सत्र ~~2015-16~~ 2016-17

III Semester M.Sc. Zoology

प्रश्नपत्र	प्रश्नपत्र का शीर्षक	अधिकतम अंक़		न्यूनतम उत्तीर्णांक	
		सैध्दांतिक	सी. सी.ई	सैध्दान्तिक	सी.सी.ई
प्रथम	Comparative Anatomy of Vertebrates	85	15	28	05
द्वितीय	Limnology	85	15	28	05
तृतीय	Eco-Toxicology	85	15	28	05
चतुर्थ	Aquaculture	85	15	28	05
	1- Practical -I	50	–	17	–
	2- Practical -II	50	–	17	–

विषय – प्राणीशास्त्र चतुर्थ सेमेस्टर

प्रश्नपत्र	प्रश्नपत्र का शीर्षक	अधिकतम अंक		न्यूनतम उत्तीर्णांक	
		सैध्दांतिक	सी. सी.ई	सैध्दान्तिक	सी.सी.ई
प्रथम	Animal Behaviour And Neurophysiology(Compulsory)	85	15	28	05
द्वितीय	Gamete ,Biology, Development and Differentiation (Compulsory)	85	15	28	05
तृतीय	Pisci Culture and Economic Importance of Fishes (Icthyology) (Optional)	85	15	28	05
चतुर्थ	~~Molecular Cell Biology and Genetics~~ Icthyology	85	15	28	05
	3- Practical -I	50	–	17	–
	4- Practical -II	50	–	17	

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Class	: M.Sc
Semester	: III
Subject	: Zoology
Title of Subject Group	: Comparative Anatomy of Vertebrates
Paper No.	: Paper- I
Max. Marks	: 35

Unit-1	1. Origin of Chordata: Concept of Protochordata 2. Vertebrate morphology : Definition, scope and importance. 3. Development, structure and functions of vertebrates integument and its derivatives (glands, scales, feathers and hairs) 4. Respiratory system : Characters of respiratory tissue, external and internal respiration. Comparative account of respiratory organs. 5. Comparative account of Digestive System.
Unit-2	1. Evolution of heart. 2. Evolution of aortic arches and portal systems. 3. Blood circulation in various vertebrates groups. 4. Form, function, body size and skeletal elements of the body. 5. Comparative account of jaw suspensorium and vertebral column.
Unit-3	1. Evolution of urinogenital system in vertebrates. 2. Comparative account of organs of olfaction and taste. 3. Comparative anatomy of brain and spinal cord (CNS). 4. Comparative account of peripheral and autonomous nervous system.
Unit-4	1. Comparative account of lateral line system. 2. Comparative account of electroreception. 3. Flight adaptations in vertebrates. 4. Aquatic adaptations in birds and mammals.
Unit-5	1. Origin, evolution general organization and affinities of Ostracoderms . 2. General organization, specialized, generalized and degenerated characters of Cyclostomes. 3. Origin, evolution general organization of early Gnathostomes . 4. General account of Elasmobranchi, Holocephali, Dipnoi and Crossoptergii.

Suggested Readings :

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

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Session - ~~2010-2011~~ ~~2015-16~~ 2016-17

Class	: M.Sc
Semester	: III
Subject	: Zoology
Title of Subject Group	: Limnology
Paper No.	: Paper- II
Max. Marks	: 35

Unit-1	1.Limnology – Definition, historical development and scope of Limnology. 2.Types of freshwater habitats and their ecosystem - (a) Ponds, Streams and rivers. (b) Lakes – Origin and classification. 3.Morphpmetry – Use of various morphometric parameters and Zonation.
Unit-2	Physico – Chemical Characteristics. 1. Light and Temperature- (a) Light as an ecological parameter in freshwater. (b) Temperature- Radiation, Stratification and Heat Budget. 2. (a) Dissolved Solids – Carbonate, Bicarbonates, Phosphate and Nitrate. (c) Physico – Chemical characteristics of freshwater with special reference to different parameters- Turbidity, dissolved gases(Oxygen, Carbon dioxide, Hydrogen Sulphide), Seasonal changes in dissolved gases and pH.
Unit-3	1. Study of Biota (a) Phytoplankton, Zooplankton and their inter-relationship. (b) Aquatic insects, birds and their environmental significance. 2. Ecological classification of aquatic fauna higher aquatic plants and their significance.
Unit-4	1. Methods of water quality testing BOD and COD. 2. Sewage – Definition, composition and its treatment. 3. Bioindicators- Aquatic flora and fauna in relation to water quality in an aquatic environment.
Unit-5	1. Causes of pollution of Aquatic Resources, their management and conservation. 2. Resource Conservation – Aquatic pollution, control, legislation, regulation on discharge of industrial effluents and domestic wastes in rivers and reservoirs. 3. Use and misuse of inland waters.

Suggested Readings :

Anathakrishnan	:	Bioresources Ecology
Goldman	:	Limnology
Odum	:	Ecology
Pawlosuske	:	Physico- chemical methods for water
Wetzal	:	Limnology
Trivedi & Goyal	:	Chemical and biological methods for water pollution studies
Welch	:	Limnology Vols. I-II
Perkins	:	Ecology
Arora	:	Fundamentals of environmental biology

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Post Graduate Semester wise Syllabus
as recommended by Central Board of Studies and approved by the Governor of M.P.
उच्च शिक्षा विभाग, म.प्र. शासन
स्नातकोत्तर कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम
केंद्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म. प्र. के राज्यपाल द्वारा अनुमोदित

Session - ~~2010-2011~~ ~~2012-2013~~ 2016-17

Class : M.Sc
Semester : III
Subject : Zoology
Title of Subject Group : ECO- TOXICOLOGY
Paper No. : Paper- III
Max. Marks : 35

Unit-1	1. General principles of Environmental Biology with emphasis on ecosystems. 2. Abiotic and biotic factors of ecosystems. 3. Communities of the environment, their structure & significance. 4. Energy flow in environment : Ecological energetics.
Unit-2	1. Productivity, Production and analysis. 2. Recycling and reuse technologies for solid and liquid wastes and their role in environmental conservation. 3. Remote sensing –basic concepts and applications of remote sensing techniques in environmental conservation. 4. Environmental indicators and their role in environmental balance.
Unit-3	1. Kinds of environmental pollution and their control methods. 2. Radioactive compounds and their impact on the environment. 3. Vehicular exhaust pollution, causes and remedies. 4. Noise pollution.
Unit-4	1. Toxicology- Basic concepts, Principles and various types of toxicological agents. 2. Toxicity testing principles, hazards, risks and their control methods. 3. Food toxicants and their control methods. 4. Public Health Hazards due to environmental disasters.
Unit-5	1. Pesticides, types, nature and their effects on environment. 2. Important heavy metals and their role in environment. 3. Agrochemical use and misuse, alternatives. 4. Occupational Health Hazards and their Control.

Suggested Readings :

1. Clark : Elements of ecology
2. Odum : Fundamentals of Ecology
3. South Woods : Ecological methods
4. Trivedi and Goel : Chemical and biological methods for water pollution studies

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Session - ~~2010-2011~~ ~~2011-2013~~ 2016-17

Class	: M.Sc
Semester	: III
Subject	: Zoology
Title of Subject Group	: Aquaculture
Paper No.	: Paper- IV
Max. Marks	: 35

Unit-1	1. Aquaculture: history, definition, scope & importance. 2. Fishery resources of India in general & Madhya Pradesh in particular. 3. Abiotic & biotic factors of water necessary for fish life. 4. Ecological characteristics of lakes & rivers. 5. General ecological characteristics of reservoirs of India.
Unit-2	1. Fish culture :- Mono, Poly, mixed and composite Fish culture. 2. Fresh water prawn culture and its prospects in India. 3. Culture of Mussels , clams,oysters & pearl culture. 4. Sewage fed fish culture, paddy cum fish culture 5. Frog culture.
Unit-3	1. Fish breeding in natural conditions , bundh breeding, hypophysation & stripping. 2. Transport of live fish & seed. 3. Different types of crafts & gears used for fish catching. 4. Plankton- its definition, culture & indentification. 5. Common weeds of fish ponds and methods of their eradication.
Unit-4	1. Fresh water fish farm engineering : selection of site, construction of fish farm & soil chemistry. 2. Designing, layout & construction of different types of fish ponds. 3. Setting and management of fresh water aquarium. 4. Preservation & processing of fish. 5. By products of fish Industry & their utility.
Unit-5	1. Water pollution, its effects on fisheries and methods of its abatment. 2. Common fish diseases & their control . 3. Biochemical composition and nutritional value of fish. 4. Fisheries economics and marketing. 5. Fisheries managements and extension.

Suggested Readings :

1. C.B.L. Shrivastava : Fishes of India
2. Jhingaran : Fish and fisheries of India
3. S.S. Khanna : An Introduction to fishes
4. R.S. Rath : Fresh water Aquaculture
5. Gopalji Shrivastava : Fishes of U.P. & Bihar
6. H.D. Kumar : Sustanibility & 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. Vishwas : Fish & Fisheries

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Session - ~~2010-2011~~ ~~2012-2013~~
2016-17

Class : M.Sc
Semester : III
Subject : Zoology
Practical I : **Related to I & II Theory Papers**

1. Study of Specimens, slides and bones related to theory papers.
2. Major Dissection- Various systems of Labeo , Wallago, Torpedo
3. Minor Dissection-
   (a) Accessory respiratory organs of Anabas, Clarias, Heteropneustes.
   (b) Herdmania
   (c) Amphioxus.
4. Estimation of DO, chloride, BOD,COD,Hardness, pH and Alkalinity of water.
5. Study of fresh water ecosystem.

Scheme for Practical Examination M.M. 50

1.	Major Dissection	10 Marks
2.	Minor Dissection	04 Marks
3.	Spotting	12 Marks
4.	Limnological exercise	10 Marks
5.	Practical Record	05 Marks
6.	Viva Voce	05 Marks
7.	Collection	04 Marks
	Total	**50 Marks**

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Session - ~~2010-2011~~ 2016-17

Class	**: M.Sc**
Semester	**: III**
Subject	**: Zoology**
Practical I	**: Related to III & IV Theory Papers**

Scheme of practical examination **M.M. 50**

1.	Spotting	16
2.	Exercise on toxicology	10
3.	Study of culture methods related to theory	05
4.	Maintenance of aquarium	05
5.	Practical Record	04
6.	Viva Voce	05
7.	Collection	05

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Session - ~~2010-2011~~ [illegible] 2016-17

Class : M.Sc

Semester : III

Subject : Zoology

Practical II : Related to III & IV Theory Papers

1. Study of plankton.
2. Preparation and Maintenance of Aquarium.
3. Study of common weeds of fish ponds.
4. Methods of culture related to theory papers.
5. Study of abiotic factors of water related to fish life.
6. Determination of different toxic chemicals in samples of soil, water and air.
7. Toxicological testing methods , General tests, acute toxicity test and LD 50 test.
8. Identification and comments on Aquaculture animals.

