	DEPARTMENT OF ZOOLOGY **GOVT. N.P.G. COLLEGE OF SCIENCE, RAIPUR** **M. Sc. ZOOLOGY**					
FIRST July Dec. 2019	**Paper**	**Title of Paper**	**Theory**	**Test**	**Cradit**	**Total**
	I	**Biosystematics and Taxonomy**	**80**	**20**	**4**	**100**
	II	**Structure and function of Invertebrates**	**80**	**20**	**4**	**100**
	III	**Quantitative Biology (Computer and Biostatistics)**	**80**	**20**	**4**	**100**
	IV	**Methods and Techniques in Zoology**	**80**	**20**	**4**	**100**
	LC-I	**Lab Course I (Based on paper I & II)**	**-**	**-**	**2**	**100**
	LC-II	**Lab Course II (Based on paper III & IV)**	**-**	**-**	**2**	**100**
	Total				**20**	**600**
SECOND Jan-June 2020	**Paper No.**	**Title of Paper**	**Theory**	**Seminar**		**Marks**
	I	**Comparative anatomy of Vertebrates**	**80**	**20**	**4**	**100**
	II	**Physiology of Vertebrates**	**80**	**20**	**4**	**100**
	III	**Molecular Cell Biology**	**80**	**20**	**4**	**100**
	IV	**Population genetics and Evolution**	**80**	**20**	**4**	**100**
	LC-I	**Lab Course I (Based on paper I & II)**			**2**	**100**
	LC-II	**Lab Course II (Based on paper III & IV)**			**2**	**100**
	Total				**20**	**600**
THIRD July-Dec. 2020	**Paper No.**	**Title of Paper**	**Theory**	**Test**		**Marks**
	I	**Developmental Biology**	**80**	**20**	**4**	**100**
	II	**Animal Behaviour and Population Ecology**	**80**	**20**	**4**	**100**
	III	**Limnology**	**80**	**20**	**4**	**100**
	IV	**Biology of Parasitism**	**80**	**20**	**4**	**100**
	LC-I	**Lab Course I (Based on paper I & II)**			**2**	**100**
	LC-II	**Lab Course II (Based on paper III & IV)**			**2**	**100**
	Total				**20**	**600**
FOURTH Jan-June 2021	**Paper No.**	**Title of Paper**	**Theory**	**Seminar**		**Marks**
	I	**General & Comparative Vertebrate Endocrinology**	**80**	**20**	**4**	**100**
	II	**Ecology and Environmental Physiology**	**80**	**20**	**4**	**100**
	EL. Group A **III A**	**Aquaculture and Fisheries**	**80**	**20**	**4**	**100**
	EL. Group A **IV A**	**Ichthyology**	**80**	**20**	**4**	**100**
	EL. Group B **III B**	**Biology of Immune system**	**80**	**20**	**4**	**100**
	EL. Group B **IV B**	**Immunopathology and Immunotechniques**	**80**	**20**	**4**	**100**
	LC-I	**Lab Course I (Based on paper I & II)**	**-**	**-**	**2**	**100**
	LC-II	**Lab Course I (Based on paper III & IV)**	**-**	**-**	**2**	**100**
	Total				**20**	**600**
	Grand Total				**80**	**2400**

Members of Board of Studies

DEPARTMENT OF ZOOLOGY,

GOVT. N.P.G. COLLEGE OF SCIENCE, RAIPUR

July-December 2019

M.Sc. (I Semester) Zoology

Paper No.	Title of Paper	Theory	Internal test	Credit	Total Marks
I	Biosystematics and Taxonomy	80	20	4	100
II	Structure and function of Invertebrates	80	20	4	100
III	Quantitative Biology (Computer and Biostatistics)	80	20	4	100
IV	Methods and Techniques in Zoology	80	20	4	100
LC-I	Lab Course I (Based on paper I & II)	-	-	2	100
LC-II	Lab Course II (Based on paper III & IV)	-	-	2	100
Total				20	600

Members of Board of Studies in Zoology

July-Dec 2019

M. Sc. ZOOLOGY

Ist Semester

Paper-I: Biosystematics and Taxonomy

Note: There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

Unit-I

Definition & basic concepts of Biosystematics, Zoological nomenclature
History and theories of biological classification, Different types of taxonomic characters
Taxonomic procedure, collection, preservation and identification

Unit-II

Newer trends in biosystematics- Morphological, Embryological, Behavioral, Cytological and Biochemical approach. Numericaltaxonomy. Differential systematics. Molecular taxonomy.Hierarchy of the categories, key & taxa.

Unit-III

Dimension of speciation. Species- problem, Concept and origin of species.
Mechanism of speciation in Panmictic and apomictic species, Species concept- different species concepts; sub species, infra species categories (Biological, Evolutionary, Typological, Nomenalistic, Polytyping and other kind of species), eco, ceno and super species.Relationship between species and their graphical presentation.

Unit- IV

Key procedures in taxonomy. Types of taxonomic key their merits and demerits. Process of typification and different Zoological types. Classification- purpose, use and basis. Biological, artificial and natural classification

Books recommended:

Elements of Taxonomy- E. Mayer
Principles of animal taxonomy- G.G. Simpson
Taxonomy- R.C. Dalella & Verma
Taxonomy-V.C. Kapoor
Biodiversity-E.O. Wilson

Members of Board of Studies in Zoology

July –Dec 2019

M. Sc. ZOOLOGY

Ist Semester

Paper-II: Structure and Function of Invertebrates

Note: There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

Unit -I
Classification, Locomotion, Nutrition, Reproduction in Protozoa
Classification, Skeleton system, Canal system, Reproduction in Porifera,

Unit-II
Classification, Polymorphism, Mesentries in Coelentrata
Classification of Platyhelminthes &Nemathehelminthes
General organization of Trematoda and Nematoda and their larval forms
Life cycle of Schistosoma, Paragonimus, Clonorchis

