

**M.Sc. Zoology
First Semester
Paper-I**

Paper code: - Zoo 511

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (one from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (one from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper –I of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Biosystematics, Taxonomy, Biodiversity and Wildlife(Total credits 05)

Unit- I-

- Definition and basic concepts of biosystematics.
- Importance and applications of Bio-systematics.
- Trends in biosystematics: chemotaxonomy, cytotaxonomy and molecular taxonomy.
- Species concepts: - Species category, Subspecies and other intra-specific categories.
- Theories of biological classification: hierarchy of categories.

Unit- II-

- Basic concepts of taxonomy
- Taxonomic characters and different kinds.
- Taxonomic procedures: taxonomic collection, preservation, curation process, process of identification.
- Taxonomic keys: different types of keys, their merits and demerits.

Unit- III-

- Taxonomic categories
- Biodiversity indices
- Shannon Weiner Index.
- Dominance Index.
- Similarity and dissimilarity Indices.

Unit- IV-

- Concept and principles of biodiversity
- Types of biodiversity.
- Measurement of biodiversity.
- Causes for loss of biodiversity
- Biodiversity conservation methods.

Unit- V-

- Present status of wild life in India.
- Values of wildlife: positive and negative.
- Wildlife protection Act.
- Conservation of wildlife in India.

- Endangered and threatened species.
- National Parks and Sanctuaries.
- Project Tiger.
- Project Gir Lion and Crocodile Breeding project.
- Wildlife in Bihar with reference to Reptiles, Birds and Mammals.

Suggested Reading Materials:

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. Sokal R.R. and F.J. Rohiff: Biometry-Freeman, San-Francisco.
7. V. B. Saharia: Wildlife in India
8. S. K. Tiwari: Wildlife in central India
9. R. K. Tandon: Biodiversity, Taxonomy & Ecology
10. M. P. Arora: An Introduction to prevantology
11. P. C. Kotwal: Biodiversity and conservation
12. Dasman: Wildlife Biology
13. Rajesh Gopal: Wildlife in India
14. Fitter: Wildlife and man

M.Sc. Zoology
First Semester
Paper-II

Paper code: - Zoo 512

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (one from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (one from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper-II of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Structure and Function of Invertebrates. (Total Credits – 06)

Unit- I-

- Origin of Metazoa
- Reproduction in Protozoa.
- Systematic position of sponges;
- Origin and organization of coelom: Pseudocoelom, Haemocoelom and Eucoelom.

Unit- II-

- Hydrostatic movement in coelenterates and echinoderms;
- Polymorphism in coelenterates
- Ctenophora :- General account and affinities.
- Filter feeding in polychaetes and molluscs.

Unit- III-

- Respiration: Respiratory organs, Respiratory pigments
- Mechanism of respiration in Arthropoda and Mollusca.
- Excretion and Osmoregulation:
 - a) Osmoregulation in Protozoa
 - b) Excretion in Annelida.

Unit- IV-

- Nervous System:
 - (i) Annelida
 - (ii) Mollusca
- Larval forms and their evolutionary significance:
 - (a) Trematoda and Cestoda
 - (b) Crustacea
 - (c) Echinodermata.

Unit- V-

Organization and affinities of the following minor phyla:-

- (a) Rotifera
- (b) Entoprocta
- (c) Phoronida
- (d) Ectoprota

Suggested Reading Materials:

1. Hyman, L.H.: The invertebrates, Nol.I. Protozoa through Ctenophora, McGraw Hill Co., New Delhi
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 higher invertebrates the Macmillan Co. Ltd London.
8. Hyman L.H. The invertebrates smaller coelomate groups Vol. V, Mc.Graw Hill Co. New York.
9. Read C.P. Animal 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, Vol-I, Macmillan Co. London.
12. Potts and Borraidaile. Invertebrates.

M.Sc. Zoology
First Semester
Paper-III

Paper code: - Zoo 513

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (One from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (One from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper-III of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Structure and functions of Vertebrates (Total Credits – 05)

Unit- I-

- Origin of chordates
- Development, structure and functions of integument and their derivatives (glands, scales, feathers and hairs)
- Comparative account of respiratory organs.
- Comparative account of digestive organs.

Unit- II-

- Evolution of heart.
- Evolution of aortic arches and portal systems.
- Blood circulation in various vertebrate groups.
- Comparative account of jaw suspensorium and vertebral column.

Unit-III-

- Evolution of urinogenital system.
- Comparative anatomy of brain.
- Comparative account of peripheral and autonomous nervous system.

Unit-IV-

- Lateral line system in fishes.
- Electroreception in fish.
- Flight adaptations in Birds.
- Aquatic adaptations in Cetacea and Sirenia.

Unit-V-

- Origin, Evolution, General organization and affinities of Rhynchocephalia.
- General account of
 - a) Dipnoi
 - b) Crossopterygii.

Suggested Reading Materials:

1. Carter G. S.: Structure and habit in vertebrates 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 Press Pvt. Ltd. New Delhi.
5. Milton & Lindergrand.: 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.: Bioogy of vertebrates, MacMillan & Co. New York.
9. Romer, A. S.: Vertebrate Body, 3rd Ed. Saunders Co., Philadelphia.
10. Young J. Z.: Life of vertebrates. The Oxford University Press London.
11. Parker & Haswell: Vol-II Rev. by Marshall Willians lastested Macmilan 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 Ed. McGraw Hill Book Co. New York.