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Post Graduate Semester wise Syllabus
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Session - ~~2010-2011~~ ~~2015-16~~ 2016-17

Class : M.Sc
Semester : IV
Subject : Zoology
Title of Subject Group : ANIMAL BEHAVIOUR AND NEUROPHYSIOLOGY
Paper No. : Paper- I (Compulsory)
Max. Marks : 35

Unit-1	1. Introduction: - Ethology as a branch of biology. - Animal psychology, classification of behavioral patterns, analysis of behaviour (ethogram) 2. Reflexes and complex behaviour. 3. Perception of the environment: mechanical, electrical, chemical, olfactory, auditory and visual. 4. Evolution and ultimate causation: Inheritance behaviour and relationships.
Unit-2	1. Neural and hormonal control of behaviour. 2. Genetic and environmental components in the development of behaviour. 3. Motivation: Drive, timing and interaction of drives, physiological basis of motivation, hormones and motivation, aggregation. 4. Communication: Chemical, visual, light and audio, evolution of language (primates).
Unit-3	1. Ecological aspects of behaviour: Habitat selection, food selection, optimal foraging theory, anti-predator defenses, aggression, homing territoriality, dispersal, hostparasite relations. 2. Biological rhythms: Circadian and circannual rhythms, orientation and navigation, migration of fishes, turtles and birds. 3. Learning and memory: Conditioning, habituation, insight learning, association learning and reasoning.
Unit-4	1. Reproductive behaviour. Evolution of sex and reproductive strategies, mating systems, courtship, sexual selection. parental care. 2. Social behaviour. aggregations, schooling in fishes, flocking in birds, herding in mammals, group selection, kin selection, altruism, reciprocal altruism, inclusive fitness, social organization in insects and primates.
Unit-5	1. Thermoregulation: Homeothermic animals, poikilotherms & Hiberhnation. 2. Receptor physiology a comparative study – Mechano receptor Photo receptor Phono receptor Chemo receptor Equilibrium receptor 3. Bioluminescence

Suggested Readings -

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

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Session - ~~2010-2011~~ 2016-17

Class	**: M.Sc**
Semester	**: IV**
Subject	**: Zoology**
Title of Subject Group	**: Gamete Biology, Development and differentiation**
Paper No.	**: Paper- II (Compulsory)**
Max. Marks	: 35

Unit-1	1. Comparative account of differentiation of gonads in mammals and invertebrate. 2. Spermatogenesis : Morphological basis in rodents and in any invertebrates. Gamete specific gene expression and genomics 3. Biochemistry of Semen : Semen composition and formation, assessment of sperm function. 4. Fertilization : Prefertilization events Biochemistry of fertilization post fertilization events.
Unit-2	1. Ovarian follicular growth and differentiation : morphology, endocrinology, molecular biology oogenesis and vitellogenesis, ovulation and ovum transport in mammals. 2. Biology of sex determination and sex differentiation a comparative account. 3. Multiple ovulation and embryo transfer technology : in vitro oocyte maturation, superovulation.
Unit-3	1. Hormonal regulation of ovulation, pregnancy and parturition. 2. Hormonal regulation of development of mammary gland and lactation. 3. Endocrinology and Physiology of placenta. 4. Cryopreservation of gametes and Embryo. 5. Teratological effects of xenobiotics on gametes.
Unit-4	1. Cell commitment and differentiation. 2. Germ cell determinants and germ cell migration. 3. Development of gonands. 4. Melanogenesis.
Unit-5	1. Creating new cell types, the basic evolutionary mystery. 2. Cell diversification in early Amphibian embryo, totipotency and pleuripotency. 3. Embryonic stem cells, renewal by stem cells, epidermis. 4. Connective tissue cell family 5. Haemopoietic stem cells : Blood cells formation, stem cell disorders.

Suggested Readings :

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

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Session - ~~2010-2011~~ 2016-17

Class : M.Sc
Semester : IV
Subject : Zoology
Title of Subject Group : Pisci Culture and Economic Importance of Fishes (Icthyology)
Paper No. : Paper- IV A (Optional)
Max. Marks : 35

Unit-I	1. Collection of fish seed from natural resources. 2. Dry bundh breeding of camps. 3. Wet bundh breeding of camps. 4. Hypophysation and breeding of Indian major camps.
Unit-2	1. Drugs useful in induced breeding of fish 2. Types of ponds required for fish culture farms 3. Management of hatcheries, nurseries and reany ponds 4. Management of stocking ponds
Unit-3	1. Composite fish culture 2. Prawn cuiture and pearl industries in India. 3. Fisheries resources of MP 4. Riverine fishries.
Unit-4	1. Costal fishries in India 2. Offshore and deep sea fisher's in India 3. Role of fishries in rural development 4. Sewage fishries
Unit-5	1. Methods of fish preservation 2. Marketing of fish in India. 3. Economic importance and by product of fishes 4. Shark liver oil industry in India Transport of live fish &fish seed.

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केंद्रीय अध्ययन मण्डल द्वारा अनुमोदित तथा म. प्र. के शासकीय

Session - ~~2010-2011~~ 2016-17

Class : M.Sc
Semester : IV
Subject : Zoology
Title of Subject Group : Icthyology (Fish)
: Structure and Function
Paper No. : Paper- IV A (Optional)
Max. Marks : 35

Unit-1	1. Origin and evolution of fishes 2. Classification of fishes as proposed by Berg 3. Fish integument 4. Locomotion
Unit-2	1. Alimentary canal and digestion 2. Accessary respiratory organs 3. Air bladder and its functions 4. Weberian ossicles their homologies and functions
Unit-3	1. Excretion and osmoregulation 2. Acoustico-lateral line system 3. Luminous organs 4. Colouration in fishes
Unit-4	1. Sound producing organs 2. Deep sea adaptions 3. Hill stream adaptions 4. migration in fishes
Unit-5	1. Sexual cycle and fecundity 2. parental care in fishes 3. Early development and hatching 4. Poisonous and venomous fishes.

Practicals –Fish (based on paper III (a)

1. Dissection of local fishes for the following
   a. Nervous system
   b. Urinogenital system
2. Minor dissection and preparation –scales,otolith, Ampulla of lorenzini, typesof tails, weberian ossicles
3. Study of museumspecimens
4. Collection and study of development stages of fish
5. Age determination by scales

Scheme of Practical examination

MM -25

1.	Major dissection	07 Marks
2.	Minor dissection	03 Marks
3.	Spotting	08 Marks
4.	Viva voce	04 Marks
5.	Practical Record	03 Marks
	Total	25 Mark

Suggested Readings : Paper III A & IV A

1. J.R. Norman – The History of fishes.
2. Nagaraja Rao – An introduction to fisheries
3. Lagler – Ichthyology
4. Herden Jones – Fish migration.
5. Marshals – The life of fishes.
6. Thomas – Diseases of fish.
7. Greenwood – Inter relationship of fishes.
8. Gopalji, Srivastava – Freshwater fishes of U.P. and Bihar.
9. Brown – Physiology of fishes Vol. I & II.
10. Hoar and Randall – Fish physiology of fishes Vol. I & IX.
11. Gunther Sterba C.N.H. – Freshwater fishes of the world Vol- VII.
12. W. Lanlva – The Fishes.
13. G.V. Nikolsky – The ecology of Fishes
14. Borgstram, – Fish as food Vol. I & II.
15. Nilsson – Fish physiology – Recent Advances
16. P.B. Myle and J.J. Cech – Fishes – An Introduction to Ichthyology.
17. Carl E. Bond – Biology of fishes.
18. M. Jobling – Environmental Biology of fishes.
19. Santosh Kumar & Manju Tembhre – Fish and Fisheries.
20. S.K. Gupta – Fish and Fisheries
21. K.P. Vijayas – Fish and Fishries.
22. Jhingaran – Fish and Fishries.

Post Graduate Semester wise Syllabus
as recommended by Central Board of Studies and approved by the Governor of M.P.
उच्च शिक्षा विभाग, म.प्र. शासन
स्नातकोत्तर कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम
केंद्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म. प्र. के राज्यपाल द्वारा अनुमोदित

Session - ~~2010-2011~~ 2016-17

Class : M.Sc
Semester : IV
Subject : Zoology
Title of Subject Group : General Practical
Paper No. : Paper- I & II (Compulsory)
Animal behavior and gamete biology

Max Marks : 50

Scheme for Practical Examination

1.	Exercise based on animal behavior	20	
2.	Exercise based on developmental biology	16	
3.	Practical record	05	
4.	Viva Voce		04
5.	Collection		05
	Total		50 Marks

Dr. P. K. Sanghvi
Professor & Head
P.G. Dept. of Zoology
Govt. Motilal Vigyan Mahavidyalaya Jabalpur (M.P.)

5/5/11

14.7.16

14.7

As recommended by Central Board of Studies and Approved by the Governor of ...

उच्च शिक्षा विभाग, म.प्र. शासन

स्नातकोत्तर कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम

केंद्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म. प्र. के राज्यपाल द्वारा अनुमोदित

Session - ~~2010-2011~~ 2016-17

Class : M.Sc

Semester : IV

Subject : Zoology

Title of Subject Group : General Practical

Paper No. : Paper- I & II (Compulsory)

Animal behavior and gamete biology

1. Exercise on Animal behavior
   a. Taxes
   b. Reflexes
   c. Biological clocks
   d. Social behavior
   e. Learning behavior
   f. Reproductive behavior

2. Developmental Biology
   - Study of embryological slides
   - Study of gametes of frog and chick
   - Study of fate maps
   - Study of different stages of spermatogenesis and oogenesis

Dr. P. K. Sanghvi
Professor & Head
P.G. Dept. of Zoology

5/5/11

14.7.16

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M.Sc. IV sem Icthyology practical examination scheme based on

paper III(a) and IV (a) 2016-17

Zoology
Practical II (Special Paper)
Ichthyology (III & IV)

Time: 5 hour **M: M 50**

1. Major dissection Nervous system of Walago, Mystus, Labeo, Toredo.		10
2. Minor dissection of internal ear, accessory, respiratory, organ, pituitary glands, webrian ossicles.		03
3. Mounting preparation of permanent slides.		03
4. Age determination of fish with the help of scales		03
5. Identification of fish		08
6. Spotting of museum specimen slides and bones.		08
7. Viva Voice.		05
8. Practical record, collection.	5+5	10
Total		50

Dr. P. K. Sanghvi
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Dept. of Zoology
Govt. P.G. College Ilanbur (M.P.)