Unit-III
Classification of Annelida, Coelomoducts, Nepheridia ,Filter feeding in Polychaeta
Classification, of Arthropoda, Respiration in insect, Larval forms in crustacea, Mouth parts of insects

Unit-IV
Classification, Foot and Nervous system, Torsion and Detorsion in Mollusca
Classification, water vascular system and Larval forms in Echinodermata,
Minor Phyla- Ectoprocta & Endoprocta

Books recommended:
The Invertebrate Vol. 1& 2- L.H. Hyman
Invertebrate structure and function – E.J.W. Barrington
Invertebrate Zoology-R.D. Barnes
Biology of higher Invertebrate- W.D. Russell -Hunter
Text Book of Zoology- T.J. Parker & W.A. Haswell
A student text book of Zoology- A. Sedgwick

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July-Dec 2019

M. Sc. ZOOLOGY

Ist Semester

Paper-III: Quantitative Biology (Computer and Biostatistics)

Note: There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

Unit-I: Computer

History of Computers, Structure of Computers, Classification of Computers, Introduction to digital computer- basic knowledge of hard ware &soft ware**,** CPU,Input and Output devices,Binary number system.

Unit-II: Computer

Introduction to MS Office- MS Word, MS Excel, MS Power point,
Introduction of Internet

Unit-III: Biostatistics

Measurement of central tendency- Arithmetic Mean, Median & Mode. Measurement of Dispersion- Standard deviation, Standard error. Presentation of data by Tables -types, rules for making tables, Use of tables, Graph- types, rules for making graph & its uses, pie diagram, pictogram & its uses.

Unit-IV: Biostatistics

Probability- normal and binomial distribution, Correlation and regression- kinds, significance and application of correlation and regression. Test of significance-t-test and Chi square test. Analysis of Variance (one & two way ANOVA).

Books Recommended

Programming in BASIC- E. Balagurusamy
How computers work- J.H. Zar
Computers: concept & uses- A.C. Wardlaw
Statistics for Biologists- R.C. Campbell
Statistical methods- R.R. Sokal& F.J. Rolf
Introduction to Biostatistics- M. Summer

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July-Dec 2019

M. Sc. ZOOLOGY

Ist Semester

Paper-IV: Methods and Techniques in Zoology

Note: There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

Unit-I

Lab safety and disposal of bio-waste, pH metry, Colorimetry, Spectrophotometry-UV, visible spectrophotometer. Infra red spectrophotometer, NMR, ESR,

Unit-II

Light and Electron microscopy, Florescencemicroscopy, Phase contrast microscopy, Confocal microscopy.

Unit-III

Radioisotopes techniques- Radioactive decay, sample preparation for radioactive counting, Radioactive counters, Autoradiography, Magnetic resonance Imaging (MRI),
Biosensors.

Unit-IV

Centrifugation-Principle, techniques and types, Chromatography-Principle, techniques and types (paper, thin layer, column and gel Chromatography), Electrophoresis- Principle, techniques and types (especially Paper and Gel).

Books recommended

Introduction to Instrumental analysis- Robert Braun
Principles of Instrumentation- B.K. Sharma
Principles of Instrumentation- Upadhayay&Upadhayay
Principles of Instrumentation- Chatwal & Chatwal

Members of Board of Studies in Zoology

July-Dec 2019

M. Sc. ZOOLOGYIst Semester

Lab Course- I (Practical based on paper I & II)

Duration- 6 hrs. Max. Marks-100

1. Study of museum specimens from Protozoa to Minor Phyla.
2. Study of histological slides of Protozoa to Minor Phyla.
3. Alternative methods of dissection– Prawn, Cockroach, Snail, Earth worm, Leech,
4. Mounting of preserved stored material
5. Exercise based on taxonomy

Examination Scheme

Major dissection (Alternative procedure)	**18 marks**
Minor- dissection Alternative procedure)	**12**
Spotting	**20**
Exercise based on taxonomy/Mounting	**10**
Collection	**10**
Viva-voce	**10**
Sessional	**20**

Lab Course- II (Practical based on paper III & IV)

Duration-6 hrs. Max. Marks-100

List of practical for paper III **35 marks**

1. Exercises for computation of Mean, Mode, Median, SD, SE, regression.
2. Exercises for data presentation.
3. Data analysis by ANOVA.
4. Hypothesis testing by *t*-test, Chi-square test.
5. Exercise based on Microsoft word.
6. Study of different components of a computer system.
7. Preparation of a document/non-document by using a suitable word processor.
8. Graphical presentation of data using excel

List of practical for paper IV **35 marks**

1 Determination of pH of different soil & water samples
2 Determination of maximum absorption
3. Demonstration of Beers Law
4. Extraction of carbohydrate, protein and amino acids from tissue
5. Separation of Amino acids,sugars by paper and thin layer chromatography
6. Paper & Gel Electrophoresis

Viva-voce **10marks**
Sessional 20 marks

Members of Board of Studies in Zoology:

DEPARTMENT OF ZOOLOGY

GOVT.N.P.G.COLLEGE OF SCIENCE, RAIPUR

Jan- June 2020

M.Sc. (II Semester) Zoology

Paper No.	Title of Paper	Marks		Cradit
		Theory	Seminar	
I	Comparative anatomy of Vertebrates	80	20	4
II	Physiology of Vertebrates	80	20	4
III	Molecular Cell Biology	80	20	4
IV	Population genetics & Evolution	80	20	4
LC-I	Lab Course I (Based on paper I & II)	100		2
LC-II	Lab Course II (Based on paper III & IV)	100		2
Total		600		20

Members of Board of Studies in Zoology

Jan- June 2020

M. Sc. ZOOLOGY

IInd Semester

Paper-1: Comparative anatomy of Vertebrates

Note:There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

Unit-I

Origin of chordates- Fishes, Amphibia, Reptiles, Aves & Mammals. Classification of Fishes, Amphibia, Reptiles, Aves &Mammales (as proposed by Williams &Marshell).

