

सत्र 2016-17

III Semester M.Sc. Zoology

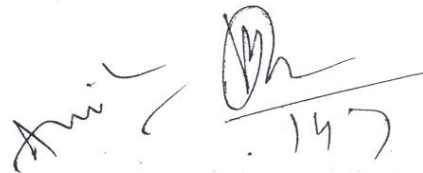
प्रश्नपत्र	प्रश्नपत्र का शीर्षक	अधिकतम अंक		न्यूनतम उत्तीर्णांक	
		सैध्दांतिक	सी. सी.ई	सैध्दान्तिक	सी.सी.ई
प्रथम	Comparative Anatomy of Vertebrates	85	15	28	05
द्वितीय	Limnology	85	15	28	05
तृतीय	Neo-Toxicology	85	15	28	05
चतुर्थ	Aquaculture	85	15	28	05
	1- Practical -I	50	-	17	-
	2- Practical -II	50	-	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	Fisci Culture and Economic Importance of Fishes (Ichthyology) (Optional)	85	15	28	05
	Molecular Cell Biology and Genetics Ichthyology	85	15	28	05
	3- Practical -I	50	-	17	-
	4- Practical -II	50	-	17	-

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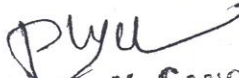

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Class	: M.Sc
Semester	: III
Subject	: Zoology
Title of Subject Group	: Comparative Anatomy of Vertebrates
Paper No.	: Paper- I
Max. Marks	: 35

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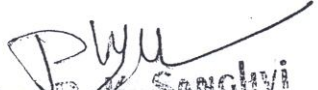
Session - ~~2010-2011~~ ~~2015-16~~ 2016-17



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.Morphometry – 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 :

A nathakrishnan	: Bioresources Ecology
Goldman	: Limnology
Odum	: Ecology
Pawlosuske	: Physico- chemical methods for water
Wetzel	: 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 ~~2010-11~~ **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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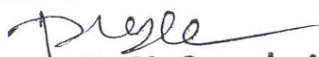
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Class	: M.Sc
Semester	: III
Subject	: Zoology
Title of Subject Group	: Aquaculture
Paper No.	: Paper- IV
Max. Marks	: 35


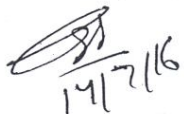
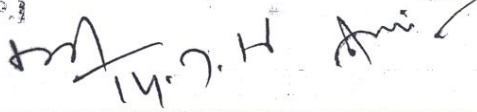
Unit-1	1. Aquaculture: history, definition, scope & importance. 2. Fishery resources of India in general & Madhya Pradesh in particular. 3. Abiotic & biotic factors of water necessary for fish life. 4. Ecological characteristics of lakes & rivers. 5. General ecological characteristics of reservoirs of 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 & identification. 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 abatement. 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 : Sustainability & Management of Aquaculture & Fisheries
7. A.J.K. Mainan : Identification of fishes
8. R. Sanatam : A Manual of fresh water Aquaculture
9. S.K. Gupta : Fish & Fisheries
10. P.D. Pandey : Fish & Fisheries
11. K.P. Vishwas : Fish & Fisheries


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Department of Higher Education, Govt. of M.P.
Post Graduate Semester wise Syllabus
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Session - 2010-2011 ~~2011-12~~

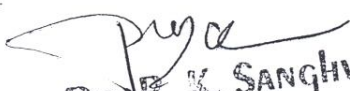
2016-17

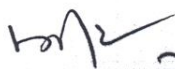
Class : M.Sc
Semester : III
Subject : Zoology
Practical I : Related to I & II Theory Papers

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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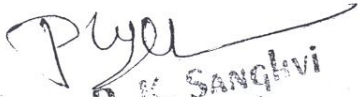
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Session - ~~2010-2011~~ ~~2011-12~~ ~~2012-13~~ ~~2013-14~~ ~~2014-15~~ ~~2015-16~~ 2016-17


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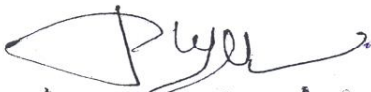
Session - 2010-2011- ~~2015-16~~ 2016-17