5/5/16

14.7.16

14.7.16

Devi Ahilya Vishwavidylaya, Indore

स्नातकोत्तर पाठ्यक्रम की परीक्षा योजना

प्रथम सेमेस्टर सत्र 2019–20 के लिए

विषय – प्राणीशास्त्र प्रथम सेमेस्टर

M.Sc. Zoology

प्रश्नपत्र	प्रश्नपत्र का शीर्षक	अधिकतम अंक		न्यूनतम उत्तीर्णांक	
		सैध्दांतिक	सी. सी.ई	सैध्दान्तिक	सी.सी.ई
प्रथम	Biosystematics, Taxonomy and evolution	85	15	28	05
द्वितीय	Structure and Function of Invertebrates	85	15	28	05
तृतीय	Quantitative biology, biodiversity and wildlife	85	15	28	05
चतुर्थ	Biomolecules and structural Biology	85	15	28	05
	1- Practical -I	50	–	17	–
	2- Practical -II	50	–	17	–

विषय – प्राणीशास्त्र द्वितीय सेमेस्टर

प्रश्नपत्र	प्रश्नपत्र का शीर्षक	अधिकतम अंक		न्यूनतम उत्तीर्णांक	
		सैध्दांतिक	सी. सी.ई	सैध्दान्तिक	सी.सी.ई
प्रथम	Genral and Comparative animal Physiology and Endocronology	85	15	28	05
द्वितीय	Population Ecology and Environmental physiology	85	15	28	05
तृतीय	Tools and techniques in Biology	85	15	28	05
चतुर्थ	Molecular Cell Biology and Genetics	85	15	28	05
	1- Practical -I	50	–	17	–
	2- Practical -II	50	–	17	

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सत्र 2020–21

III Semester M.Sc. Zoology

प्रश्नपत्र	प्रश्नपत्र का शीर्षक	अधिकतम अंक		न्यूनतम उत्तीर्णांक	
		सैध्दांतिक	सी. सी.ई	सैध्दान्तिक	सी.सी.ई
प्रथम	Comparative Anatomy of Vertebrates	85	15	28	05
द्वितीय	Eco-Toxicology	85	15	28	05
तृतीय	Limnology	85	15	28	05
चतुर्थ	Aquaculture	85	15	28	05
	1- Practical -I	50	—	17	—
	2- Practical -II	50	—	17	—

विषय – प्राणीशास्त्र चतुर्थ सेमेस्टर

प्रश्नपत्र	प्रश्नपत्र का शीर्षक	अधिकतम अंक		न्यूनतम उत्तीर्णांक	
		सैध्दांतिक	सी. सी.ई	सैध्दान्तिक	सी.सी.ई
प्रथम	Animal Behaviour And Neurophysiology(Compulsory)	85	15	28	05
द्वितीय	Gamete ,Biology, Development and Differentiation (Compulsory)	85	15	28	05
तृतीय	Ichthyology (Fish Structure and Functions)	85	15	28	05
चतुर्थ	Pisci Culture and Economic Importance of Fishes (Icthyology) (Optional)	85	15	28	05
	3- Practical -I	50	—	17	—
	4- Practical -II	50	—	17	

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एम.ए. एम.कॉम. एम.एस.सी. की सेमेस्टर परीक्षा उत्तीर्ण करने के लिए योजना निम्नानुसार रहेगी :–

1. प्रत्येक प्रश्न पत्र 100 अंकों का होगा। 33 प्रतिशत उत्तीर्णांक होगा।
2. कुल अंको (Aggregate marks) में 40 प्रतिशत अंक प्राप्त करने होगें अर्थात 160/400 अंक अर्जित करने होगे।
3. प्रत्येक सेमेस्टर में दो विषयों में ए.टी./के.टी. की पात्रता रहेगी।

सरल कमांक	कक्षा	सैद्धांतिक/प्रायोगिक प्रश्नपत्रों के लिए निर्धारित		न्यूनतम प्राप्तांक	एग्रीगेट प्राप्तांक
		सैद्धांतिक अंक	आंतरिक मूल्यांकन अंक		
1.	M.A., M.Sc., M.Com. M.H.Sc. (सेमेस्टर प्रणाली नियमित)	85	15	28 05	40%
2.	प्रायवेट परीक्षार्थियों के लिए	100	—	33	40%
				Aggregate Marks 160/400	

(Gyan Prakash)

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Syllabus of M.Sc. I Semester Zoology Session 2019-20

Paper – 1: Biosystematics and Evolution

Marks: 15 (CCE)+ 85(Th.) = 100

Unit I	Definition and basic concepts of biosystematics taxonomy and classification. History of Classification. Types of Texonomy Chemotaxonomy, Cytotaxonomy and Molecular taxonomy Dimensions of speciation and taxonomic characters. Species concepts : different species concepts. Theories of biological classification.
Unit II	Origin of reproductive isolation, biological mechanism of genetic incompatibility. Taxonomic procedures: Taxonomic collections , preservation ,curetting, process of identification. Taxonomic keys, different types of keys, their merits and demerits. International code of Zoological Nomenclature (ICZN). Operative principles, interpretation and Application of important rules: Formation of Scientific names of various Taxa.
Unit-III	Phylogenetic . gradualism and punctuated equilibrium. Modes of speciation (allopatry & sympatry) Evaluation of biodiversity indices. Evaluation of Shannon-Weiner Index. Evaluation of Dominance Index. Similarity and Dissimilarity Index.
Unit-IV	Concepts of evolution and theories of organic evolution. Neo Darwinism and population genetics: A. Hardy-Weinberg law of genetic equilibrium. B. A detailed account of destabilizing forces: i Natural selection ii Mutation iii Genetic Drift iv Migration v Meiotic drive. Trends in Evolution Molecular Evolution a) Gene evolution b) Evolution of gene families c) Assessment of molecular variation and its significance.
Unit-V	Major trends in the origin of higher categories Micro and macro evolution. Molecular population genetics Pattern of cha nges in nucleotide and amino and sequence. Phylogenetic and biological concept of species. Origin and Evolution & Taxonomically important microbes and animals.

SUGGESTED READING MATERIAL

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

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Syllabus of M.Sc. I Semester Zoology Session 2019-20

Paper – 2 : Structure and Functions of Invertebrates

Marks: 15 (CCE)+ 85(Th.) = 100

UNIT- I	1. Theories of Origin of metazoa 2. Organization of Coelom A. Acoelomates B. Pscudocoelomates C. Coclomates 3. Locomotion. A. Amoeboid flageller and cillary movement in protozoa B. Hydrostatic movement in Coelenterata. C. Locomotion in annelids. D. Locomotion in Echinodermats. 4. F. 1. Structure, affinities and life history of the following minor Phyla - A. Rotifera B. Entoprocta C. Phoronida D. Ectoprocta
UNIT - II	1. Patterns of Feeding and digestion in lower invertebrates. 2. Patterns of Feeding and digestion in higher invertebrates. 3. Organs of respiration and Mechanism in lower invertebrates. 4. Organs of respiration and Mechanism in higher invertebrates.
UNIT - III	1. Excretion in lower invertebrates. 2. Excretion in aquatic higher invertebrates. 3. Excretion in terrestrial higher invertebrates. 4. Mechanism of Osmoregulation in fresh water and Marine Invertebrates.
UNIT- IV	1. Primitive Nervous systems in Coelenterata and Echinodermata. 2. Advanced nervous system in Annelida, 3. Advanced nervous system in Arthropoda. 4. Advanced nervous system in Mollusca.
UNIT - V	1. Larval forms of Trematoda,Cestoda and Annelida. 2. Larval forms of Crustacea. 3. Larval forms of Mollusca. 4. Larval forms of Echinoderms.

Suggested Reading Material –

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

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Syllabus of M.Sc. I Semester Zoology Session 2019-20

Paper – 3: Quantitative Biology, Biodiversity and Wildlife

Marks: 15 (CCE)+ 85(Th.) = 100

UNIT- I	**Biostatistics** 1. Mean – Definition & Calculation. 2. Median - Definition & Calculation. 3. Mode - Definition & Calculation. 4. Standard deviation (SD) - Definition and Calculation. 5. Graphs & Histogram including application. 6. Bar diagram & Pictogram including application.
UNIT - II	1. Sampling theory 2. Experimental designing : Completely randomized design and randomized block design 3. Variance and analysis 4. Co-relation, types of correlation. 5. Karl persones coefficient correlation 6. T- test , Chi square test.
UNIT - III	**Biodiversity** 1. Concept and principal of biodiversity. 2. Causes for the loss of biodiversity. 3. Biodiversity conservation method. 4. National Biodiversity status of india. (vertebrates.) 5. Medicinal uses of various parts of animals.
UNIT- IV	**Wildlife of India** 1. Values of wildlife positive and negative values. 2. Wildlife protection Act.(Legal Provision) 3. Causes for the extinction of Wildlife. 4. Conservation of wildlife in India. 5. Endangered and threatened Indian species. 6. Wildlife Corridor. 7. Dianosaure – Causes of extinction
UNIT - V	**Wildlife and conservation** 1. National Parks and Sanctuaries 2. Project Tiger & Project Gir lion 3. Crocodile – conservation. 4. wildlife in M.P. with references to Reptiles, Birds and mammals 5. Biospheres reserves & Safari Park. 6. Wildlife Crossing.

Ist Semester
Suggested reading materials:

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

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Suggested Readings Materials

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

- Pelon, E.C. The interpretation of ecological data : A promer on classifica ordivation.
- A. lewis – Biostatics
- B.K. Mahajan Methods in Biostatics
- V.B. Saharia wildlife in India
- S.K. Tiwari wildlife in central India
- J.D. Murrey Mathematical Biology
- Georgs & Wilians Startical method
- R.K. Tondon Biodiversity Texonomy & Ecology
- M.P. Arora An Introduction to prevantology
- P.C. Kotwal Biodiversity and conservation

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Syllabus of M.Sc.I Semester Zoology Session 2019-20

Paper – 4 : Biomolecules and Structural Biology

Marks: 15 (CCE)+ 85(Th.) = 100

Unit-I	**Chemical Foundation of biology - I** 1. pH, PK, acids bases, buffers, weak bonds 2. Acid soluble pool of living tissues . 3. Nanoparticles. 4. Structure of amino acid and peptides. 5. Primary, secondary, tertiary and quaternary structures of proteins, protein folding and denaturation.
Unit-II	**Chemical Foundation of biology – II** 1. Structure and types of Nucleotides. 2. DNA: Double helical structure of DNA, 3. DNA replication, recombination and repair 4. RNA: Structure of RNA, role of RNA in gene expression 5. Functional importance of lipid storage and membrane lipids
Unit-III	**Carbohydrate and Fat matabolism:** 1. Basic concepts of metabolism: Coupled and interconnecting reactions of metabolism cellular energy resources and ATP synthesis 2. Glycolysis and gluoneogenesis, glycogenolysis. 3. Citric acid cycle 4. Oxidative phosphorylation. 5. Fatty acid metabolism.
Unit-IV	**Biosynthesis:** 1. RNA synthesis and splicing 2. Biosynthesis of amino acids 3. Biosynthesis of nucleotides 4. Protein synthesis and its regulation. 5. Biosynthesis of membrane lipids and steroids and fatty acids.
Unit-V	**Enzymes and Thermodynamics:** 1. Enzymes: Terminologies, classification and basics of enzyme kinetics 2. Mechanism of enzyme catalysis 3. Regulation of enzyme action 4. Concept of free energy and thermodynamic principles in biology 5. Energy rich bonds, compound and biological energy transducers resonance, isomerisation.