Unit-II

Vertebrate integument and its derivatives- Development, general structure and function of skin and its derivatives, glands, scales, horns, claws, feathers & hairs. General plan of circulation in various groups- Structure and function of blood, Evolution of heart, evolution of aratic arches and portal system. Comparative account of digestive system in vertebrates.

Unit-III

Respiratory system in Vertebrates- Comparative account of respiratory organs in vertebrates, Skeletal system- Comparative account of Skull, vertebrae, limbs and girdles. Evolution of Urinogenital system in vertebrates.Comparative account of urinogenital system in vertebrates.

Unit-IV

Sense organs- receptors, organs of olfaction and taste, lateral line system and electroreception. Nervous system- Comparative account of the brain in relation to its function, Cmparative anatomy of spinal cord, Nerves- cranial, peripheral and Autonomic nervous system.

Books recommended

Life of the vertebrate- J.Z. Young
Vertebrate body- A.S. Romer
Evolution of vertebrate-E.H. Colbert
Comparative anatomy of Vertebrate- C.G. Kent
Life of the mammals- J.Z. Young

Members of Board of Studies in Zoology

Jan- June 2020

M. Sc. ZOOLOGY

IInd Semester

Paper-II: Physiology of Vertebrates

Note:There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

Unit-I

Feeding mechanism and physiology of digestion, Respiratory organsand respiratory pigments through phylogenetic group, Mechanism and regulation of breathing, Exchange and transport of gases. Chromatophores, their regulation & function.

Unit-II

Blood Circulation of body fluid (blood) and their regulation- Composition of blood, Cell types, Blood coagulation. Cardiac cycle and its regulation.Physiology of excretion, formation of urea and urine osmoregulation

Unit-III

Muscles contraction, Reproductive physiology-reproductive cycle, gametogenesis, estrous cycle, menustral cycle, lactation &pregnancy, Placenta,Thermoregulation-homeothermic, poikilothermic animals and hibernation,.

Unit-IV

Nerve impulse and their transmission- Mechanisms of conduction along axon and across synapses Neurotransmitters, Types and physiology of reflexes.Receptor physiology- Mechano, photo, phono, chemo & equilibrium reception, Bioluminescence, Pheromones

Books recommended

Comparative Animal Physiology- C.L. Prosser
Animal Physiology- R. Eckert
General and Comparative Animal Physiology- W.S. Hoar
Review of Medical Physiology- W.F. Ganog
Text Book of Medical Physiology - A.C. Guyton

Members of Board of Studies in Zoology

Jan- June 2020

M. Sc. ZOOLOGY

IInd Semester

Paper-III: Molecular Cell Biology

Note: There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

Unit-I

Biomembranes- Different models, molecular composition and arrangement. Transportation of biomolecules across biomembrane.Structure and function of Mitochondria, Golgi complex, Endoplasmic reticulum, Lysosomes, Ribosome.

Unit-II

Nucleus and Nucleolus- structure and function.Cytoskeleton- cilia and flagella, structure and dynamics of microtubules and Microfilaments.Chromosomes- structure, types and function, Human karyotype.Nucleosomes- structure and function.Apoptosis- Mechanism and regulation. Aging.

Unit-III

Cell- cycle-check points, cyclin dependent kinases and its regulation.Cell signaling-cell surface receptors, messenger system, signaling from plasma membrane to nucleus.Protein synthesis and its regulation.

Unit- IV

DNA- structure, types, replication in prokaryotic & eukaryotic cell, noncoding region, mobile DNA, R DNA technology, Genomic library, PCR techniques and colony hybridization, DNA chip, Blotting techniques, DNA foot printing, RFLP, RADP, Gene related disorders

Books recommended

Genes VIII- B. Lewin
Molecular Biology of Genes- Watson & other
Principle of Genetics- Gardner
Molecular Biology of Cell- B. Albert's& other

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Jan. June 2020

M. Sc. ZOOLOGY

IInd Semester

Paper-IV: Population Genetics & Evolution

Note: There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

Unit-I

Molecular population genetics- molecular phylogenetics of amino acids & nucleic acids, molecular clock. Destabilizing forces for evolution- Genetic variation, natural selection, mutation, Genetic drift ,Hardy-Weinberg Law.

Unit- II

Gene Migration,Quantitativetraits.Phylogenetic and biological concept of species, Models of Speciation-allopetric, sympatric, parapatric and metapatric, Phylectic speciation, quatam speciation, gradual speciation, theories of evolution. Pattern & mechanism of isolation.

Unit- III

Origin of life,Evidences of Evolution, Theories of Evolution (Lamarckism, Darwinism & Synthetic theory). Basic patterns of Evolution: Micro, Macro& Mega Evolution.

Unit- IV

Phylogenetic tree, Fossils- their nature and interpretation, Evolution ofCamel, Man, Elephant & Horse.