M.Sc. Zoology
First Semester
Paper-IV (Practical)

Paper code :- Zoo 514

Time:- 4 hours

Full Marks- 50

(Total Credits – 04)

- | | |
|---|-----------|
| 1. Bionomics and systematic position of the specimens provided | 05 |
| 2. Histological preparation of the sections (tissues) provided. | 10 |
| 3. Identify and Comment upon spots 1 – 10 | 10x2 = 20 |
| (i) One slide from lower invertebrates. | |
| (ii) One slide from higher invertebrates. | |
| (iii) One embryological slide from Amphibia and Chick. | |
| (iv) One Histological slide from Amphibia and mammal. | |
| (v) One slide from mammalian endocrine glands. | |
| (vi) One cytological slide | |
| (vii) One disarticulated skull bone. | |
| (viii) One bone from girdle/limbs of vertebrate (Amiphibia to mammal) | |
| (ix) One invertebrate museum specimen. | |
| (x) One vertebrate museum specimen. | |
| 4. Class Record | 05 |
| 5. Viva – voce | 10 |

**M.Sc. Zoology
Second Semester
Paper-V**

Paper code: - Zoo 521

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (One from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (One from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper-V of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Quantitative Biology, Ecology and Animal Behaviour (Total Credits – 05)

Unit- I-

- Distribution of the data in biology- Mean, Mode and Median.
- Standard Deviation and Standard Error of Mean
- Probability Distribution: Normal, Binomial and Poisson Distribution
- “t” test and Chi-Square test.

Unit- II-

- Analysis of variance. (ANOVA)
- Correlation – types of correlation.
- Coefficient of correlation.
- Regression.

Unit- III-

- Limiting factors with reference to Liebig’s and Shelford law.
- Food-chain, Food web and Ecological pyramids.
- Energy flow.
- Ecosystem- Freshwater and Terrestrial
- Bio-geo-chemical cycles (Nitrogen, Sulphur and Phosphorus cycle).

Unit- IV-

- Population and their characters
- Life tables.
- Population growth
- Population regulation- Extrinsic and Intrinsic
- Air and water pollution- Causative agents and hazards to human health.

Unit- V-

- Basic concept of Ethology
- Reflexes and complex behavior.
- Innate and learned Behaviour
- Ecological Aspects of behavior: Habitat selection, Food selection, optimal foraging theory, aggression, Homing and Territorial.
- Biological rhythms: Circadian and Circannual.
- Hormonal control of Behaviour.

Suggested Reading Materials:

1. Bataschelet, E.: Introduction to mathematics for site scientist. Springer & Verlag, Berlin
2. Jorgenserr, S. E.: Fundamental of Ecological modeling E. Sevier New York
3. Lenderen D.: Modelling in behavioural ecology, Chapman & Hall London U.K.
4. Sokal, R. R. and F. J. Rohit: Biometry Freeman San Francisco
5. Snecdor, G. W. and W. G. Cochran: Statistical Methods, Affiliated East, West Press New Delhi (Indian Ed.)
6. Murry, J. D.: Mathematical Biology, Springer Verlag Berlin
7. Pelon, E. C.: The interpretation of ecological data
8. Lewis A.: Biostatistics
9. K. Mahajan: Methods in Biostatistics
10. Odum: Elements of Ecology

**M.Sc. Zoology
Second Semester
Paper-VI**

Paper code: - Zoo 522

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (One from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (One from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper-VI of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Biochemistry, Physiology and Endocrinology (Total Credits- 06)

Unit- I-

- Bio-synthesis of Amino acids
- Bio-synthesis of fatty acids
- Carbohydrate metabolism: HMP shunt and TCA cycle
- β -oxidation of fatty acids.

Unit- II-

- Enzyme – Classification, kinetics and mechanism of action.
- Oxidative phosphorylation
- Protein folding – Formation of native (Biologically functional) proteins and their denaturation.
- Vitamins – Types, sources and functions.

Unit-III-

- Respiratory pigments
- Transport of oxygen and carbon dioxide in blood.
- Physiology of nerve conduction.
- Physiology of Muscle contraction.

Unit-IV-

- Pheromones and their roles.
- Bioluminescence
- Phonoreception and Photoreception
- Thermoregulation in poikilotherms and homeotherms.

Unit-V-

- Hormones – Definition, chemical nature and functions.
- Mechanism of Hormone action.
- Hormone- Receptor signal transduction mechanism.
- Hormones and Reproduction
 - Seasonal breeders
 - Continuous breeders.

Suggested Reading Materials:-

1. EJW Barrington : General & Comparative Endocrinology – Oxford Press, W.B.Saunders's
2. C. R. Martin: Endocrine Physiology – Oxford University Press

3. Hadley : Endocrinology
4. Cohn & Stumpf: Biochemistry
5. Chaterjee C.C.: Animal Physiology, Vol-I & II
6. Lehninger: Principles of Biochemistry.
7. Turner: Comparative Endocrinology
8. Giese, A.: Cell Physiology
9. Gorbman: Comparative Endocrinology
10. Harper's Review of Physiological Chemistry
11. Sampson & Wright: Medical Physiology

M.Sc. Zoology

Second Semester

Paper-VII

Paper code: - Zoo 523

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (One from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (One from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper-VII of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Instrumentation and Techniques (Total Credits- 05)

Unit- I-

- Microscopy: Principles and Applications
- Electron microscope: SEM, TEM
- Fluorescence microscopy.
- X-ray Diffraction

Unit- II-

- General Principle and applications of:
 - Spectrophotometry.
 - Ultra centrifugation.
 - Flame photometry
- Culture techniques.
 - Media Preparation and sterilization
 - Cell culture

Unit- III-

- Computer aided techniques for data presentation, data analysis and statistical techniques.
- Cryotechniques: Cryopreservation of cells, tissues, organs and organisms.
- Organ ablation (Ovariectomy, adrenalectomy)
- Amniocentosis

Unit- IV-

- Separation techniques:
 - I. Chromatography - Principle, type and applications.
 - II. Electrophoresis: Principles and applications
 - SDS PAGE
 - Agarose gel electrophoresis.