Suggested Readings:

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

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SEMESTER - I
Practical : Ist

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M,M, 50

1. Spotting – Classification and identification of various phylum. 10
2. One major dissection of various systems of invertebrates – 10
   Squilla, Prawn, Sepia, Loligo.
3. One minor dissection- Grosshopper, Honeybee, Echinus, Starfish, Aplysia. 5
4. Mounting material - permanent balsum mount 5
5. Spottings related with Adaptation. Homologics, Analogics and modification of month parts :
   5
6. Viva Voce.
   10
7. Pratical Records, collection 5

Total Marks 50

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

M,M, 50

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

Total Marks 50

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Syllabus of M.Sc. II Semester (Zoology) Session 2019-20

PAPER – I : General and Comparative Animal Physiology and Endocrinology

Marks: 15 (CCE)+ 85(Th.) = 100

Unit - I	1. Respiratory pigments through different phylogenic groups 2. Transport of oxygen and carbon dioxide in blood and body fluids 3. Regulation of respiration 4. Physiology of impulse transmission through nerves and synapses 5. Autonomic nervous system, neurotransmitters and their physiological functions
Unit-II	1. Comparative physiology of digestion 2. Patterns of nitrogenons excretion in different animal groups 3. Osmoregulation in different animal groups 4. Thermoregulation in homeotherms, poikilotherms and hibernation 5. Physiology of pregnancy, placental hormones, pregnancy diagnosis tests, parturition and breast and lactation (human being)
Unit-III	1. Comparative study of mechanoreception 2. Comparative study of photoreception 3. Comparative study of phonoreception & equilibrium reception 4. Comparative study of chemoreception 5. Comparative study of Lateral line systems in Fishes.
Unit-IV	1. Bioluminescence 2. Pheromones (Invertebrates & vertebrates) 3. Chromatophores and regulation of their function among animals 4. Hormones, chemical nature and their classification. 5. Mechanisms of hormone action (a) protinous Hormones (b) steroidal Hormones.
Unit-V	1. Structure & Function of pituitary, pancreas, adrenal and thyroid. 2. Phylogeny of endocrine glands (pituitary, pancreas, adrenal, thyroid) 3. Ontogeny of endocrine glands 4. Neuroendocrine sysyem in vertebrates. 5. Hormone receptors . signal transaction mechanisms 6. Hormones and reproduction a. Seasonal breeders b. Continuous breeders

Paper-I List of Books

SUGGESTED READING MATERIAL

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

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Department of Zoology

Syllabus of M.Sc. II Semester (Zoology) Session 2019-20

PAPER – V : Population Ecology and Environmental physiology

Marks: 15 (CCE)+ 85(Th.) = 100

Unit - I	1. Population and its characteristics – Size & density, Dispersion, Natality, Mortality, Age distribution, Biotic Potential. 2. Population Growth and Population Dynamics: Population growth patterus (J & S Shaped), Population cycles. 3. Factors affecting population: Population Regulation – Extrinsic and intrinsic factors.
Unit-II	1. Environmental Limiting Factors: Liebig Law of Minimum, Shelford's Law of Tolerance, Combined concept of Limiting factors. 2. Physical Factors workings as Limiting Factors. 3. Biotic Factors (a) Inter-specific Biotic Factors, (i) Positive Interactions – Scavenging, Proto-cooperation, Symbiosis (Mutualism & Commensalism). (ii) Negative Interactions – Ammensalism, Competition, Parasitism, Predation, Antibiosis. (b)Intra-specific Biotic Factors: colonization, Aggregation, Social organization.
Unit-III	(a)**Eco – physiological Adaptations –** 1. Aquatic (Primary & Secondary aquatic animals) Adaptation. 2. Aerial or Volant Adaptation. 3. Desert Adaptation. 4. Fossorial Adaptation. 5. Cursorial Adaptation. 6. Scansorial Adaptation. 7. Deep Sea Adaptation. b. **Protective Adaptation** – Mimicry: Protective, Aggressive and conscious.
Unit-IV	1. Environmental Degradation (Pollution & Human health): Air, Water, Soil, Thermal, Noise, Plastic and their Control. 2. Natural Resources & their conservation: Water, Soil, Forest, Mineral resources. 3. Environmental impact assessment and Sustainable development
Unit-V	1. Radiation Ecology: Kinds of Radiations ,Sources of Radiations, Effect of Radiations, Control of Radiation pollution. 2. Global Warming & Green House effect: causes of green House effect, Effects of green house gases, ozone depletion. 3.Physiological response to body exercise , Meditation ,Yoga and their effects.

Suggested Readings:

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

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Syllabus of M.Sc. II Semester (Zoology) Session 2019-20

PAPER – IV: Tools and Techniques in Biology

Marks: 15 (CCE)+ 85(Th.) = 100

Unit - I	1. General Principle, Instrumentation and applications of a) Colorimeter b) Spectrophotometer c) Flame photometer d) Light, Electron microscope and phase contrast microscope 2. Separation techniques:- a) Centrifugation – Ultracentrifugation, Density gradient & differential Centrifugation. b) Chromatography- Principle and Applications of Paper, TLC, Affinity, Gel and HPLC. c) Electrophoresis – Principles and Applications of PAGE and Agarose gel electrophoresis.
Unit-II	1. Microbiological Techniques:- a) Types of Bacterial culture media and sterilization. b) Inoculation Methods. c) Microbial assay of vitamins and amino acids. d) Different Staining techniques for Bacterial identification. e) Basic design and Applications of Fermentor. 2. Cryotechniques a) Cryopreservation of cells, tissues, organs and organisms. b) Freeze fracture and freeze drying method.
Unit-III	1. Radioactivity:- a) Types and applications of different Radioisotopes . b) Measurement of radioactivity. c) Autoradiography. 2. Immunological techniques and its applications:- a) Immunodiffusion (single and double). b) Immunoelectrophoresis. c) Immunofluorocence & Immunoblotting d).ELISA & RIA.
Unit-IV	1. Microtomy a) Types of microtomes b) Fixatives & fixation of tissue c) Dehydration of tissue and paraffin block preparation d) Sectioning, stretching & staining (Single & Double) 2. Cell culture techniques. a) Design and functioning of tissue culture laboratory b) Essential components and Preparation of tissue culture media.
Unit-V	1. Cytological techniques a) Karyotyping & Giant chromosome. b) Chromosome banding techniques (G,C,Q, R, banding) c) Flow cytometry. 2. Molecular biology techniques a) Insitu hybridization (FISH and GISH) b) Southern and northern hybridization. c) DNA Sequencing method. d) Polymerase Chain reaction (PCR):- Principle, procedure & applications.

Suggested Readings:

1. **Biophysical Methods: Tools and Techniques in Biology Part I-Microscopy** - Author Name: Dr. Nisha Raghav and Dr. Ravindra Pratap Raghava
2. **Biological Instrumentation and Methodology: (Tools and Techniques of Biology) - Author Name: Dr. P.K. Bajpai, Published by S. Chand & Company Ltd**
3. **Tools, Techniques and Assessment in Biology: A Course Guide for Students and Teachers - Author Name: John Adds, Erica Larkcom, Nelson Thornes**
4. **Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology by Andreas Hofmann (Editor), Samuel Clokie (Editor)**
5. **Molecular Biology and Biotechnology– by Ramawat K.G. (Author), Goyal Shaily (Author)**
6. **Fundamentals and Techniques of Biophysics and Molecular Biology by Pranav Kumar (Author)**

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Devi Ahilya Vishwavidylaya, Indore

Syllabus of M.Sc. II Semester (Zoology) Session 2019-20

PAPER-IV: Molecular Cell Biology and Genetics

Marks: 15 (CCE)+ 85(Th.) = 100

Unit-I	**Biomembrane** 1. Molecular composition arrangement and functional consequences 2. Transport across cell membrane, diffusion, active transport, pumps, uniports, symports and antiports 3. Micro filaments and microtubules structure and dynamics 4. Cell movements, intracellular transport, role of kinesins and dynein. 5. Transportation of proteins through golgi post translational modifications.
Unit-II	**Cell. Cell signalling** 1. Cell surface receptors 2. Second messenger system 3. Signaling from plasma membrane to nucleus 4. Gap junctions and connexins 5. Integrins
Unit-III	**Cell, Cell adhesion and communication** 1. Ca++ dependant homophilic cell . cell ahension 2. Ca++ independent homophilic cell . cell ahension 3. Genome organization, hierarchy in organization 4. Chromosomal organization of genes. 5. Non Coding DNA and its importance.
Unit-IV	**Sex determination** 1. Sex determination in drosophila and mammals. 2. Basic concept of dosage compensation 3. Cytogenetic of human chromosomes 4. Human genome project (HGP) & its significance. 5. Transgenic animals & their applications
Unit-V	**Genetic Diseases and Genomics** 1 Human genetic disorders and gene therapy. 2 Prenatal diagnosis & genetic counseling 3 Genetic screening 4 Structural and Functional Genomics. 5 Gene libraries

Suggested Readings

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

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Practical : Ist

Devi Ahilya Vishwavidylaya, Indore M.M. 50

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

Exercise :

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

Total Marks

SEMESTER - II
Practical : IInd

M.M. 50

Tools and Techniques for biology.
Molecular cell Biology and Genetics

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

Total Marks

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Syllabus of M.Sc. III Semester Session 2020-21

Paper – V : Comparative Anatomy of Vertebrates

Marks: 15 (CCE)+ 85(Th.) = 100

Unit-1	1.	Origin of Chordata: Protochordata and **Euchordata.**
	2.	Vertebrate morphology: Shap, size, colour and their importance.
	3.	Comparative account of integument and its derivatives in vertebrates.
	4.	Comparative account of respiratory organs in vertebrates.
	5.	Comparative account of Alimentary Canal in vertebrates.
Unit-2	1.	Comparative account of heart in vertebrates.
	2.	Comparative account of Evolution of aortic arches and portal systems in vertebrates.
	3.	Comparative account of blood and blood circulation in vertebrates.
	4.	Comparative account of girdles and limb bones of vertebrates.
	5.	Comparative account of jaw suspensorium and vertebral column.
Unit-3	1.	Comparative account of Kidney in vertebrates.
	2.	Comparative account of Reproductive organs in vertebrates.
	3.	Comparative account of olfactory organ and taste buds.
	4.	Comparative account of brain and spinal card in vertebrate.
	5.	Comparative account of Cranial and spinal nerves in vertebrates.
Unit-4	1.	Comparative account of electroreceptors.
	2.	Anatomical aerial adaptations in vertebrates.
	3.	Anatomical aquatic adaptations in vertebrates.
	4.	Anatomical terrestrial adaptation in vertebrates.
	5.	Origin, evolution, general organization and affinities of Ostracoderms .
Unit-5	1.	General organization of Cyclostomes.
	2.	Specialized and degenerated characters of Cyclostomes.
	3.	General organization of Gnathostomes .
	4.	General account of Elasmobranchi and Holocephali.
	5.	General account of Dipnoi and Crossoptergii.