Books recommended

Genes & Evolution- A.P. Jha
Evolution- M.W. Strikberger
Evolutionary Genetics- Smith
Evolution –Moody
Evolution – Dobzhansky & Other

Members of Board of Studies in Zoology

Jan- June 2020

M. Sc. ZOOLOGYIInd Semester

Lab Course-I (Practical based on paper I & II)

Duration-6 hrs. Max. Marks-100

Practical based on paper-I **35**

Study of museum specimens of chordate (from protochordate to mammal).
Study of histological slide (from protochordate to mammal).
Osteology of Fishes, Amphibia, Aves, Reptiles and Mammals, skull of dog, cattle, and man.
Alternative methods of dissection- cranial nerves of vertebrates,

Practical based on paper-II **35**

RBC, WBC and DLC blood.
Hb% and Ht.of vertebrate blood.
Blood group & clotting time.
Preparation of haemin crystals
Demonstration of Kymograph
Demonstration of action of salivary amylase

Viva-voce **10**
Sessional **20**

Lab Course- II (Practical based on paper III & IV)

Duration-6 hrs. Max. Marks-100

Practical based on paper-III **35**

Biochemical estimation of DNA
Biochemical estimation of RNA by orcinol method
Isolation and electrophoresis of DNA
Problem based on molecular genetics.
Study of types of cells.
Study of permanent slide of cell organelles and cell division.
Preparation of slide of cell division by squash preparation.
Preparation of slide of polytene chromosomes.
Demonstration of Apoptosis

Practical based on paper-IV **35**

Experimental analysis of Genetic drift
Experimental analysis of Hardy Weinberg Law
Numerical problem based on quantitative traits
Construction of phylogenetic tree
Comments upon important evolutionary traits

Viva-voce **10**
Sessional **20**

Members of Board of Studies in Zoology

DEPARTMENT OF ZOOLOGY

GOVT.N.P.G.COLLEGE OF SCIENCE, RAIPUR

July-Dec. 2020

M.Sc. (III Semester) Zoology

Paper No.	Title of Paper	Theory	Test	Marks	cradit
I	Developmental Biology	80	20	100	4
II	Animal Behaviour and Population Ecology	80	20	100	4
III	Limnology	80	20	100	4
IV	Biology of Parasitism	80	20	100	4
LC-I	Lab Course I (Based on paper I & II)	-	-	100	2
LC-II	Lab Course II (Based on paper III & IV)	-	-	100	2
Total				600	20

Members of Board of Studies in Zoology

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July-Dec. 2020
M. Sc. ZOOLOGY
IIIrd Semester
Paper-I: Developmental Biology

Note: There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

Unit-I
Biology of sex determination, Biology of sex differentiation, Spermatogenesis, Oogenesis and vitellogenesis, Ovulation and ovum transport in mammals

Unit-II
Fertilization-recognition of gametes, acrosome reaction, activation of egg metabolism Cleavage-pattern and mechanism of cleavage, Fate maps Formative movements, Metamorphosis- in insect and in frog,

Unit-III
Organizer concept. Multiple ovulation and embryo transfer technology (IVF and IVET), super ovulation, embryo sexing and cloning, Stem cell, Teratology.

Unit-IV
Parthenogenesis, Transgenic animals- knockout experiments, methods of transfection its application and production of transgenic animals-rat, sheep, pig, cattle, fish, Nucleo-cytoplasmic interaction.

Books Recommended
Developmental Biology- S.F. Gilbert
Reproduction in animals- Auston & Short
Embryology- N.J. Berril

Members of Board of Studies in Zoology

July-Dec. 2020
M. Sc. ZOOLOGY
IIIrd Semester

Paper-II: Animal Behaviour and Population Ecology

Note: There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

Unit-I
Ethology- history & branches, Ethogram- analysis of behaviour,Concept and Patterns of behavior, Biological rhythm,communication-chemical, visual, light, tactile and audio, Learning & memory-conditioning: Classical, Instrumental and Insight learning, habituation, reasoning, neural mechanism of learning,

Unit-II
Ecological aspects of behaviour-feeding strategies & territorial behaviour. Social behaviour-social organization in insects & primate, evolution of language (Primates and honey bee). Aggregation- schooling in fishes & flocking in birds, Bird migration, navigation and orientation, reproductive behavior, Parental care in amphibian.

Unit-III
Population characterstics, Demography-life table. Population growth-exponential, logistic, stochastic & time lag. Population density, reproductive strategies (r and k selection).

Unit-IV
Competition & niche theory, Mutualism (plants pollinator & animal interaction), predation, population regulation (extrinsic & intrinsic), distribution of organism.

Book recommended
Behavioural Ecology- J.R. Krebs & N.B. Davies
Animal behaviour- Reena Mathur
Animal behaviour- R.A. Hinde
Evolutionary Ecology-E.R. Pianka

Members of Board of Studies in Zoology

July-Dec. 2020
M. Sc ZOOLOGY
IIIrd Semester

Paper-III: Limnology

Note:There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

Unit-I

Characteristic of water, Lentic system, Pond ecosystem and communities and lake-forms and origin, Eutrophication.

Unit-II

Lotic ecosystem, river, stream ecosystem and biota Phytoplankton & Zooplankton of fresh water, Estuaries.

Unit-III

Physical condition of water- light (transmission and absorption of light, thermal radiation, color of water), heat (thermal stratification, flow of heat, comparative analysis of river reservoirs and lake),water (properties of water, hydrological cycle, global water balance), water movement (flow of water, motion in epilimnion, thermocline,hypolimnion, circulation due to thermal bars, river influence).

Unit-IV

Chemical component of fresh water-Oxygen(Sources, effect of temperature, salinity and organism, seasonal changes, oxygen depth curve, distribution), carbon dioxide (Distribution, dial & seasonal variation, utilization), Nitrogen (Cycle,, forms of N2 in lakes, seasonal distribution, Nitrogen fixation, dinitrification), Phosphorus (Distribution, cycling, recycling), Iron, silica, Calcium and sulphur (cycle, Bacterial transformation).

Books recommended

Fundamental of Ecology- E. P. Odum
Ecology- C.J. Krebs
Ecology- R.E. Ricklets and G. Miller

Members of Board of Studies in Zoology

July-Dec. 2020
M. Sc. ZOOLOGY
IIIrdSemester
Paper-IV: Biology of Parasitism

Note:There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

Unit-I

Host-parasite relationship, Transmission of infectious agent, Protozoan diseases (Amoebiasis, Malaria, Giardiasis, Trypanosomiasis, Coccidiasis), Vectors of human diseases.