Unit- V-

- Histological and Histochemical techniques.
 - Concepts of fixation, Microtomy and Staining.
 - Histochemical detection of carbohydrates by PAS technique.
 - Histochemical detection of proteins by Millon's reaction.
 - Histochemical detection of bound lipids by Sudan black B method.
 - Feulgen reaction for histochemical demonstration of DNA.
 - Histochemical detection of acid and alkaline phosphatases.

Suggested Reading Materials:-

1. Introduction to instrumental analysis – Robert Braun – McGraw Hill
2. 2A 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 Walker: Practical Biochemistry, Cambridge, 2000
8. Cooper: The Cel – A Molecular Approach. ASM, 1997
9. John R. W. Masters: Animal Cell culture – A practical approach, IRI, Press
10. Robert Braun: Introduction to instrumental analysis, McGraw Hill
11. A.G.E. Pearse: Principles of Histochemistry, Vol-I & II

M.Sc. Zoology
First Semester
Paper-VIII (Practical)
(Total Credits- 04)

Paper code: - Zoo 524

Time:- 4 hours

Full Marks- 50

- | | |
|--|----|
| 1. Enumeration of R.B.C./W.B.C. in the blood sample provided. | 05 |
| Or | |
| Estimation of Haemoglobin content in the blood sample provided. | |
| 2. Demonstration of carbohydrates by PAS technique in the sections provided. | 10 |
| Or | |
| Demonstration of proteins by Millon's Reagent/ Mercury bromophenol blue | |
| 3. Demonstration of bound lipids by Sudan black B in the sections provided. | 10 |
| 4. Determination of standard deviation or standard error of Mean of the data provided. | 10 |
| 6. Class Record | 05 |
| 7. Viva – voce | 10 |

**M.Sc. Zoology
Third Semester**

Paper-IX

Paper code: - Zoo 531

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (One from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (One from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper-IX of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Cell Biology (Total Credits – 06)

Unit- I-

- **Plasma membrane**
 - Molecular organization
 - Molecular models with special reference to Fluid Mosaic Model and its modifications.
 - Modifications of Plasma Membrane.
 - Membrane transport (Diffusion, Passive transport, Active transport Exocytosis & Endocytosis).
- Endoplasmic Reticulum: Molecular organization and functions.
- Molecular organization and functions of 80 S Ribosomes.

Unit- II-

- **Golgi complex** : Structure, chemical composition and functions.
- **Mitochondria:**
 - I. Ultra structure
 - II. Organization of respiratory chain complex.
- **Cytoskelton:** Microtubules, Actin filaments and Intermediate filaments.
- **Kinesin and Dynein:** Role in intra-cellular transport.

Unit- III-

- **Nuclear envelope:** Structure and molecular organization.
- **Chromosome**
 - I. Morphology
 - II. Single- stranded and Multi-stranded hypotheses.
 - III. Molecular structure of chromosome (Nucleosome model)
- Nucleo-cytoplasmic transport

Unit- IV-

- Structure of DNA
- Structure of RNA
- Replication of DNA
- DNA and RNA polymerases

Unit- V-

- Mitotic apparatus.
- Cytological characters of ageing cells and theories of aging.
- Cancer- Types, carcinogens, oncogenes and human tumor viruses
- Programmed cell death / Apoptosis.
- **Stem cell:** Basic concept and applications.

Suggested Reading Materials:

1. Freifelder, D. Essentials of Molecular Biology
2. De, Robertis: Cell Biology
3. Styrer: Cell and Molecular Biology
4. Cohn: Elements of Cytology
5. Barnel. J. Lodish H. and Baltimore D.: Molecular Cell Biology. Scientific American Book, Inc. USA
6. Alberts, B. Bray D. Lewis. J. Raff M., Roberts K., and Watson, J.D.: Molecular Biology of the Cell Garland Publishing Inc. N.Y.
7. Watson, J. D.: Hopkins, N. H., Roberts, J.W., Steitz, J. A. and Weiner, A.M. Molecular Biology of the Gene The Benjamin / Cumming Publishing Co., Inc, California.
8. Meyers R.A.: Molecular Biology and Biotechnology, VCH Pub., N.Y.
9. Sambrook. J.: Fritsch E.F. and Maniatis. T. Molecular Cloning. Cold Spring Harbor Laboratory Press, N.Y.
10. Dabre, P.D.: Introduction to Practical Molecular Biology, John Wiley & Sons. Ltd., N.Y.
11. DeRobertis and DeRobertis: Cell and Molecular Biology. Lee & Febiger, Philadelphia. Giese. Cell Physiology. W.B. Saunders.
12. Lewin, A,: Genes
13. Ambrose, A. : Cell Biology

**M.Sc. Zoology
Third Semester**

Paper-X

Paper code: - Zoo 532

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (One from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (One from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper-X of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Molecular Biology (Total Credits- 05)

Unit- I-

- Structure of nucleotides
- Concept of Mitochondrial DNA
- Chromosomal DNA and its packaging in chromatin fibre.
- Chromosomal proteins and their functions
- Heterochromatin.

Unit- II-

- Genome and genomic size in eukaryotes
- C-value paradox and repetitive DNA sequence
- Split genes, overlapping genes, pseudo genes, retro genes and cryptic genes.

Unit- III-

- DNA sequencing: (a) Maxam & Gilbert method (b) Sanger's Dideoxy method.
- Protein sequencing: (a) Dabsyl chloride method (b) Edman's Degradation method
- Import of proteins into Endoplasmic reticulum
- ER-associated protein degradation
- Transport of proteins into mitochondria.

Unit- IV-

- Biosynthetic secretory pathways
- Protein sorting and vesicular traffic from ER to Golgi and Golgi to cell surface.
- Molecular basis of gene expression in Prokaryotes.
- Molecular basis of gene expression in eukaryotes.

Unit- V-

- Blotting techniques
 - Southern blot
 - Northern blot
 - Western blot
- Enzyme-linked Immuno-sorbent Assay (ELISA).
- Polymerase Chain Reaction (PCR).
- DNA damage and repair mechanisms.