Suggested Readings :

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

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Syllabus of M.Sc. III Semester Session 2020-21

Paper – 10 : Eco- Toxicology

Marks: 15 (CCE)+ 85(Th.) = 100

Unit-1	1. General principles of Environmental Biology with emphasis on ecosystems. 2. Abiotic and biotic factors of ecosystems. 3. Communities of the environment, their structure & significance. 4. Energy flow in environment : Ecological energetics.
Unit-2	1. Productivity, Production and analysis. 2. Recycling and reuse, reduce technologies for solid and liquid wastes and their role in environmental conservation. 3. Remote sensing –basic concepts and its uses in biological systems. 4. Environmental indicators and their role in environmental balance.
Unit-3	1. Kinds of environmental pollution, causes and their control methods. 2. Radioactive compounds and their impact on the environment. 3. Vehicular exhaust pollution, causes and remedies. 4. Noise pollution causes and remedies.
Unit-4	1. Toxicology- Basic concepts, principles and various types of toxicological agents. 2. Toxicity testing principles, hazards, risks and their control methods. 3. Food toxicants and their control methods. 4. Public Health Hazards due to environmental disasters.
Unit-5	1. Pesticides, types, nature and their effects on environment. 2. Important heavy metals, their role in environment and diseases caused by them. 3. Agrochemical use and misuse, alternatives. 4. Plastic pollution and remedies.

Suggested Readings :

1. Clark : Elements of ecology
2. Odum : Fundamentals of Ecology
3. South Woods : Ecological methods
4. Trivedi and Goel : Chemical and biological methods for water pollution studies

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Syllabus of M.Sc. III Semester Session 2020-21

Paper – III : Limnology

Marks: 15 (CCE)+ 85(Th.) = 100

Unit-1	1. Limnology – Definition, historical and scope. 2. Fresh water resources of India and their Management. 3. Lotic ecosystem of freshwater and their fishery (a) Rivers (b) Springs (streams). 4. Lentic ecosystem of fresh water and their fishery (a) Ponds (b) Lakes (c) Reservoir
Unit-2	1. Physical characteristics of fresh water fishery Resources – Depth, Light, Temperature, Turbidty. 2. Chemical characteristic of fresh water fishery resources – Part A – Minerals i.e., Carbonate, Bicarbonate, Phosphate, Sulphate, chloride, Nitrate, Nitrite. 3. Chemical characteristics of fresh water fishery resources Part B – Gases – CO_2 and DO. 4. Estimation and Role of BOD and COD in the fish culture.
Unit-3	1. Phytoplankton-Defination, Types, seasonal variation and role in fish culture. 2. Zooplankton Defination ,Types, seasonal variation and role in fish culture. 3. Aquatic insects and their importance in fish culture. 4. Aquatic birds and their importance in fish culture.
Unit-4	1. Aquatic (fresh water) pollution: its causes effect on fishes and remedy. 2. Pollution status of River Ganga and their remedy including Ganga action plan i.e. measures taken to clean river Ganga. 3. Pollution status of River Yamuna action plan i.e. measures taken to clean river Yamuna. 4. Bioindicatior and their relationship with water quality.
Unit-5	1. Sewage – Defination, Composition, treatment and use in pisciculture. 2. Hydrophytes and their role in fish culture. 3. Uses and Misuses of various inland water resources. 4. Legislations to regulate fresh water pollution.

Suggested Readings :

Anathakrishnan : Bioresources Ecology
Goldman : Limnology
Odum : Ecology
Pawlosuske : Physico- chemical methods for water
Wetzal : Limnology
Trivedi & Goyal : Chemical and biological methods for water pollution studies
Welch : Limnology Vols. I-II
Perkins : Ecology
Arora : Fundamentals of environmental biology

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Syllabus of M.Sc. III Semester Session 2020-21

Paper -IV: Aquaculture

Marks: 15 (CCE)+ 85(Th.) = 100

Unit-1	1. Aquaculture: history, definition, scope & importance. 2. Fishery resources of India in general & Madhya Pradesh in particular. 3. Abiotic & biotic factors of water necessary for fish life. 4. Ecological characteristics of lakes & rivers. 5. General ecological characteristics of reservoirs of India.
Unit-2	1. Fish culture:- Mono, Poly, mixed and composite Fish culture. 2. Fresh water prawn culture and its prospects in India. 3. Culture of Mussels, clams, oysters & pearl oysters. 4. Sewage fed fish culture, paddy cum fish culture 5. Frog culture.
Unit-3	1. Stripping and bundh breeding 2. Hypophysation and breeding. 3. Transport of live fishes & seeds. 4. Different types of crafts & gears used for fish catching. 5. Common weeds of fish ponds and methods of their eradication.
Unit-4	1. Fresh water fish farm engineering: selection of site, construction of fish farm & soil chemistry. 2. Designing, layout & construction of different types of fish ponds. 3. Fresh water aquarium - Setting and management of fresh water aquarium. 4. Fish preservation & processing. 5. By products of fish Industry & their utility.
Unit-5	1. Water pollution, its effects on fisheries and methods of its abatment. 2. Bactrial and viral diseases in fishes and their control. 3. Proftozoan and Helminthes diseases in fishes and their control. 4. Biochemical composition and nutritional value of fish. 5. Fish marketing.

Suggested Readings :

1. C.B.L. Shrivastava : Fishes of India
2. Jhingaran : Fish and fisheries of India
3. S.S. Khanna : An Introduction to fishes
4. R.S. Rath : Fresh water Aquaculture
5. Gopalji Shrivastava : Fishes of U.P. & Bihar
6. H.D. Kumar : Sustanibility & 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. Vishwas : Fish & Fisheries

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Semester : III
Subject : Zoology
Practical I : Related to I & II Theory Papers

1. Study of Specimens, slides and bones related to theory papers.
2. Major Dissection- Various systems of Labeo , Wallago, Torpedo
3. Minor Dissection-
   (a) Accessory respiratory organs of Anabas, Clarias, Heteropneustes.
   (b) Herdmania
   (c) Amphioxus.
4. Estimation of DO, chloride, BOD,COD,Hardness, pH and Alkalinity of water.
5. Study of fresh water ecosystem.

Scheme for Practical Examination M.M. 50

1.	Major Dissection	10 Marks
2.	Minor Dissection	04 Marks
3.	Spotting	12 Marks
4.	Limnological exercise	10 Marks
5.	Practical Record	05 Marks
6.	Viva Voce	05 Marks
7.	Collection	04 Marks
	Total	50 Marks

Semester : III
Subject : Zoology
Practical I : Related to III & IV Theory Papers

Scheme of practical examination M.M. 50

1.	Spotting	16
2.	Exercise on toxicology	10
3.	Study of culture methods related to theory	05
4.	Maintenance of aquarium	05
5.	Practical Record	04
6.	Viva Voce	05
7.	Collection	05

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emester : III

Subject : Zoology

: Related to III & IV Theory Papers

Practical II

1. Study of plankton.
2. Preparation and Maintenance of Aquarium.
3. Study of common weeds of fish ponds.
4. Methods of culture related to theory papers.
5. Study of abiotic factors of water related to fish life.
6. Determination of different toxic chemicals in samples of soil, water and air.
7. Toxicological testing methods , General tests, acute toxicity test and LD 50 test.
8. Identification and comments on Aquaculture animals.

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Syllabus of M.Sc. IV Semester Session 2020-21

Paper 13 - ANIMAL BEHAVIOUR AND NEUROPHYSIOLOGY

Marks: 15 (CCE)+ 85(Th.) = 100

Unit-I	1. Introduction: Ethology as a branch of biology, Classification of behavioral patterns, analysis of behavior (ethogram). 2. Reflexes and complex behavior. 3. Perception of the environment: mechanical, electrical, chemical, olfactory, auditory and visual. 4. Evolution and ultimate causation: Inheritance behavior and relationships.
Unit-2	1. Neural and hormonal control of behavior. 2. Genetic and environmental components in the development of behavior. 3. Motivation: (a) Drive, timing and interaction of drives, (b) physiological basis of motivation, (c) hormones and motivation, (d) aggregation. 4. Communication: Chemical, visual, light and audio, evolution of language (primates).
Unit-3	1. Ecological aspects of behavior: Habitat selection, food selection, optimal foraging theory, anti-predator defenses, aggression and homing territoriality, dispersal, hostparasite relations. 2. Biological rhythms: Circadian and circannual rhythms, orientation and navigation. migration of fishes, turtles and birds. 3. Learning and memory: Conditioning, habituation, insight learning, association learning and reasoning.
Unit-4	1. Reproductive behaviour. Evolution of sex and reproductive strategies, mating systems, courtship, sexual selection. parental care. 2. Social behaviour. aggregations, schooling in fishes, flocking in birds, herding in mammals, group selection, kin selection, altruism, reciprocal altruism, inclusive fitness. social organization in insects and primates. 3. Parental behaviour.
Unit-5	1. Thermoregulation: Homeothermic animals, poikilotherms & Hibernation. 2. Bioluminescence. 3. Vocalization & Communication in birds. 4. Hormone, drugs and human behaviour.

sted Readings -

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

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Paper 14 - Gamete Biology, Development and Differentiation

Marks: 15 (CCE)+ 85(Th.) = 100

Unit-I	1. Comparative account of gonads in mammals. 2. Spermatogenesis: Morphological basis in rodents. Gamete specific gene expression and genomics. 3. Biochemistry of Semen: Semen composition and formation, assessment of sperm function. 4. Fertilization: Pre fertilization events, fertilization events and post fertilization events. 5. Biochemistry of fertilization.
Unit-II	1. Ovarian follicular growth and differentiation : morphology, type of ovaries, 2. Endocrinology of mammals, molecular biology. 2. Oogenesis and vitellogenesis, ovulation and ovum transport in mammals. 3. Biology of sex determination and sex differentiation a comparative account. 4. Multiple ovulation and embryo transfer technology : in vitro oocyte maturation, super ovulation.
Unit-III	1. Hormonal regulation of ovulation, pregnancy and parturition. 2. Hormonal regulation of development of mammary gland and lactation. 3. Hormonal regulation and Physiology of placenta. 4. Cryopreservation of gametes and Embryo. 5. Teratological effects of xenobiotics.
Unit-IV	1. Cell commitment and differentiation. 2. Germ cell determinants and germ cell migration. 3. Development of gonands. 4. Melanogenesis. 5. Frog and Chick embryology.
Unit-V	1. Creating new cell types, the basic evolutionary mystery. 2. Cell diversification in early Amphibian embryo, totipotency and pleuripotency. 3. Embryonic stem cells, renewal by stem cells, epidermis. 4. Connective tissue cell family 5. Haemopoietic stem cells : Blood cells formation, stem cell disorders.