Unit-II

Helminth parasites and diseases (Taeniasis, Schistosomiasis), nematodes parasites and diseases (Ascariasis, Filariasis), bacterial disease (Tuberculosis). Parasites of domestic animals

Unit-III

Viral diseases (AIDS, Rabbies, Plague, respiratory disease caused by virus & bacteria).

Unit-IV

Fungal diseases (Mycosis, Mycotoxicosis), disease transmitted by ticks and insects (Lyme disease, Rickettsiae).

Books Recommended

Parasitology- Chandler
Parasitology-Chatterji&Chatterji
Parasitology-Dey
Microbiology- Prescott

Members of Board of Studies in Zoology

July-Dec. 2020

M. Sc. ZOOLOGYIIIrd Semester

Lab Course I (Based on paper I & II)

Duration - 6 hrs. Max. Marks-100

Practical based on paper-I **35**

Study of histological slides of gonads.
Alternative to dissection and display the reproductive system of vertebrates.
Study of embryological slides of frog and chick.
Effect of thyroid hormones on metamorphosis of frog.
Window preparation in chick
Study of complete developmental cycle of invertebrate (Snail)
Study of complete developmental cycle of vertebrate (Frog)

Practical based on paper-II **35**

Study of insect behavior in response to various environmental stimuli
Study of various behaviour patterns in vertebrate
Preparation of life table from given data
Study of experiment showing animal –animal interaction
Study of experiment showing animal –plantinteraction
Study of population characteristics- density, frequency and abundance

Viva-voce **10**
Sessional **20**

Lab Course II (Based on paper III & IV)

Duration - 6 hrs. Max. Marks. - 100

Practical based on paper III **35**

Study of physical condition of fresh water.
Study of chemical constituents of freshwater.
Plankton analysis-identification of phyto and zooplankton.
Study of aquatic weeds and aquatic insects.

Practical based on paper-IV **35**

Study of slides of protozoan parasites
Study of slides of helminthes parasites
Study of slides of bacterial, fungal and viral diseases
Study of rectal content of vertebrate showing parasites
Preparation of permanent slide of parasites& vector

Viva-voce **10**
Sessional **20**

Members of Board of Studies in Zoology

DEPARTMENT OF ZOOLOGY

GOVT. N.P.G.COLLEGE OF SCIENCE, RAIPUR

Jan-June 2021

M.Sc. (IV Semester) Zoology

Paper No.		Title of Paper			Marks	Cradit
			Theory	Seminar		
I		General & Comparative Vertebrate Endocrinology	80	20	100	4
II		Ecology and Environmental Physiology	80	20	100	4
EL. Group A	IIIA	Aquaculture and Fisheries	80	20	100	4
	IV A	Ichthyology	80	20	100	4
EL. Group B	IIIB	Biology of Immune system	80	20	100	4
	IVB	Immuno-pathology and Immuno-techniques	80	20	100	4
LC-I		Lab Course I (Based on paper I & II)	-	-	100	2
LC-II A/ B		Lab Course II (Based on paper III & IV)	-	-	100	2
Total					600	20

Members of Board of Studies in Zoology

Jan.-June 2021
M. Sc. ZOOLOGY
IVth Semester

Paper-I: General & Comparative Vertebrate Endocrinology

Note: There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

Unit-I
Aims & scope of Endocrinology, Neuro-endocrine system and neuro-secretion, Endocrine glands, their structure & function-hypothalamus, Pituitary, Thyroid, Adrenal, Pancreas and other endocrine structure(mucosa of alimentary canal, placenta, gonads, kidney, heart), Classification of hormones,

Unit-II
Chemical structure and biosynthesis of hormones- peptide hormones (pre & pro hormones), steroid hormones, amino acid derived hormones (thyroid and epinephrine hormones),

Unit-III
General principle of hormone releasing, transport & action-mechanism of hormone action, hormone receptors-membrane bound & intracellular receptor, termination of hormone action. Hormones & Metabolic regulation (regulation of carbohydrate, protein, lipid & Ca metabolism).

Unit-IV
Hormones &behaviour, Hormones & Osmoregulation, Hormones & Reproduction-the gonadial cycle (Parturation, menstruation, lactation & pregnancy), the control of metamorphosis, the role of hormone in maturation.

Books recommended
General and Comparative Endocrinology- E.J.W. Barrington
Comparative vertebrate Endocrinology- P.J. Bentley
Endocrine Physiology- C.R. Martin
Endocrinology- Turner

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Jan.-June 2021
M. Sc. ZOOLOGY
IVth Semester

Paper-II: Ecology and Environmental Physiology

Note: There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

Unit-I
Abiotic factors (climatic and edaphic), biotic factors and Limiting factors. Community ecology, Ecological succession, energy flow, aquatic and terrestrial habitat

Unit-II
Kinds of environmental pollution and their control methods, Bioremediation, Natural resources and its conservation–forest, soil, water and energy.Wild life and its conservation, Environmental impact assessment

Unit-III
Aquatic adaptation-Fresh water, marine water- deep sea, shores and estuarine water. Terrestrial adaptation- Cursorial, fussorial,cave and desert. Aerial adaptation. Parasitic adaptation**.**Specific adaptation- fight and autotomy.

Unit-IV
Basic concept of environmental stress: Temperature, Chemical and Noise.
Responding Stress Concepts: Emotional, Physiological, Behavioual, and Psychological concepts.
Biology of Stress: Hormonal Control and Neurological control.
Stress resistance, stress tolerance, stress avoidance.
Physiological response to oxygen deficient stress.
Assessment of Stress: General adaptive syndrome.
Stress management: Yoga, Meditation.