Suggested Reading Materials:

1. Freifelder, D. Essentials of Molecular Biology
2. De, Robertis: Cell Biology
3. Styrer: Cell and Molecular Biology
4. Cohn: Elements of Cytology
5. Barnel. J. Lodish H. and Baltimore D.: Molecular Cell Biology. Scientific American Book, Inc. USA
6. Alberts, B. Bray D. Lewis. J. Raff M., Roberts K., and Watson, J.D.: Molecular Biology of the Cell Garland Publishing Inc. N.Y.
7. Watson, J. D.: Hopkins, N. H., Roberts, J.W., Steitz, J. A. and Weiner, A.M. Molecular Biology of the Gene The Benjamin / Cumming Publishing Co., Inc, California.
8. Meyers R.A.: Molecular Biology and Biotechnology, VCH Pub., N.Y.
9. Sambrook. J.: Fritsch E.F. and Maniatis. T. Molecular Cloning. Cold Spring Harbor Laboratory Press, N.Y.
10. Dabre, P.D.: Introduction to Practical Molecular Biology, John Wiley & Sons. Ltd., N.Y.
11. DeRobertis and DeRobertis: Cell and Molecular Biology. Lee & Febiger, Philadelphia. Giese. Cell Physiology. W.B. Saunders.
12. Lewin, A,: Genes
13. Ambrose, A. : Cell Biology

M.Sc. Zoology

Third Semester

Paper-XI

Paper code: - Zoo 533

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (one from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (one from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper–XI of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Genetics and Evolution (Total Credits-05)

Unit- I-

- Linkage and crossing over
- Sex-linked inheritance
- Determination of Sex
- Multiple alleles
- Interaction of genes

Unit- II-

- Variation in chromosome structure.
- Variation in chromosome number
- Extra-chromosomal Inheritance
- Transposable genetic elements.
- Gene mutation

Unit- III-

- Population genetics:
 - a) Hardy-Weinberg Law and its application
 - b) A detailed account of destabilizing forces.
 - I. Natural Selection
 - II. Mutation
 - III. Genetic drift
 - IV. Migration
 - V. Meiotic Drive

- Recombinant DNA techniques.
- Transgenic Animals and their applications.

Unit- IV-

- Origin of life
- Neo-Darwinism
- Synthetic theory of organic evolution
- Patterns of changes in Nucleotide and Amino acid sequence.

Unit- V-

- Micro and macro evolution
- Reproductive isolation and its role in evolution.
- Modes of speciation: Allopatry and Sympatry.
- Barriers to Gene flow
 - i. Pre-zygotic Barriers
 - ii. Post-zygotic Barriers

Suggested Reading Materials:

1. Philop E. Hartman: Gene Action
2. L. C. Dunn: principals of Genetics.
3. A. M. Winchester: genetics
4. L. C. Dunn: genetics and the origin of species.
5. Sinnot, Dunn and Dobjhansky: Principles of Genetics
6. Strick Burger: Genetics
7. Strutevant : Genetics
8. Lull: Organic Evolution
9. A.P.Jha: Genes and Evolution, Oxford Publication Press

M.Sc. Zoology
Third Semester
Paper-XII (Practical)
(Total Credits- 04)

Paper code: - Zoo 534

Time:- 4 hours

Full Marks- 50

- | | |
|---|----|
| 1. Study of cell division in onion root tip cells or grasshopper testes. | 10 |
| 2. Histochemical demonstration of glycogen by Best carmine method in the sections provided. | 10 |
| Or | |
| Histochemical demonstration of Acid mucopolysaccharide by Alcian Blue (p ^H 2.5) method | |
| 3. Smear and Squash preparation of salivary gland chromosome. | 10 |
| 4. Vital staining of Mitochondria | 05 |
| 10. Class Record | 05 |
| 11. Viva – voce | 10 |

M.Sc. Zoology
Fourth Semester
Cell-Biology (Elective Paper)

Paper-XIII

Paper code: - ZOC 541

Cell-organelle and Cell Physiology (Total Credits- 05)

The course contents have been categorized into five units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (one from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (one from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper-XIII of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Unit- I-

1. Plasma membrane
 - a) Membrane Proteins
 - b) Membrane Lipids
 - c) Fluid mosaic model and its modifications
2. Structure and functions of ER.

Unit- II-

1. Mitochondria:
 - a) Ultra structure
 - b) Organization of respiratory chain complex
2. Golgi Complex: Ultra structure and functions
3. Structure and functions of prokaryotic ribosomes.

Unit- III-

1. Mitotic apparatus and its role during cell division.
2. Structure and Molecular organization of nuclear membrane.
3. Nucleolus: Nucleolar organization, Proteome, Cajal Bodies, PML nuclear Bodies.
4. Nucleo-cytoplasmic transport

Unit- IV-

1. Chromosome morphology
2. Molecular structure of chromosome (Nucleosome Model)
3. Lamp brush chromosome
4. Polytene chromosome

Unit- V-

1. Transport of substances across cell membrane: Passive transport, active transport, exocytosis and endocytosis.
2. Bio-synthetic secretory pathway: Protein sorting and vesicular traffic from ER to Golgi, Golgi to Lysosomes and Golgi to cell surface.
3. Transport of proteins into mitochondria.

M.Sc. Zoology
Fourth Semester
Cell-Biology (Elective Paper)

Paper-XIV

Paper code: - ZOC 542

Molecular Cell Biology and Histochemistry (Total Credits-05)

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (One from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (One from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper-XIII of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Unit- I-

1. Chromosomal proteins and their functions.
2. Gene expression in prokaryotes
3. Gene expression in eukaryotes
4. Organization of genetic material: Split genes, overlapping genes, pseudogenes, retrogenes and cryptic genes.