Suggested Readings :

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

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Syllabus of M.Sc. IV Semester Session 2020-21

Paper IV ~~III~~ **Ichthyology (Fish Structure and Functions)** Paper III

Marks: 15 (CCE)+ 85(Th.) = 100

Unit-I	1. Origin and evolution of fishes. 2. Classification of fishes as proposed by Berg. 3. Fish integument and its derivatives. 4. Fins and girdles: structure and types. Origin and evolution of paired fins 5. Mechanism of Locomotion.
Unit-II	1. Alimentary canal and digestion. 2. Accessary respiratory organs. 3. Air bladder and its functions. 4. Weberian ossicles their homologies and functions. 5. Brain and cranial nerves.
Unit-III	1. Excretion and osmoregulation. 2. Acoustico-lateral line system. 3. Luminous organs. 4. Colouration in fishes. 5. Electric organs in fish.
Unit-IV	1. Poisonous organs in fishes. (Poisonous and venomous fishes). 2. Sound producing organs. 3. Deep sea adaptations. 4. Hill stream adaptations. 5. Migration in fishes.
Unit-V	1. Reproductive system 2. Sexual cycle and fecundity. 3. Parental care in fishes. 4. Early development and hatching.5. Biology of fish fry and fingerlings.

Suggested Readings : Paper III & IV A

1. J.R. Norman – The History of fishes.
2. Nagaraja Rao – An introduction to fisheries
3. Lagler – Ichthyology.
4. Herden Jones – Fish migration.
5. Marshal's The life of fishes.
6. Thomas Diseases of fish.
7. Greenwood Inter relationship of fishes.
8. Gopalji, Srivastava – Freshwater fishes of U.P. and Bihar
9. Brown – Physiology of fishes Vol. I & II.
10. Hoar and Randall – Fish physiology of fishes Vol. I & IV
11. Gunther Sterba C.N.H. – Freshwater fishes of the world Vol. VII.
12. W. Landon – The Fishes.
13. G.V. Nikolsky – The ecology of Fishes
14. Borgstram – Fish as food Vol. I & II.
15. Nilsson – Fish physiology – Recent Advances
16. P.B. Nyle and J.J. Cech – Fishes – An Introduction to Ichthyology
17. Carl L. Pond – Biology of fishes.
18. M. Jobling – Environmental Biology of fishes.
19. Santosh Kumar & Manju Tembhre – Fish and Fisheries
20. S.K. Gupta – Fish and fisheries.
21. K.P. Vishwas – Fish and Fishries
22. Jhingaran – Fish and Fishries

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Syllabus of M.Sc. IV Semester Session 2020-21

Paper-IV: Pisci Culture and Economic Importance of Fishes

Marks: 15 (CCE)+ 85(Th.) = 100

Unit-I	1. Collection of fish seed from natural resources. 2. Streeping method of breeding. 3. Dry bundh breeding of carps. 4. Wet bundh breeding of carps. 5. Hypophysation and breeding of Indian major carps.
Unit-II	1. Drugs/hormones useful in induced breeding of fish. 2. Types of ponds required for fish culture. 3. Management of hatcheries and nurseries. 4. Management of rearing ponds and stocking ponds.
Unit-III	1. Composite fish cultures 2. Prawn culture techniques. 3. Pearl culture technique. 4. Fisheries resources of MP 5. Riverine fisheries in India and their problems.
Unit-IV	1. Costal fisheries in India, its problems and solution. 2. Offshore and deep sea fisheries of India, its problems and solution. 3. Role of fisheries in rural development 4. Sewage fed fisheries
Unit-V	1. Methods of fish preservation 2. Marketing of fishes in India. 3. Economic importance and by product of fishes 4. Shark liver oil, its characteristics, manufacture and importance. 5. Transport of live fish & fish seed.

Suggested Readings:

1. Carp and Pond Fish Culture: Including Chinese Herbivorous Species, Pike, Tench, Zander, Wels Catfish, Goldfish, African Catfish and Sterlet Book by Chris Seagrave, Gizella Tamas, and Laszlo Horvath.
2. Freshwater Aquaculture: A Handbook for Small Scale Fish Culture in North America Book by William O. McLarney.
3. Fish Hatchery Management - Book by Robert G. Piper.
4. Pisciculture: An Address on the Artificial Breeding of Fish, Their Habits, Etc., Delivered Before the Detroit Scientific Association Book by Clark N W.
5. A Textbook of Pisciculture and Aquarium Keeping Book by H. S. Jagtap, S. N. Mukherjee, and V. K. Garad
6. Aquaculture and Fisheries Paperback – 2014 by N Arumugam.
7. A Text Book of Fish Biology and Fisheries by S S Khanna (Author)
8. Fresh Water Aquaculture – R.K. Rath.
9. General and Applied Ichthyology by S.K. Gupta, P.C. Gupta.
10. An Introduction to Fishes – S.S. Khanana, H.R. Singh.

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Semester : IV
Subject : Zoology
Title of Subject Group : General Practical
Paper No. : Paper- I & II (Compulsory)
Animal behavior and gamete biology

1. Exercise on Animal behavior
   a. Taxes
   b. Reflexes
   c. Biological clocks
   d. Social behavior
   e. Learning behavior
   f. Reproductive behavior

2. Developmental Biology
   - Study of embryological slides
   - Study of gametes of frog and chick
   - Study of fate maps
   - Study of different stages of spermatogenesis and oogenesis

Semester : IV
Subject : Zoology
Title of Subject Group : General Practical
Paper No. : Paper- I & II (Compulsory)
Animal behavior and gamete biology

Max Marks : 50

Scheme for Practical Examination

1.	Exercise based on animal behavior	20
2.	Exercise based on developmental biology	16
3.	Practical record	05
4.	Viva Voce	04
5.	Collection	05
	Total	50 Marks

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M.Sc. IV sem Ichthyology practical examination scheme based on

paper III(a) and IV (a)

Zoology

Practical II (Special Paper)

Ichthyology (III & IV)

M: M 50

Time: 5 hour

1. Major dissection Nervous system of Walago, Mystus, Labeo, Toredo.		10
2. Minor dissection of internal ear, accessory, respiratory, organ, pituitary glands, webrian ossicles.		03
3. Mounting preparation of permanent slides.		03
4. Age determination of fish with the help of scales		03
5. Identification of fish		08
6. Spotting of museum specimen slides and bones.		08
7. Viva Voice.		05
8. Practical record, collection.	5+5	10
Total	—	50

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स्नातकोत्तर पाठ्यक्रम की परीक्षा योजना
2016-2017
प्रथम सेमेस्टर सत्र ~~2015-16~~ के लिए

विषय – प्राणीशास्त्र प्रथम सेमेस्टर

M.Sc. Zoology

प्रश्नपत्र	प्रश्नपत्र का शीर्षक	अधिकतम अंक		न्यूनतम उत्तीर्णांक	
		सैध्दांतिक	सी. सी.ई	सैध्दान्तिक	सी.सी.ई
प्रथम	Biosystematics, Taxonomy and evolution	85	15	28	05
द्वितीय	Structure and Function of Invertebrates	85	15	28	05
तृतीय	Quantitative biology, biodiversity and wildlife	85	15	28	05
चतुर्थ	Biomolecules and structural Biology	85	15	28	05
	1- Practical -I	50	–	17	–
	2- Practical -II	50	–	17	–

विषय – प्राणीशास्त्र द्वितीय सेमेस्टर

प्रश्नपत्र	प्रश्नपत्र का शीर्षक	अधिकतम अंक		न्यूनतम उत्तीर्णांक	
		सैध्दांतिक	सी. सी.ई	सैध्दान्तिक	सी.सी.ई
प्रथम	Genral and Comparative animal Physiology and Endocronology	85	15	28	05
द्वितीय	Population Ecology and Environmental physiology	85	15	28	05
तृतीय	Tools and techniques in Biology	85	15	28	05
चतुर्थ	Molecular Cell Biology and Genetics	85	15	28	05
	1- Practical -I	50	–	17	–
	2- Practical -II	50	–	17	

Department of Higher education, Govt. of M.P.
Semester wise Syllabus for Postgraduates
As recommended by Central board of Studies and
Approved by HE the Governor of M.P.

Session ~~2015-16~~ 2016-17

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

Max.Marks. 100
Theory 85
C.C.E. 15

Unit I

. Definition and basic concepts of biosystematics taxonomy and classification.
- History of Classification.
Trends in biosystematics : Chemotaxonomy, cytotaxonomy and molecular taxonomy
Dimensions of speciation and taxonomic characters.
Species concepts : species category, different species concepts, subspecies and other infra-specific categories.
Theories of biological classification: hierarchy of categories.

Unit II

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

Unit III

- Taxonomic categories.
- Evaluation of biodiversity indices.

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

Unit-IV

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

Unit – V

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

Molecular population genetics

- Pattern of changes in nucleotide and amino and sequence.
- Ecological significance of molecular variations (genetic polymorphism).

Genetic & Speciation

- Phylogenetic and biological concept of species.
- Patterns and mechanism of reproductive isolation.
- Modes of speciation (allopatry & sympatry)

Origin and Evolution & Economically important microscopes and animals.

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Department of Higher education, Govt. of M.P.
Semester wise Syllabus for Postgraduates
As recommended by Central board of Studies and
Approved by HE the Governor of M.P.

Session ~~2015-16~~ 2016-17

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

Max.Marks. 100
Theory 85
C.C.E. 15

SUGGESTED READING MATERIAL

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

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Department of Higher education, Govt. of M.P.
Semester wise Syllabus for Post Graduates
As recommended by Central board of Studies and
Approved by HE the Governor of M.P.

Session ~~2013-15~~ 2016-17

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

Max.Marks. 100
Theory 85
C.C.E. 15

UNIT –I

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

UNIT –II
A: NUTRITION AND DIGESTON
Patterns of Feeding and digestion in lower metazoa, Mollusea, Echinodermata Filter feeding in polychaeta.
B: Respiration
Organs of respiration : Gills, lungs and trachea, respiratory pigments.
Mechanism of respiration.

