change
5. Intracellular motility : Axonal transport of pigment in chromatophores

Unit III

1. Aging : Theories of aging and current concepts
2. Apoptosis and cell death current concept and significance
3. Age associated neurodegenerative diseases : Alzheimer,s & Parkinson,s diseases
4. Cells and tissues in immune system : General organization and functions
5. Innate and adaptive immunity

Unit IV

1. Antibody – Structure and Function
2. Antibody Diversity
 - (a) Rearrangement in immunoglobulin genes
 - (b) Recombination in immunoglobulin genes
3. Major histocompatibility (MHC) molecules.

Unit V

1. Concept of Innate and acquired Immunity

2. Humoral Immune Responses
3. Cell Mediated Immune Responses
4. Allergy.
5. Auto Immunity
6. Immune Response genes and AIDS

M.Sc. Zoology Semester IV
Paper – IV (Optional)
Cell – Biology

Chromosomes. Genes and Genetic Engineering

Unit I

- 1- Molecular Organization of eukaryotic chromosome : Structure of nucleosome particles and higher order compaction of mitotic chromosomes ; chromatin remodelling.
- 2- Specialized chromosomes : structural organization and functional significance of politeness chromosomes
- 3- DNA methylation and DNA Aase – I Hypersensitivity in relational to gene activity and chromatin organization
- 4- Specialized chromosomes II: structural Organization and funtional significance of lamp0brush chromosomes
- 5- Organization and significance of heterochromatin.

Unit II

1. Structural Organization of eukaryotic genes: Interrupted genes and overlapping genes and their evolution.
2. Gene families: Organization, evolution and significance
3. Transposable genetic elements of prokaryotes and eukaryotes
4. Gene mutations and molecular mechanism of occurrence of mutations Repair Mechanisms

Unit III

1. Organization of eukaryotic transcriptional machinery promoter enhancers transcription factors polymerases activators and repressors.
2. DNA binding domains of transcription apparatus zinc finger steroid receptors hemeo domains Hilix – loop, Helix and Leucine Zipper.
3. Eukaryotic transcription of eukaryotic transcriptional control
4. Environmental modulation of gene activity (stress response) Stress genes and stress proteins
5. Molecular basis of thalasemias muscular dystrophy cystic fibrosis

Unit IV

1. DNA Rearrangement
2. Amplification during development with special responses to
 - (a) Ciliates
 - (b) Chlorine gene
 - (c) 58 RNA genes
3. Drosophila development I

- (a) Cleavage
- (b) Gastrulation
- (c) Origine of Anterior – Posterior polarity (Maternal effect genes and segneatation genes

Unit V

- 4. Drosophila Development II
origin of dorsal ventrul polarity
- 5. Basic Idea of homeotic selector genes and homeotic mutation.
- 6. Basic Idea of organization of homeoboxes
- 7. Evolutionary significance of homeoboxes.

Suggested Reading :

- 1- Robertis, De and Robertis Cell and Molecular Biology Lea and Febiger.
- 2. Watson Hopkis Roberts Steitz and Weiner Molecular Biology of the Gene the Benjamin/Cummings Publishing Company Inc.
- 3. Bruce A;berts Bray Lewis Raff Roberts Watson Molecular Biology of the Cell. Garland Publishing Inc.
- 4. Watson Gilman Witkowski Zoller Recombinant DNA Scientific American Books.
- 5. Karp Gerald Cell Biology.
- 6. Lewin B. Genes VII
- 7. King Cell Biology
- 8. Kaniel L., Hartl , Elizabeth W. Jones. Genetics Principals and Analysis Jones and Bartlett Publisher
- 9. Lodish Berk Zipursky Matsudaira Baltimore Darnell Molecular Cell Biology W. H. Freeman and Company.
- 10. Suzuki Griffith Miller Lewontin An Introction to Genetic Analysis W.H. Freeman and Company
- 11. Travers, Immunology Current Biology limited.
- 12. Kuby , Immunology W.H. Freeman and Company.
- 13. Roitt, Male Snustad Immunology.
- 14. Gardner Simmons snustad Principles of Geneties John Wiley and Sons Inc.

LIST OF PRACTICAL EXERCISES FOR LABORATORY COURSE

M.C. Zoology Semester IV
PRACTICAL II CELL BIOLOGY

1. Preparation of Mitotic chromosomes from rat cornea fish Kidney or bone marrow of bird.
2. Preparation of polytene chromosomes from natural population of Drosophila or chironomus to study chromosomal rearrangement (e.g., Inversion Translocation etc).
3. Study of meiosis in rat/grasshopper testis
4. Histochemical and fluorescence localization of age pigments (e.g. Lipofuscin and ceroids) in rat/ mice
5. Study of chromatophores: hormonal and pharmacological treatments
6. Study of immune cells in cytological preparation.
7. Study on antigen antibody reactions : Blood group and Rh Factor
8. Study of heat shock puffs and gene activity in chironomus
9. study of monohybrid and dihybrid crosses/sex linkage in Drosophila
10. Study of development (homeotic) and other phenotypic Mutants of Drosophila
11. Transgenic Drosophila Application Study.

SCHEME OF PRACTICAL EXAMINATION

- 1- Exercise on mitosis meiosis , polytene chromosomes heat shock puffs 5 and gene activity.
- 2- Study of age pigments in rats/ mice
6
- 3- Analysis of Mono- or Di hybrid or sex linkage crosses in Drosophila /
6
Experiment in immunology
4. Spotting (permanent slides -3 Development & phenotypic mutants -2
12
immunological demonstration.



- 5- Viva Voce
8
 - 6- Practical record
8
 - 7- Seminar
5
-

TOTAL MARKS

50

Duration 6 Hour

Project

50

Class: M.Sc.
SEMESTER – IV
Practical : Ist (General)

Time : 5 hours

M,M, 50

1. i. Exercise based on social behaviour :
 - Reproductive behaviour
 - Learning and Memory

- ii Experiment based on Animal behavior so as to show – 10
 - Taxes
 - Reflexes
 - Biological Clock

2. Experiment based on Toxicology testing methods :- 10
 - General Test
 - Acute toxicity test
 - LD 50 test

3. Pathological techniques in toxicology – autopsy, Histochemical analysis 10
Determination of different Toxic chemicals in samples of soil, water, and air.

4. Viva 10
5. Practical Record and Collection 10
- Total Marks 50

Class: M.Sc.
SEMESTER – IV
Practical : IInd (Special)

Time : 5 hours

M,M, 50

1.	Taxonomical Identification of any 5 fishes	15
2.	Identification of Fry and Finger lings.	5
3.	Identification of Zoo Plankton	5
4.	Spotting on Aquaculture specimen Mytilus, sepia, Prawn, Shirp Champ, Oysters, Claims, Loligo and Edible Fishes.	5
5.	Identification and comments upon the predatory insects harmful to fish industry.	5
6.	Viva Voce	10
7.	Practical Record	5
Project Work		<u>50</u>
Total Marks		100