Unit- II-

1. Post translational modifications of proteins
2. Organization of genetic material :
3. Splicing of RNA in eukaryotes :
 - a) Splicing of type I & type II introns (self splicing)
 - b) Splicing of type III introns (Nuclear splicing)
 - c) Alternative splicing
 - d) Trans splicing.

Unit- III-

1. Ageing:
 - a) Definition and characteristics of ageing cells.
 - b) Theories of ageing
 - c) Cytological changes in ageing cells
2. Cancer:
 - a) Cytological characteristics of cancer cells.
 - b) Proto oncogenes
 - c) Oncogenes
 - d) Tumour suppressing genes
3. Stem cells: Definition, basic concept and types

Unit- IV-

1. Blotting techniques :
 - a) Southern Blot
 - b) Northern Blot
 - c) Western Blot

d) ELISA

2. Gene amplification: PCR and its applications.

Unit- V-

1. PAS reaction for histochemical detection of carbohydrates.
2. Millon's reaction for histochemical detection of proteins.
3. Histochemical detection of Alkaline phosphatases.
4. Feulgen reaction for detection of DNA.

**M.Sc. Zoology
Fourth Semester
Cell-Biology (Elective Paper)**

**Paper-XV
Project (Total Credits-06)**

**Paper code: - ZOC 543
Full Marks - 100**

Project work assigned by the teacher concerned

- | | |
|----------------------------------|----------|
| 1. Project Report / Dissertation | 60 Marks |
| 2. Viva – voce | 40 Marks |



M.Sc. Zoology
Fourth Semester
Cell-Biology (Elective Paper)

Paper-XVI

Paper code: - ZOC 544

Practical (Total Credits-04)

Time –4 Hrs.

Full Marks – 50

1. Demonstration of acid mucopolysaccharides in the section provided
Or
Demonstration of glycogen in paraffin sections by Best carmine method 05
2. Histochemical demonstration of Proteins by Millon's reagent or Mercury Bromophenol Blue in the sections provided
Or
Demonstration of Boundlipids by sudan Black b method 05
3. Vital staining of Mitochondria or secretory granules 02
4. Staining and mounting of salivary gland chromosomes 03
5. Identify and comment upon spots 1 – 10 10x2=20

7. Class Record & Collections / Stides / Excursion Report / Models. 05
8. Viva – voce 10

Note: - Paper XVI Containing 100 marks (50 marks ESE Practical+ 50 Marks CIA practical)

M.Sc. Zoology
Fourth Semester
Entomology (Elective Paper)

Paper-XIII

Paper code: - ZOE 541

Taxonomy, Morphology, Physiology and Endocrinology Total Credit-(05)

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (One from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (One from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper–XIII of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Unit- I-

1. Salient Features and Outline Classification of Class Insecta and its Subdivisions (Apterygotes, Hemiptera, Diptera and Lepidoptera)
2. Structure, Sclerotization & Moulting of Integument and their modifications and functions
3. Structure, Variation and Modification of Wings, Flight Muscles and Mechanism of Flight & Migration

Unit-II

1. Structure, Types and Functions of Antenna
2. Orientation, Motor Learning and Learning Behaviour by Experience
3. Origin and Evolution of Insects

Unit-III

1. Modification of Alimentary Canal in relation to Food, Physiology of Digestion and Role of Microorganism in Digestion of Food.
2. Excretion: Organs of Excretion, Nitrogen Excretion and Salt & Water Regulation.
3. Terrestrial, Aquatic and Endoparasitic Respiration

Unit-IV

1. Sound Production
2. Light Production
3. Constituents and Functions of Haemolymph Circulation, Heart and Accessory Pulsatile Organs
4. Peripheral and Visceral Nervous System and Mechano – and Chemo – Reception

Unit-V

1. Types of Reproduction, Accessory Organs Regeneration, Oviposition and Factors controlling Fecundity & Fertility
2. Early Embryonic Development up to Blastokinesis and Post – Embryonic Development (Metamorphosis & Diapause)
3. Endocrine Glands and Concept of Neurosecretion, Chemical Nature and Function of Brain Hormones (Ecdysone & Juvenile Hormones) and Kinds & Functions of Pheromones.

Suggested Reading Materials:

Books Recommended :

1. Anantha Krishna: Dimensions of Insect – Plant Interactions, Oxford NIBH
2. Atwal: Agriculture Pests of India and South – East Asia, Kalyani Publishers, New Delhi
3. Chapman: The Insect Structure and Function, ELBS
4. Imms: A General Text Book of Entomology Vol. I–II, Asia Publishing House
5. Metcalf & Flint: Destructive and Useful Insects and their Control, McGrawhill
6. Pruthi: A Text Book of Applied Entomology, ICAR, New Delhi
7. Rockstein: Biochemistry of Insects, Academic Press
8. Sricastava: A Text Book of Applied Entomology Vol. I – II, Kalyani Publishers, New Delhi
9. Wiggelworth: Principles of Insect Physiology, ELBS
10. Ayyar: Hand Book of Economic Entomology for South India, Controller of Stationary & Printing, Govt. of Madras.
11. Roy: Entomology: Medical Veterinary, Excelsior Press and Brown, AWA, Calcutta

M.Sc. Zoology
Fourth Semester
Entomology (Elective Paper)

Paper-XIV

Paper code: - ZOE 542

Agricultural, Veterinary, Medical & Industrial Entomology (Total Credit-05)

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (one from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (one from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper-XIV of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Unit- I-

1. Types, Merits and Demerits of Insect Control, Sterilization by Chemical Radiation
2. Hormonal Control
3. Types, Formulation & Hazards of Insecticides, Precaution and Antidotes
4. Chemical Nature, Preparations, Toxicity and Mode of Action of Chlorinated Hydrocarbons, Organophosphorous Compounds, Carbamates and Insecticides of Botanical Origin