UNIT – III
EXCRETION
Excretion in lower invertebrates.
Excretion in higher invertebrates.
Mechanism of Osmoregulation.

UNIT – IV
NERVOUS SYSTEM.

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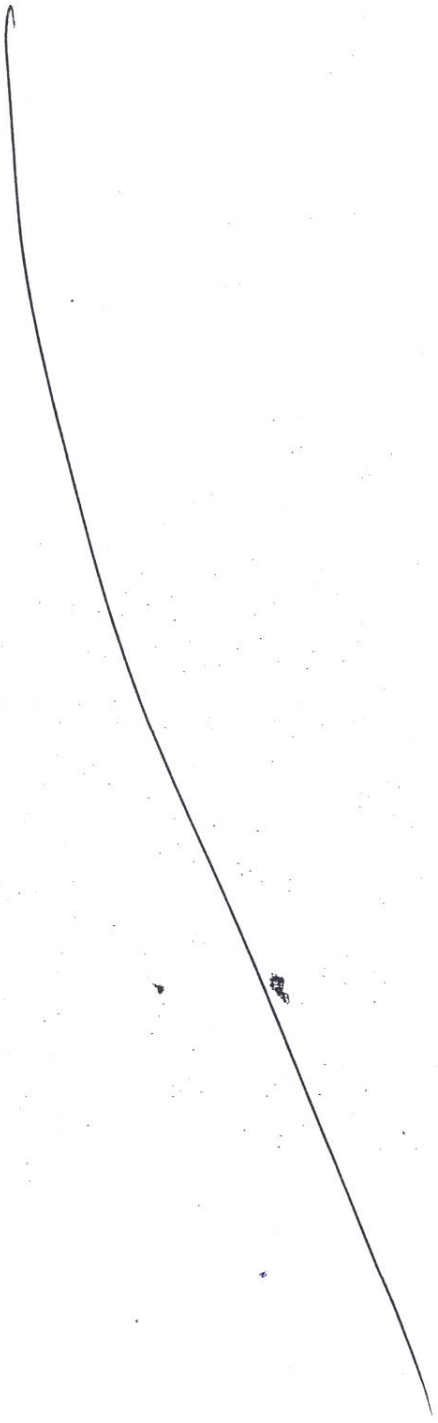
A. Primitive Nervous systems-Coelenterata and Echinodermata.
B. Advanced nervous system in Annelida,
Arthropoda (Crustacea and Insecta) and Mollusa (Cephalopoda)



UNIT – V

A. INVERTEBRATES LARVAL FORMS AND THEIR EVOLUTIONARY SIGNIFICANCE.

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

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

A. Rotifera
B. Entoprocta

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

A. Phoronida
B. Ectoprocta

Suggested Reading Material –

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

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Department of Higher education, Govt. of M.P.

Semester wise Syllabus for Post Graduates

As recommended by Central board of Studies and
Approved bv HE the Governor of M.P.
Session ~~2013-14~~ 2016-17

M.Sc. Previous

I Sem III Paper

Quantitative biology, biodiversity and wildlife

Unit – I Quantitative biology

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

Unit – II

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

14/10 14/10/11

24.9.13 14.7.16 14.7

Unit – III Biodiversity

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

Unit – IV Wildlife of India, types of wildlife

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

Unit – V Wildlife and conservation

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

Suggested Readings Materials

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

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

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Ist Semester

Suggested reading materials:

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

Department of Higher education, Govt. of M.P.
Semester wise Syllabus for Postgraduates
As recommended by Central board of Studies and
Approved by HE the Governor of M.P.
Session ~~2013-14~~ 2016-17

Max.Marks. 100
Theory 85
C.C.E. 15

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

Unit – I
Chemical Foundation of bilogy — 73

- PH, PK, acids bases, buffers, weak bonds
- Free energy, resonance, isomerisation
- Acid soluble pool of living tissues – aminoacids, monosaccorides, oligosaccharides, nucleotides, peptides. — 104, 105, 106, 207
- Nanoparticles
- Biomaterials

Unit – II

1. Primary, Secondry, tertiary and quaternary structures of proteins, protein folding and denaturation — 64, 69, 1
2. DNA & RNA: Double helical structure of DNA, Structure of RNA, role of RNA in gene expression — 121, 129
3. DNA replication, recombination and repair — 745
4. Functional importance of lipid storage and membrane lipids — 324
5. Membrane channels and pumps — 345

Unit – III

1. Basic concepts of metabolism: Coupled and interconnecting reactions of metabolism cellular energy recources and ATP synthesis — 31
2. Glycolysis and glyconeogenesis - 425
3. Citric acid cycle - 465 — 491
4. Oxidative phosphorylation : Protein and it's regulation
5. Fatty acid metabolism: Synthesis and degradation of fatty acids

Unit – IV

1. RNA synthesis and splicing — 781
2. Biosynthesis of amino acids - 665
3. Biosynthesis of nucleotides - 693
4. Biosynthesis of membrane lipids and steroids - 715 – 726
5. Protein synthesis — 873

24.9.13 14.7.14 14.7

Unit – V

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

Suggested Readings:

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

Department of Higher education, Govt. of M.P.
Semester wise Syllabus for Postgraduates
As recommended by Central board of Studies and
Approved by HE the Governor of M.P.
Session ~~2013-14~~ 2016-17

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

M,M, 50

1. Spotting – Classification and identification of various phylum. 10
2. One major dissection of various systems of invertebrates – 10
   Squilla, Prawn, Sepia, Loligo.
3. One minor dissection- Grosshopper, Honeybee, Echinus, Starfish, Aplysia. 5
4. Mounting material - permanent balsum mount 5
5. Spottings related with Adaptation. Homologics, Analogics and modification of month parts :
   5
6. Viva Voce.
   10
7. Pratical Records, collection 5

Total Marks 50

24.9.13 14.7.16 14.7

Department of Higher education, Govt. of M.P.
Semester wise Syllabus for Postgraduates
As recommended by Central board of Studies and
Approved by HE the Governor of M.P.
Session ~~2013-14~~ 2016-17

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

M,M, 50

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

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14.7.16
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Department of Higher education, Govt. of M.P.
Semester wise Syllabus for Postgraduates
As recommended by Central board of Studies and
Approved by HE the Governor of M.P.
Session ~~2011-12~~ 2016-17

Max.Marks. 100
Theory 85
C.C.E. 15

Class: M.Sc.
SEMESTER - II
Paper: Ist Paper
GENRAL AND COMPARATIVE ANIMAL PHYSIOLOGY AND ENDOCRONOLOGY

Unit – I

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

Unit – II

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

Unit – III

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

Unit – IV

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

Unit –V

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

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Department of Higher education, Govt. of M.P.
Semester wise Syllabus for Postgraduates
As recommended by Central board of Studies and
Approved by HE the Governor of M.P.
Session ~~2013-16~~ 2016-17

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

SUGGESTED READING MATERIAL

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

24.9.13 14.7.16 14.7.16 14.7

Department of Higher education, Govt. of M.P.
Semester wise Syllabus for Postgraduates
As recommended by Central board of Studies and
Approved by HE the Governor of M.P.
Session ~~2011-12~~ 2016-17

M. Sc. Previous
Zoology
Semester II
Paper II

Max.Marks. 100
Theory 85
C.C.E. 15

Population Ecology and Environmental physiology

Unit I

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

Unit II

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

Unit III

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

Unit IV

Environmental poliution and human health.

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

P.S.
Govt. P.

Unit V

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

Suggested Readings:

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

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Department of Higher education, Govt. of M.P.
Semester wise Syllabus for Postgraduates
As recommended by Central board of Studies and
Approved by HE the Governor of M.P.
Session ~~2013-15~~ 2016-17

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

Max.Marks. 100
Theory 85
C.C.E. 15

Unit – I

1. Microsocopy, principle & applications
- Light microscope and phase contrast microscope
- Fluorescence microscope
- Electron microscope
- Confocal microscopy

2. General Principle and applications of
- Colorimeter
- Spectrophotometer
- Ultra centrifuge
- Flame photometer
- Beer and Lambert's law.

3. Microbiological techniques
- Media Preparation and sterilization
- Inoculation and growth monitoring.
- Microbial assays.
- Microbial identification (cytological staining methods for bacterial and fungal strains)
- Use of fermentors

Unit – II

1. Computer aided techniques for data presentation data analysis, statistical techniques.
2. Cryotechniques
- Cryopreservation of cells, tissues, organs and organisms.
- Cryosurgery
- Cryotomy
- Freeze fracture and freeze drying.

3. Separation techniques. Chromatography, principle type and applicants.
- Electrophoresis, Principles, types and applications PAGE and agarose gel electrophoresis.
- Organelle separation by centrifugation.

Unit – III

1. Radioisotope and man isotope techniques in biology.

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a. Sample preparation for radioactive counting
b. Autoradiography.

2. Immunological techniques
- Immunodiffusion (Single & Double)
- Immuno electrophoresis
3. Techniques immuno detection
- Immunocyto / histochemistry
- Immunioblotting, immunodetection, immunofluroscence.
4. Surgical techniques.
- Organ ablation (eg. Ovariactomy, adrenalectomy)
- Perfusion techniques
- Stereotaxy
- Indwelling cathethers
- Biosensors.

Unit –IV

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

Unit – V

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

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Department of Higher education, Govt. of M.P.
Semester wise Syllabus for Postgraduates
As recommended by Central board of Studies and
Approved by HE the Governor of M.P.
Session 2015-16 2016-17

M.Sc. Previous Zoology

Max.Marks. 100
Theory 85
C.C.E. 15

II Sem IV Paper

Topic – Molecular Cell Biology and genetics

Unit – I Biomembrane

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

Unit – II Cell – Cell signaling

- Cell surface receptors
- Second messenger system
- Signaling from plasma membrane to nucleus
- Gap junctions and connexius
- Entegrius Integrins

Unit – III Cell – Cell adhesion and communication

- Ca^{++} depandant homophilic cell – cell ahension
- Ca^{++} independant homophilic cell – cell ahension
- ~~Gap junctions and connexius~~
- Genome organization, hierarchy in organization

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- Chromosomal organization of genes and non-coding DNA

Unit –IV Sex determination

- Sex determination in dtosophila
- Sex determination in mammals
- Basic concept of dosage compensation
- Cytogenetic of humen chromosoms
- Human genome project (HGP) purpose 2 Implicatic

Unit – V Genetic Diseases and Genomics

- Human gene therapy
- Prenatal diagnosis & genetic counseling
- Genetic screening
- Structural Genomics
- Functional Genomics
- Gene libraries
- Trasgenic animals & their applications

Suggested Readings

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

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Department of Higher education, Govt. of M.P.
Semester wise Syllabus for Postgraduates
As recommended by Central board of Studies and
Approved by HE the Governor of M.P.