Books recommended
Ecology –E.P. Odum
Environmental and metabolic animal Physiology- C.L. Prosser
Animal Physiology: Adaptation & Environment- S. Nielsen
Environmental Physiology-P.G. Willmer& other
Animal Physiology: mechanism and adaptation- R. Eckert

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Group A Paper – IIIA: Aquaculture and Fisheries

Note: There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

Unit- I

General characters, classification, evolution and phylogeny of-Placodermi, Holocephali, Elasmobranchi, Dipnoi, Teleostomi, Actinopterygii,Crossopterygii.

Unit-II

Indian major carps, Construction and maintenance of fresh water fish farm, management of ponds, physiochemical condition of water and its effect on fishes. Fresh water fish breeding (Dry & wet bundh breeding and induced breeding), fishing methods.

Unit-III

Fish cum paddy culture, Sewage fisheries, Composite fish culture and integrated fish farming, intensive culture of air-breathing fishes, Aquarium fishes, preparation and maintainance of fish aquarium

Unit-IV

Capture fishery (marine), Prawn fishery, Pearl fisheries, Fish preservation & Fish byproduct, Fish disease.

Books recommended

Fish & Fisheries- V.G. Jhingran
Fish & Fisheries- C.B.L. Shrivastava
Ichthyology- S.K. Gupta & P.C. Gupta
Fish Biology & Fisheries- R.P. Parihar
Classification of Fishes- L.S. Berg
A manual of fresh water aquaculture- R. Santhanam & other

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Group A Paper-IVA: Ichthyology

Note:There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

Unit-I
Skin**,** scales, coloration, Skeleton system, Light production & Electric production in fishes.

Unit-II
Locomotion, fins,Deep sea fishes, Hill stream fishes, Migration in fishes, Parental care.

Unit-III:
Food, feeding habit and alimentary canal, Respiration & accessory respiratory organs, Swim bladder, Weberian ossicles, Blood vascular system-heart, blood vessels & blood, Endocrine gland.
.
Unit-IV
Excretion, Osmoregulation, Nervous system, (Brain, Spinal cord & Cranial nerves) Sense organs (eye, ear, tango receptors& olfactory receptors) Reproductive system-Male & female, lateral line system.

Books recommended
Fish Physiology (series) – W.S. Hoar and D.J. Randall
Fish Physiology (Vol. 1-2) – Brown
Ichthyology- Lagler
Ichthyology- S.S. Khanna
Fish & Fisheries- R.P. Parihar

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Group B Paper-IIIB:Biology of Immune system

Note: There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

Unit – I
History; scope and applications of immunology
Immunity, Introduction to innate and acquired immune system
Haematopoisis,Different cells& tissues of immune system
Immune organs their structure functions and organization
Inflammation

Unit – II
T-cell receptors and B-cell receptors
T-cell maturation, activation and differentiation
B-cellgeneration, activation and differentiation
Antigen, its processing and presentation

Unit – III
Antibody- immunoglobulin structures, types and functions
Major histocompatibility complex & human leucocytes antigen
Cytokines,
Complements

Unit – IV
Immune response- humoral and cell mediated immune response
Hypersensitivity reactions – Types I,II, III, IV
Vaccins and vaccination

Books recommended
Immunology – Roitt, Brosffort and Male
Immunology – Tizard
Understanding immune system – Elgert
Immunology –Aabbas et al
Fundamentals of Immunolog-, Willium Paul
Immunology – Dulsy Fatima, A. Murumgan (saraspblication)
Immunology - Benzamini et al
Kubey's Immunology- Goldsby et al
Internet: *.ac.in, edu.com, nic.in*

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Group B Paper-IVB:Immunopathology and Immunotechniques

Note: There will be four questions in all. One question from each unit with fifty percent internal choice is compulsory.

UNIT I:

Immunity to viruses
Immunity bacteria (Streptococcus & Mycobacterium) and fungi
Immunity to worm (Filaria, Ascaris, Taenia and Fasciola) and protozoans(Plasmodium,Leishmania, Trypanosoma)

UNIT II:

Immunodeficiency diseases (Primary, secondary & combined) and disorders
Secondary immunodeficiency Disease-AIDS, Bird flue
B- cell & T-cell generated diseases, Aging and immune factors

UNIT III:

Tumor immunology
Immune tolerance
Autoimmunity and autoimmune diseases
Transplantation

UNIT IV:

Hybridoma technology, Monoclonal Antibodies
Ag-Ab- interaction: Its principles & application
Ag-Ab- interaction techniques- precipitation, agglutination , Immunodiffussion (RID, DID),Immunoelectrophoresis, ELISA., Radioimmuno assay, Immunoflorecence assay
Applications of immune techaniques in Immunodiagnostics .

Books recommended

Immunology – Roitt, Brosffort and Male
Immunology – Tizard
Understanding immune system – Elgert
Immunology –Aabbas et al
Fundamentals of Immunolog- Willium Paul
Immunology – Dulsy Fatima, A. Murumgan (saraspblication)
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IVth Semester

Lab Course-I (Practical based on paper I& II)

Duration-6 hrs. Max. Marks-100

Practical based on paper-I **35**

Study of histological slide of various endocrine glands of vertebrates
Alternative methods of dissection of vertebrates to show the position of endocrine glands
Histological preparation of endocrine glands
Hormone assay

Practical based on paper-II **35**

Water analysis- Determination of hardness, turbidity & alkalinity of water sample.Soil analysis- Determination of chemical composition, physical condition and Cl content of soil.Oxygen consumption of aquatic animal under stress. Experiments showing Stress physiology. Measurement of stress using stress scaling.