Unit- II-

1. Principles of Fumigation and Precaution in handling Fumigants
2. Chemical Nature, Toxins and Mode of Action
3. Attractants, Repellents and Antifeedants
4. Insecticide Appliances

Unit- III-

1. Major Pests of Paddy, Wheat, Maize & Sugarcane and their Life History and Control
2. Major Pests of Stored Grains, Vegetables and Tropical Fruits and their Life History and Control

Unit- IV-

1. Veterinary Entomology-Pests of Farm Animals
2. Medical Entomology – Pests of Public Health Importance
3. Insect – borne Diseases: Vector Borne Diseases, Pathogens and Control

Unit- V-

1. Industrial Entomology – Sericulture
2. Industrial Entomology – Apiculture
3. Status of Aqua Culture in India

Suggested Reading Materials:

1. Anantha Krishna: Dimensions of Insect – Plant Interactions, Oxford NIBH
2. Atwal: Agriculture Pests of India and South – East Asia, Kalyani Publishers, New Delhi

3. Chapman: The Insect Structure and Function, ELBS
4. Imms: A General Text Book of Entomology Vol. I–II, Asia Publishing House
5. Metcalf & Flint: Destructive and Useful Insects and their Control, McGrawhill
6. Pruthi: A Text Book of Applied Entomology, ICAR, New Delhi
7. Rockstein: Biochemistry of Insects, Academic Press
8. Sricastava: A Text Book of Applied Entomology Vol. I – II, Kalyani Publishers, New Delhi
9. Wigglesworth: Principles of Insect Physiology, ELBS
10. Ayyar: Hand Book of Economic Entomology for South India, Controller of Stationary & Printing, Govt. of Madras.

**M.Sc. Zoology
Fourth Semester
Entomology (Elective Paper)**

**Paper-XV
Project (Total Credits-06)**

**Paper code: - ZOE 543
Full Marks - 100**

Project work assigned by the teacher concerned

- | | |
|----------------------------------|----------|
| 1. Project Report / Dissertation | 60 Marks |
| 2. Viva – voce | 40 Marks |



M.Sc. Zoology
Fourth Semester
Entomology (Elective Paper)

Paper-XVI

Paper code: - ZOE 544

Practical (Total Credits-04)

Time : 4 Hours

Full Marks: 50

1. To draw the Diagram and comment on the Digestive, Nervous and Reproductive System of Grasshopper/
Chrysocoris/ Gryllotalpa/ Honey bee 05
2. Identify and comments upon spots 1 to 10 Out of the following:- 2X10= 20
 - a) Whole Specimen (Small Insects)
 - b) Mouth Parts
 - c) Wings
 - d) Legs
 - e) Antenna
 - f) External Genitalia
 - g) Poison Apparatus
 - h) Spiracles
 - i) Scales
 - j) Different Tissues
 - k) Whole Mount
 - l) Morphological Slides
 - m) Histological Slides
 - n) Embryological Slides
 - o) Beneficial Insect
 - p) Damaged Material by a pest
 - q) Larva / Pupa
 - r) Pests
3. Physiology / Toxicology 05
 - (a) To Determine the oxygen requirement of aquatic insects
 - (b) To Determine LC₅₀ of a common pesticide against a stored grain pest
 - (c) Study of Blood Cells
4. Taxonomy, Identification with reasons upto family of two insects 05
5. Field Works and Records 05
7. Viva – voce 10

Note: - Paper XVI Containing 100 marks (50 marks ESE Practical+ 50 Marks CIA practical)

M.Sc. Zoology
Fourth Semester
Fish & Fisheries (Elective Paper)

Paper-XIII

Paper code: - ZOF 541

Taxonomy, Structure, Physiology and Diseases. Total Credit-(05)

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (One from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (One from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper–XIII of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Unit- I-

1. Classification of Fishes.
2. Origin and Evolution of Fishes.
3. Structure and Affinities of Holocephali
4. Dipnoi : Distribution , Structure and affinities.

Unit-II

1. Skin of Fishes
2. Colouration in Fishes.
3. Air Bladder in Fishes
4. Weberian Ossicles
5. Lateral line system

Unit-III

4. Osmo-regulation in Fish
5. Digestion in fish
6. Respiration in Fish
7. Reproduction in Fish
8. Structure and Functions of endocrine glands of fishes.

Unit-IV

1. Electric Organs in Fish
2. Migration in Fish.
3. Deep Sea adaptation.
4. Parental care in Fishes
5. Hill Stream fishes

Unit-V

Fish Diseases & their control:

- Fungal diseases
- Bacterial diseases
- Protozoan diseases..
- Helminthic diseases.
- Pollutant caused diseases.

Suggested Reading Materials:

1. C.B.I. Shrivastava: Fishes of India

2. Jhingaran: Fish and Fisheries of India
3. S.S. Khanna: An Introduction of Fishes
4. R.S. Rath: Fresh water Aquaculture
5. Gopalji Shrivastava: Fishes of U.P. & Bihar
6. H. D. Kumar: Sustainability & Management of Aquaculture & Fisheries
7. A.J.K. Mainan : Identification of Fishes
8. R. Sanatam: A Manual of Fresh water Aquaculture
9. S. K. Gupta: Fish & Fisheries
10. P.D. Pandey: Fish & Fisheries
11. K. P. Viswas: Fish & Fisheries
12. Pandey & Shukla: Fish & Fisheries
13. Santosh Kumar & Manju Tembhre: Anatomy and Physiology of Fishes.