Session ~~2013-15~~ 2016-17

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

M.M. 50

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

Exercise :

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

24.9.13 14.7.16 14.7

Department of Higher education, Govt. of M.P.
Semester wise Syllabus for Postgraduates
As recommended by Central board of Studies and
Approved by HE the Governor of M.P.

Session ~~2015-16~~ 2016-17

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

M,M. 50

Tools and Techniques for biology.
Molecular cell Biology and Genetics

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

24.5.16 14.7.16 14.7

स्नातकोत्तर पाठ्यक्रम की परीक्षा योजना

प्रथम सेमेस्टर सत्र 2017-18 के लिए

विषय – प्राणीशास्त्र प्रथम सेमेस्टर

M.Sc. Zoology

प्रश्नपत्र	प्रश्नपत्र का शीर्षक	अधिकतम अंक		न्यूनतम उत्तीर्णांक	
		सैध्दांतिक	सी. सी.ई	सैध्दान्तिक	सी.सी.इ
प्रथम	Biosystematics, Taxonomy and evolution	85	15	28	05
द्वितीय	Structure and Function of Invertebrates	85	15	28	05
तृतीय	Quantitative biology, biodiversity and wildlife	85	15	28	05
चतुर्थ	Biomolecules and structural Biology	85	15	28	05
	1- Practical -I	50	–	17	–
	2- Practical -II	50	–	17	–

विषय – प्राणीशास्त्र द्वितीय सेमेस्टर

प्रश्नपत्र	प्रश्नपत्र का शीर्षक	अधिकतम अंक		न्यूनतम उत्तीर्णांक	
		सैध्दांतिक	सी. सी.ई	सैध्दान्तिक	सी.सी.ई
प्रथम	Genral and Comparative animal Physiology and Endocronology	85	15	28	05
द्वितीय	Population Ecology and Environmental physiology	85	15	28	05
तृतीय	Tools and techniques in Biology	85	15	28	05
चतुर्थ	Molecular Cell Biology and Genetics	85	15	28	05
	1- Practical -I	50	–	17	–
	2- Practical -II	50	–	17	

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Department of Higher education, Govt. of M.P.
Semester wise Syllabus for Postgraduates
As recommended by Central board of Studies and
Approved by HE the Governor of M.P.

Session 2017-18

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

Max.Marks. 100
Theory 85
C.C.E. 15

Unit I

. Definition and basic concepts of biosystematics taxonomy and classification.
- History of Classification.
Trends in biosystematics : Chemotaxonomy cytotaxonomy and molecular taxonomy
Dimensions of speciation and taxonomic characters.
Species concepts : species category, different species concepts, subspecies and other infra-specific categories.
Theories of biological classification: hierarchy of categories.

Unit II

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

Unit III

- Taxonomic categories.
- Evaluation of biodiversity indices.

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

Unit-IV

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

Unit – V

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

Molecular population genetics

- Pattern of changes in nucleotide and amino and sequence.
- Ecological significance of molecular variations (genetic polymorphism)

Genetic & Speciation

- Phylogenetic and biological concept of species.
- Patterns and mechanism of reproductive isolation.
- Modes of speciation (allopatry & sympatry)

Origin and Evolution & Economically important microscopes and animals.

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As recommended by Central board of Studies and
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Session 2017-18

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

Max.Marks. 100
Theory 85
C.C.E. 15

SUGGESTED READING MATERIAL

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

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Session 2017-18

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

Max.Marks. 100
Theory 85
C.C.E. 15

UNIT –I

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

UNIT –II

A: NUTRITION AND DIGESTON

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

B: Respiration

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

UNIT – III

EXCRETION

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

UNIT – IV

NERVOUS SYSTEM.

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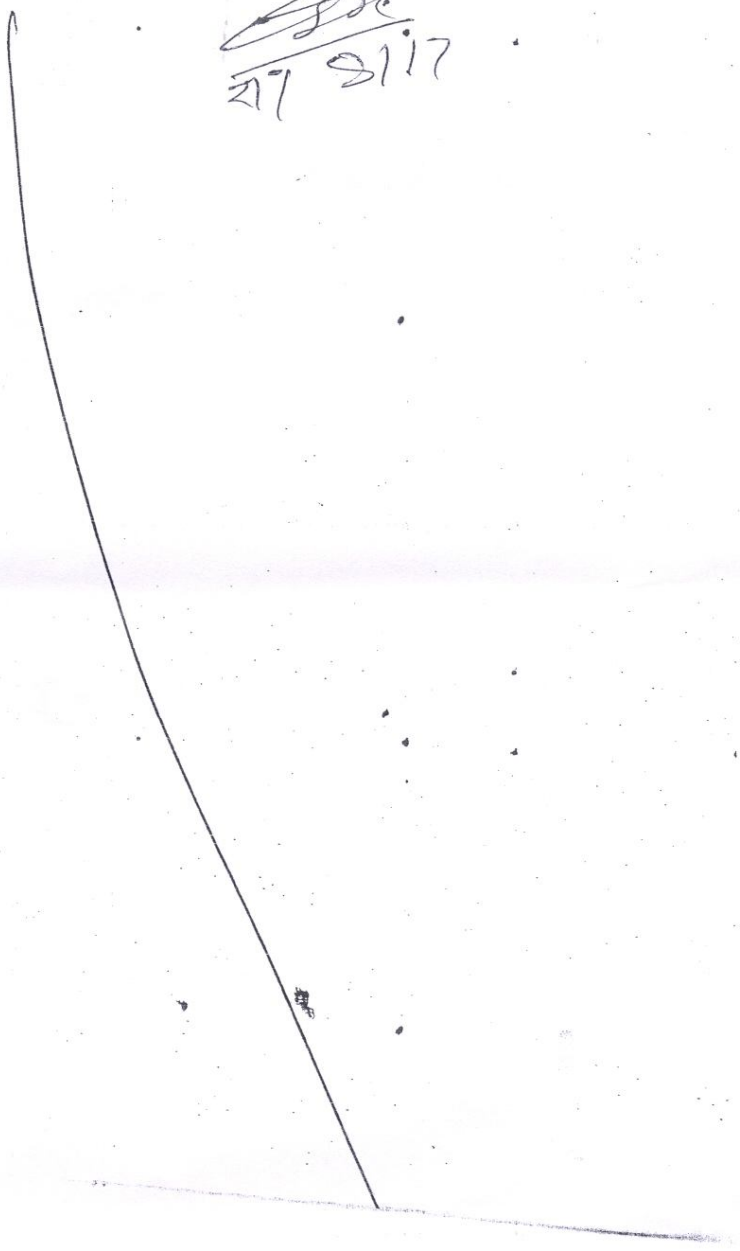
A. Primitive Nervous systems-Coelenterata and Echinodermata.

B. Advanced nervous system in Annelida, Arthropoda (Crustacea and Insecta) and Mollusa (Cephalopoda)



UNIT – V

A. INVERTEBRATES LARVAL FORMS AND THEIR EVOLUTIONARY SIGNIFICANCE.

A. Trematoda and Cestoda

B. Larval forms of Crustacea

C. Larval forms of Mollusea

D. Larval forms of Echinodermata.

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

A. Rotifera

B. Entoprocta

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

A. Phoronida

B. Ectoprocta

Suggested Reading Material –

1. Hyman, L.H. The invertebrates, Nol. I.protozoa through Ctenophora, McGraw Hill Co., New York

2. Barrington, E.J.W. Invertebrate structure and function. Thomas Nelson anmd Sons Ltd., London.

3. Jagerstein, G. Evolution of Metazoan life cycle, Academic Press, New York & London.

4. Hyman, L.H. The Invertebrates. Vol. 2. McGraw Hill Co., New York.

5. Hyman, L.H. The Invertebrates. Vol. 8. McGraw Hill Co., New York and London.

6. Barnes, R.D. Invertebrates Zoology, III edition. W.B. Saunders Co. Philadelphia.

7. Russel-Hunter, W.D. A biology of higher invertbrates, the Macmillan Co. Ltd., London.

8. Hyman, L.H. The Invertebrates smaller coelomate groups, Vol. V.Mc.Graw Hill Co., New York.

9. Read, C.P. Animal Parasitism. Parasitism. prentice Hall Inc., New Jersey.

10. Sedgwick, A.A. Student text book of Zoology. Vol. I,II and III. Central Book Depot, Allahabad.

11. Parker, T.J., haswell W.A. Text book of Zoology, Macmillan Co., London.

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M.Sc. Previous

I Sem III Paper

Quantitative biology, biodiversity and wildlife

Unit – I Quantitative biology

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

Unit – II

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

Unit – III Biodiversity

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

Unit – IV Wildlife of India, types of wildlife

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

Unit – V Wildlife and conservation

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

Suggested Readings Materials

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

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- Pelon, E.C. The interpretation of ecological data : A promer on classifica ordivation.
- A. lewis – Biostatics
- B.K. Mahajan Methods in Biostatics
- V.B. Saharia wildlife in India
- S.K. Tiwari wildlife in central India
- J.D. Murrey Mathematical Biology
- Georgs & Wilians Startical method
- R.K. Tondon Biodiversity Texonomy & Ecology
- M.P. Arora An Introduction to prevantology
- P.C. Kotwal Biodiversity and conservation

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Ist Semester

Suggested reading materials:

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

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Max.Marks. 100
Theory 85
C.C.E. 15

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

Unit – I
Chemical Foundation of bilogy

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

Unit – II

1. Primary, Secondry, tertiary and quaternary structures of proteins, protein folding and denaturation
2. DNA & RNA: Double helical structure of DNA, Structure of RNA, role of RNA in gene expression
3. DNA replication, recombination and repair
4. Functional importance of lipid storage and membrane lipids
5. Membrane channels and pumps

Unit – III

1. Basic concepts of metabolism. Coupled and interconnecting reactions of metabolism cellular energy recources and ATP synthesis
2. Glycolysis and glyconeogenesis
3. Citric acid cycle
4. Oxidative phosphorylation : Protein and it's regulation
5. Fatty acid metabolism: Synthesis and degradation of fatty acids

Unit – IV

1. RNA synthesis and splicing
2. Biosynthesis of amino acids
3. Biosynthesis of nucleotides
4. Biosynthesis of membrane lipids and steroids
5. Protein synthesis

Unit – V

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

Suggested Readings:

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

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

	M,M, 50
1. Spotting – Classification and identification of various phylum.	10
2. One major dissection of various systems of invertebrates – Squilla, Prawn, Sepia, Loligo.	10
3. One minor dissection- Grosshopper, Honeybee, Echinus, Starfish, Aplysia.	5
4. Mounting material - permanent balsum mount	5
5. Spottings related with Adaptation. Homologics, Analogics and modification of month parts : 5	
6. Viva Voce. 10	
7. Pratical Records, collection	5
Total Marks	50

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

M,M, 50

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

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