Viva-voce **10**
Sessional **20**

Jan.-June 2021
M. Sc. ZOOLOGY
IVth Semester

Lab Course-II A(Practical based on paper IIIA& IVA)

Practical based on paper IIIA & IVA 70

Study of representative fishes from museum specimens and from their own collection, Study of histological slides, Osteology of fishes, Alternative methods of dissection of fishes- Nervous system of fishes, Alternative methods of dissection accessory respiratory organs of Heteropneustesfossilis, Clariasbatrachus, Webarianossiclaesof fish, Identification of fish egg, fry and fingerling.RBC, WBC &DLC ,Age determination by scales,
Identification of fishes, Induced breeding in fishes, Opercular activity in fishes,Thermoregulatory behaviour in fishes.,

Viva-voce **10**
Sessional **20**

Jan.-June 2021
M. Sc. ZOOLOGY
IVth Semester

Lab Course-II B(Practical based on paper IIIB& IVB)

Duration–6 Max. Marks-100

Practical based on paper IIIB & IVB 70

- Enumeration of total leucocytes from human blood samples
- Enumeration ofdifferential leucocytes from human blood samples
- Demonstration of agglutination reaction using human RBC
- Demonstration of Ag-Ab precipitation by immunodifusion technique
- Antigen detection by radial immunodiffusion technique (RID)
- Estimation of total serum protein
- Estimation of serum gamma globulins
- Estimation of A/G ratio
- procedure of anti serum
- Paper and gel immuno-electrphoresis.
- conventionalvdrl tests
- strip immunological test of pregnancy (urine)
- ELISA

Viva-voce 10

Sessional 20

DEPARTMENT OF ZOOLOGY

M.Sc. ZOOLOGY DEGREE PROGRAM

Course offered

Ist Semester

Paper I: Biosystematics and Taxonomy

Paper II: Structure and Function of Invertebrates

Paper III: Quantitative Biology (Computer and Biostatistics)

Paper IV: Methods and Techniques in Zoology

V: LC I Lab course based on paper I & II

VI: LC II Lab course based on paper III & IV

IInd Semester

Paper I: Comparative anatomy of Vertebrates

Paper II: Physiology of Vertebrates

Paper III: Molecular Cell Biology

Paper IV: Population Genetics & Evolution

V: LC I Lab course based on paper I & II

VI: LC II Lab course based on paper III & IV

IIIrd Semester

Paper I: Developmental Biology

Paper II: Animal Behaviour and Population Ecology

Paper III: Limnology

Paper IV: Biology of Parasitism

V: LC I Lab course based on paper I & II

VI: LC II Lab course based on paper III & IV

IVth Semester

Paper I: General & Comparative Vertebrate Endocrinology

Paper II : Ecology and Environmental Physiology

Paper III :

Paper III A: Aquaculture and Fisheries

Paper III B: Biology of Immune system

Paper IV :

Paper IV A: Ichthyology

Paper IV B: Immunopathology and Immunotechniques

V: LC I Lab course based on paper I & II

VI: LC II Lab course based on paper III & IV

Programme Outcome

PO 1. Enable the learners to take certificate in the Master's degree in Zoology.

PO 2. Students acquire an in-depth knowledge in the area of Zoology

PO 3. M.Sc. programme enable students to specialize in one of the branches of Zoology either Icthyology or Immunology that would be offered as elective courses.

PO 4. Programme offers opportunities of continuing education and professional development.

PO 5. Widen the scope of the learners for career opportunities such as teaching, industry and research.

PO 6. Students can go for self employment as well as can provide employment to others by fish farming.

Programme Specific Outcome

PSO 1. Development of academically sound future researchers and intellectuals in the area of general biology, molecular biology, biotechnology, genetics, cell biology, environmental conservation, immunology and ichthyology.

PSO 2. Producing contributors in the area of biological research, teaching and biodiversity conservation.

PSO 3. Cultivating a generation with scientific ethics and temperament.

Course Outcome

M.Sc. (Ist Semester) Zoology

Paper I: Biosystematics and Taxonomy

CO 1. Deep understanding in the principles and practice of systematic.

CO 2. Acquire an in-depth knowledge on the diversity and relationships in animal world.

CO 3. Develop a holistic appreciation on the phylogeny and adaptations in animals.

CO 4. Classification of animals with taxonomic keys.

CO 5. Student learn how to collect the specimen its preservation and identification.

Paper-II: Structure and Function of Invertebrates

CO 1. Describe general taxonomic rules on animal classification

CO 2. Classify Phylum of invertebrates with taxonomic keys.

CO 3. Describe examples of pathogenic nematodes, ecology, zoogeography,

CO 4. Distribution of fauna in different realms interaction.

Paper-III: Quantitative Biology (Computer and Biostatistics)

CO 1. Students learn basic of hardware & software of computer.

CO 2. Students gain skills in basics of computers, operating systems, overview of programming languages.

CO 3. Students gain knowledge about statistical methods like measures of central tendencies, probability, learns about hypothesis testing and inferential statistics

Paper-IV: Methods and Techniques in Zoology

CO 1. Understand the importance of Physics to recognize life process.

CO 2. Students learn about lab safety and how to dispose off biowastes.

CO 3. Understanding of basic concepts of instrumentation such as pH meter, microscopy and its type and centrifugation.

CO 4. Students gain skills and knowledge in techniques of chromatography, electrophoresis, spectroscopy and radioisotopes.

CO 5. Equip the learner to use the tools and techniques for project work and research.

V: LC I Lab course based on paper I & II

CO . Developing Observational, Analytical and Evaluation skills related to paper I and paper II.

VI: LC II Lab course based on paper III & IV

CO . Developing Observational, Analytical and Evaluation skills related to paper III and IV.

M.Sc. (IInd Semester) Zoology

Paper-1: Comparative anatomy of Vertebrates

CO 1. Students learn how the complex form of life originated from the simple forms

CO 2. The students learn to classify the chordates phylum.

CO 3. Students get a deeper approach about comparative anatomy among the chordates.

CO 4. The course describes the evolution of different organ system such as heart and arotic arches, urinogenital system.