M.Sc. Zoology
Fourth Semester
Fish & Fisheries (Elective Paper)

Paper-XIV

Paper code: - ZOF 542

Habitats, Capture and Culture fisheries, Processing and preservation. (Total Credit-05)

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (one from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (one from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper-XIV of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Unit- I-

1. Riverine, Fisheries of India
2. Cold water Fishery
3. Estuarine Fishery
4. Reservoir Fishery
5. Sewage fed Fisheries.

Unit- II-

1. Fish Farming
 - A) Pond culture
 - B) Composite fish farming
 - C) Paddy field fish culture
 - D) Air- breathing fish culture

Unit- III-

1. Hill stream fishes
2. Induced breeding
3. Pearl Culture
4. Fresh Water Prawn culture

Unit- IV-

1. Principle Marine fisheries of India
2. Fish migration
3. Mating and parental care in fishes
4. Larvicidal fishes: Indigenous and Exotic.

Unit- V-

4. Fish Preservation.
5. Fish Byproducts and their export potentials.
6. Fishing craft and Gears
7. Determination of age in Fishes
8. Status of Aqua Culture in India

Suggested Reading Materials:

1. C.B.I. Shrivastava: Fishes of India

2. Jhingaran: Fish and Fisheries of India
3. S.S. Khanna: An Introduction of Fishes
4. R.S. Rath: Fresh water Aquaculture
5. Gopalji Shrivastava: Fishes of U.P. & Bihar
6. H. D. Kumar: Sustainability & Management of Aquaculture & Fisheries
7. A.J.K. Mainan : Identification of Fishes
8. R. Sanatam: A Manual of Fresh water Aquaculture
9. S. K. Gupta: Fish & Fisheries
10. P.D. Pandey: Fish & Fisheries
11. K. P. Viswas: Fish & Fisheries
12. Pandey & Sukla: Fish & Fisheries
13. Santosh Kumar & Manju Tembhre: Anatomy and Physiology of Fishes.

**M.Sc. Zoology
Fourth Semester
Fish & Fisheries (Elective Paper)**

**Paper-XV
Project (Total Credits-06)**

**Paper code: - ZOF 543
Full Marks - 100**

Project work assigned by the teacher concerned

- | | |
|----------------------------------|----------|
| 3. Project Report / Dissertation | 60 Marks |
| 4. Viva – voce | 40 Marks |



M.Sc. Zoology
Fourth Semester
Fish & Fisheries (Elective Paper)

Paper-XVI

Paper code: - ZOF 544

Practical (Total Credits-04)

Time : 4 Hours

Full Marks: 50

1. Dissection
Major 10
(Cranial Nerves, Internal Ear, Afferent and Efferent Blood Vessels of Bony Fish)
Or
Minor
(Weberian Apparatus, Accessory Respiratory Organs)

2. Identification and comments of Spots 1 – 10 15
 - a) Bones 04
 - b) Histological Slides 04
 - c) Museum Specimen 02

3. Identification of one local fresh water fish with Morphometric measurement upto species. 05

4. Any one of the following 05
 - a) To determine O₂ requirement of fish
 - b) Physio – Chemical analysis of water for –
 - i) Dissolved O₂
 - ii) Dissolved CO₂
 - iii) pH.
 - c) Identification Planktons.

5. Class Records. 05

6. Viva – voce 10

Note: - Paper XVI Containing 100 marks (50 marks ESE Practical+ 50 Marks CIA practical)

M.Sc. Zoology
Fourth Semester
Helminthology (Elective Paper)

Paper-XIII

Paper code: - ZOH 541

Taxonomy, Morphology, Biochemistry and Physiology (Total Credits- 05)

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (One from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (One from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper-XIII of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Unit- I-

1. Parasitism: Concept, Origin and other considerations.
2. Platyhelminthes : Classification
3. Nematoda: Classification
4. Acanthocephala : Classification

Unit- II-

1. Life cycle : Morphology, Life cycle and Pathogenicity of :
 - a) Wuchereria
 - b) Dracunculus
 - c) Moniliformes
 - d) Echinococcus
 - e) Schistosoma

Unit- III-

1. Scolex in tapeworms
2. Pharynx in Nematodes.
3. Larval forms of Digenea
4. Larval Forms of Cestoda

Unit- IV-

1. Tegument in Platyhelminthes
2. Egg-Shell: Its chemical composition & formation.
3. Carbohydrate metabolism in Fasciola, Echinococcus and Ascaris.

Unit- V-

1. Neurosecretion and Regulatory peptides.
2. Nutritional mechanism in parasitic helminthes.
3. Physiology of transmission of helminthic infections.

Suggested Reading Materials:

1. J D Smyth: Introduction to Animal Parasitology.
2. A C Chandler : Parasitology.
3. T C Chang : General Parasitology.
4. Soulsty: Parasitology : Arthropoda & Helinths.
5. Noble & Noble : Biology of Animal parasites.
6. Dogiel, UA : General Parasitology.

M.Sc. Zoology
Fourth Semester
Helminthology (Elective Paper)

Paper-XIV

Paper code: - ZOH 542

Host-Parasite relationship, Epidemiology, Immunology, Applied Helminthology and Laboratory Techniques. (Total Credits- 5)

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (One from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (One from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper-XIV of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Unit- I-

1. Host – parasite relationships:
 - (a) Activities of parasites in the host.
 - (b) Effects of parasites in the host.
 - (c) Host Specificity : Basic concepts & explanation

Unit- II-

1. Basic principles of Epidemiology
2. Determinants of disease (etiological factors)
3. Disease control strategies and programmes.

Unit- III-

1. Immunity : Basic concept and mechanism of adaptive immune responses.
2. Parasitic antigens and their immunological responses in host – parasite systems:
 - (a) Schistosomes (b) Cestoda (c) Nematodes
3. ADCC, Cytotoxicity.

Unit- IV-

1. Diagnosis of some important Helminthic diseases of man.
2. Prophylaxis of some important Helminthic diseases of man.
3. Helminthic Diseases in Fishes.
4. Anthelmintics.

Unit- V-

1. Fixation and staining techniques of helminths
2. Histochemical techniques of lipid, protein and carbohydrates in parasitic helminthes
3. Flotation technique for Egg count.
4. Baerman's technique for detection of ova/larvae in faeces/soil.

Suggested Reading Materials:

1. Belding : ATB of Parasitology.
2. Craig & Faust : ATB of Parasitology.
3. Chatterjee : Medical Parasitology.
4. Rogers : Parasite & Parasitise.
5. Laboratory Manual of Parasitology.

M.Sc. Zoology
Fourth Semester
Helminthology (Elective Paper)
Paper-XV
Project (Total Credits-06)

Paper code: - ZOH 543
Full Marks - 100

Project work assigned by the teacher concerned

- | | |
|----------------------------------|----------|
| 5. Project Report / Dissertation | 60 Marks |
| 6. Viva – voce | 40 Marks |



M.Sc. Zoology
Fourth Semester
Helminthology (Elective Paper)

Paper-XVI

Paper code: - ZOC 544

Practical (Total Credits-04)

Time –4 Hrs.

Full Marks – 50

1. Examination of host for recovery & identification of helminth parasites. 10
 2. Demonstration of acid mucopolysaccharides in the section provided
- Or
- Demonstration of glycogen in paraffin sections by Best carmine method 05
 3. Histochemical demonstration of Proteins by Millon's reagent or Mercury Bromophenol Blue in the sections provided
 4. Identify and comment upon spots 1 – 10 10x2=20
-
6. Class Record & Collections 05
 7. Viva – voce 10

Note: - Paper XVI Containing 100 marks (50 marks ESE Practical+ 50 Marks CIA practical)

M.Sc. Zoology
Fourth Semester
GERONTOLOGY (Elective Paper)

Paper-XIII

Paper code: - ZOG 541

INTRODUCTORY & BIOLOGICAL AGEING (Total Credit- 05)

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (one from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five questions (one from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper-XIII of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Unit I

1. Definition, Nature and Scope of Gerontology
2. Ageing and Senescence – Properties and Differences
3. General Concept of Life Stages, longevity and Life Expectancy.
4. Chronological, Biological and Psychological Ages

Unit II

1. Evolutionary Significance of Ageing and Ecological Implications
2. Dimensions of Ageing – Biological, Clinical and Psychosocial
3. Greying of Nations – recent trends and future demographic projections.
4. Impelling causes of age quake.

Unit III

1. Ageing Pattern in pre-mitotic, Post-Mitotic & Hybrid Cell
2. Apoptosis – Mechanism and Regulation
3. Error and Programme Theories of Ageing
4. Biomarkers of ageing

UNIT IV

1. Common Age-induced Perturbations.
2. Influence of Andropause on Sexuality
3. Influence of Menopause on Sexuality
4. Homeostatic imbalances in late age

UNIT V

1. Laboratory Models in Ageing Research
2. Stem cell and its geriatric applications
3. Therapeutic Role of Anti- ageing Agents
4. Cancer and ageing.

M.Sc. Zoology
Fourth Semester
GERONTOLOGY (Elective Paper)

Paper-XIV

Paper code: - ZOG 542

CLINICAL & PSYCHOLOGICAL AGEING (Total Credits-05)

The course contents have been categorized into V units. The questions will be set in 3 parts (Part A, B and C). Part A shall have Ten (10) Objective questions (two from each unit), each of 2 marks. Part B shall have 5 short answer questions (One from each unit), out of which a student shall have to attempt 4 questions. Each short answer question shall carry 5 marks. Part C shall have Five set questions (One from each unit) of long answer type, out of which a student shall be required to answer three (3) questions, each of 10 marks. Thus paper-XIV of 100 marks shall have 30 marks for CIA and 70 marks for ESE.

Unit I

1. Obesity Indices and hazards of Obesity
2. Hypertension- Genesis, Types and Management
3. Diabetes - Genesis, Types and Management
4. Arthritis - Genesis, Types and Management

Unit II

1. Cataract – Cause, effect and Treatment
2. Sleep Disturbances in Late Age
3. Osteoporosis- Clinical manifestations and Management
4. Benign prostatic hyperplasia – Major risk factor and management.

Unit III

1. Alzheimer's Disease
2. Parkinson's Disease
3. Werner's Syndrome
4. Depression and elderly

Unit IV

1. Impact of Familial and Societal Changes on Elderly Living
2. Problems of Single Elderly
3. Old Age Homes – Merits and Demerits
4. Care Providers for Elderly – Attributes and Societal Relevance

Unit V

1. Psychobiology of Death and Death Psychosis among Elderly
2. Effect of Bereavement upon the Psyche of Elderly
3. Constitutional Provisions for Elderly in India
4. National Policies and programmes for senior citizens

M.Sc. Zoology
Fourth Semester
GERONTOLOGY (Elective Paper)

Paper-XVI

Paper code: - ZOG 544

Practical (Total Credits-04)

Time –4 Hrs.

Full Marks – 50

1. To comment on age-associated changes in body organ/system of a mammal 10
2. To demonstrate presence of lipofuscin in the ageing brain /glycogen in the liver of mammal using suitable histochemical technique and comment on age correlation 10

or

To determine Haematocrit/Haemoglobin/ Sugar in the blood sample provided and comment on age correlation

3. To determine Body Mass Index with the measured values of Height and Weight and comment on its biomedical significance 05
4. To identify and comment on age correlation of the Slides/ Charts/Models provided 1-10 10
5. Class Record 05
6. Viva-Voce 10

M.Sc. Zoology
Fourth Semester
GERONTOLOGY (Elective Paper)

Paper-XV

Project (Total Credits-06)

Paper code: - ZOH 543

Full Marks - 100

Project Work assigned by the teacher concerned

- | | |
|---------------------------------|----------|
| 1. Project Report /Dissertation | 40 Marks |
| 2. Viva-Voce | 30 Marks |