Paper-II: Physiology of Vertebrates

CO 1. Physiological and biochemical understanding of mechanical, physical, and biochemical functions of animals , their organs, and the cells of which they are composed.

CO 2. Interactions and interdependence of physiological and biochemical processes.

CO 3. Students gain fundamental knowledge of animal physiology. Students are taught the detailed concepts of digestion respiration excretion the functioning of nerves and muscles.

CO 4. Students learn the concepts of endocrine systems and homeostasis a brief account of genetics and organic evolution.

CO 5. This course helps students to gain fundamental knowledge in these topics.

Paper-III: Molecular Cell Biology

CO 1. Understanding on the details of the basic unit of life at the molecular level.

CO 2. Explain the fine structure and functions of cell organelles.

CO 3. Introduce the new developments in molecular biology and its implications in human welfare.

CO 4. Students get an idea with recent technique like PCR, colony hybridization, DNA chip, blotting, DNA foot printing, RFLP,RAPD etc.

CO 5. Expose the learners to the emerging field of research in Molecular Biology.

Paper-IV: Population Genetics & Evolution

CO 1. Understanding of genetic basis of evolution, human karyotyping, speciation, population genetics and Hardy-Weinberg law.

CO 2. The course elaborates about evolution of camel, man, elephant and horse.

V: LC I Lab course based on paper I & II

CO . Developing Observational, Analytical and Evaluation skills related to paper I and paper II.

VI: LC II Lab course based on paper III & IV

CO . Developing Observational, Analytical and Evaluation skills related to paper III and IV.

M.Sc. (IIIrd Semester) Zoology

Paper-I: Developmental Biology

CO 1. Basic concepts of developmental biology, embryology of frog, chick and mammal, role of hormone during pregnancy.

CO 2. Students learn modern techniques such as; Stem cell, IVF, embryo cloning, knock out experiments, methods of transfection and its application etc.

CO 3. Expose to concepts and process in developmental biology.

CO 4. Understand and appreciate the genetic mechanisms and the unfolding of the same during development.

Paper-II: Animal Behaviour and Population Ecology

CO 1. Expose to the basics and advances in ethology.

CO 2. Generate an interest in Ethology in order to understand the complexities of both animal and human 35behaviour.

Paper-III: Limnology

CO 1. Students learn about the fresh water habit and habitat.

CO 2. Students learn to analyse water quality and determine whether water is good for drinking or fish culture.

CO 3. Students learn about water pollution and its control measure.

Paper-IV: Biology of Parasitism

CO 1. Students get knowledge related to the techniques involved in detection of various diseases, Pathology associated with various diseases.

CO 2. Students learn about various diseases, their causative agent, vector and control measure. The information gained by the students can be further used to educate the common people to how to prevent the pathogenic disease caused by protozoans, helimenths, fungus and virus.

V: LC I Lab course based on paper I & II

CO . Developing Observational, Analytical and Evaluation skills related to paper I and paper II

VI: LC II Lab course based on paper III & IV

CO . Developing Observational, Analytical and Evaluation skills related to paper III and IV

M.Sc. (IVth Semester) Zoology

Paper - I: General & Comparative Vertebrate Endocrinology

CO 1. Students learn classification, chemical nature and biosynthesis of hormones.

CO 2. Students get knowledge about the diseases caused by abnormal secretion of hormones.

CO 3. The course elaborates how behaviour is affected by hormones.

CO 4. Students learn about role of hormone in maturation and reproductive cycle.

Paper - II: Ecology and Environmental Physiology

CO 1. Understanding on the basic theories and principles of ecology.

CO 2. Learn current environmental issues based on ecological principles.

CO 3. Gain critical understanding on human influence on environment.

CO 4. Positive attitude towards Biodiversity conservation.

CO 5. Broad and deep understanding on environment and influence of man on environment.

CO 6. Equip the students to use various tools and techniques for the study of environment.

CO 7. The students learn the importance of Yoga and how to manage stress through yoga and meditation**.**

Paper – III A: Aquaculture and Fisheries

CO 1. Students learn about different type of fishes and it's classification.

CO 2. Understands concepts of fisheries, fishing tools and site selection, Aqua culture systems, induced breeding techniques, post harvesting techniques.

CO 3. Understanding of construction and maintenance of fresh water fish farm, fish breeding and fishing methods.
CO 4. Understanding of composite and integrated fish culture, fish cum paddy culture, sewage fisheries etc.
CO 5. The course enable the students make their own career in fisheries as well as can provide employment to others.

Paper - IVA: Ichthyology

CO 1. Students get knowledge about fish physiology.
CO 2. The course elaborates about fish migration and parental care in fishes.

III B: Biology of Immune system

CO 1. Appreciate the contribution of great immunologists.

CO 2. Types of immunity, antigens-antibodies and their properties.

CO 3. Imparts in depth knowledge of tissues, cells and molecules involved in host defence mechanisms.

CO 4. Understanding of types of immunity, Interactions of antigens, antibodies, and complements and other immune components, immune mechanisms in disease control, vaccination, process of immune interactions.

Group B Paper-IVB: Immunopathology and Immunotechniques

CO 1. Understand about different diseases and the role of Immune system.

CO 2. Familiar with the tools and techniques used in immunology.
CO 3. Students get knowledge about the immunodeficiency disease and disorders.
CO 4. Students understand about secondary immunodeficiency disease such as AIDS. The information gained can be further used to aware and eradicate the myths related to AIDS from the society.

CO 5. Students get knowledge about cancer.

V: LC I Lab course based on paper I & II

CO . Developing Observational, Analytical and Evaluation skills related to paper I and paper II

VI: LC II Lab course based on paper III & IV

CO . Developing Observational, Analytical and Evaluation skills related to paper III A, IV A and III B, IV B