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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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	<p>1. Introduction:</p> <ul style="list-style-type: none"> - Ethology as a branch of biology. - Animal psychology, classification of behavioral patterns, analysis of behaviour (ethogram) <p>2. Reflexes and complex behaviour.</p> <p>3. Perception of the environment: mechanical, electrical, chemical, olfactory, auditory and visual.</p> <p>4. Evolution and ultimate causation: Inheritance behaviour and relationships.</p>
Unit-2	<p>1. Neural and hormonal control of behaviour.</p> <p>2. Genetic and environmental components in the development of behaviour.</p> <p>3. Motivation: Drive, timing and interaction of drives, physiological basis of motivation, hormones and motivation, aggregation.</p> <p>4. Communication: Chemical, visual, light and audio, evolution of language (primates).</p>
Unit-3	<p>1. Ecological aspects of behaviour: Habitat selection, food selection, optimal foraging theory, anti-predator defenses, aggression, homing territoriality, dispersal, host-parasite relations.</p> <p>2. Biological rhythms: Circadian and circannual rhythms, orientation and navigation, migration of fishes, turtles and birds.</p> <p>3. Learning and memory: Conditioning, habituation, insight learning, association learning and reasoning.</p>
Unit-4	<p>1. Reproductive behaviour. Evolution of sex and reproductive strategies, mating systems, courtship, sexual selection, parental care.</p> <p>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.</p>
Unit-5	<p>1. Thermoregulation: Homeothermic animals, poikilotherms & Hibernation.</p> <p>2. Receptor physiology a comparative study –</p> <ul style="list-style-type: none"> Mechano receptor Photo receptor Phono receptor Chemo receptor Equilibrium receptor <p>3. Bioluminescence</p>

Suggested Readings -

1. Eibl-Eibesfeldt, I. Ethology. The biology of Behaviour. Holt, Rinehart & 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. Animal Behaviour : A Synthesis of Ethology and Comparative Psychology. McGraw Hill, New York.
5. Alcock, J. Animal Behaviour : An Evolutionary approach. Sinauer Assoc. Sunderland, Massachusetts, USA.
6. Bradbury, J.W. and S.L. Vehrencamp. Principles of Animal Communication. Sinauer Assoc. Sunderland, Massachusetts, USA.

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Session - 2010-2011

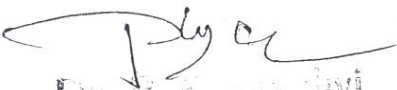
~~2010-11~~ 2016-17

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 gonads. 4. Melanogenesis.
Unit-5	1. Creating new cell types, the basic evolutionary mystery. 2. Cell diversification in early Amphibian embryo, totipotency and pluripotency. 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. Developmental Biology, Sinauer Associated Inc. Massachusetts.
5. Ethan Bier, the cold Spring. The cold spring Harbor laboratory Press, New York.
6. Balinsky B.I. Introduction to Embryology sanders, Philadelphia.
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 ~~2010-2011~~
2016-17

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

Unit-1	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 culture 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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April

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उत्तर प्रदेश विद्यापीठ, म.प्र. इलाहाबाद
 इलाहाबाद केंद्र
 केंद्रीय अध्येषण मण्डल द्वारा अनुमोदित तथा म. प्र. 2 के अधीन प्रमाणित
 Session - ~~2016-17~~ 2016-17

Class : M.Sc
 Semester : IV
 Subject : Zoology
 Title of Subject Group : Ichthyology (Fish)
 Structure and Function
 Paper- I/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. Accessory respiratory organs 3. Air bladder and its functions 4. Weberian ossicles their homologies and functions
Unit-3	1. Excretion and osmoregulation 2. Acoustice-lateral line system 3. Luminous organs 4. Colouration in fishes
Unit-4	1. Sound producing organs 2. Deep sea adaptations 3. Hill stream adaptations 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))

- Dissection of local fishes for the following
 - Nervous system
 - Urinogenital system
- Minor dissection and preparation - scales, otolith, Ampulla of Lorenzini, types of tails, Weberian ossicles
- Study of museum specimens
- Collection and study of development stages of fish
- 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

- J.R. Norman - The History of fishes.
- Nagaraja Rao - An introduction to fisheries.
- Lagler - Ichthyology
- Herden Jones - Fish migration.
- Marshals - The life of fishes.
- Thomas - Diseases of fish.
- Greenwood - Inter relationship of fishes.
- Gopalji. Srivastava - Freshwater fishes of U.P. and Bihar.
- Brown - Physiology of fishes Vol. I & II.
- Hoar and Randall - Fish physiology of fishes Vol. I & IX.
- Gunther Stead C & H. - Freshwater fishes of the world Vol- VII.
- W. Laidlaw - The Fishes.
- G.V. Nikolsky - The ecology of Fishes
- Borgstram - Fish as food Vol. I & II.
- Nilsson - Fish physiology - Recent Advances
- P.B. Myle and J.J. Cech - Fishes - An Introduction to Ichthyology.
- Carl L. Pond - Biology of fishes.
- M. Jobling - Environmental Biology of fishes.
- Santosh Kumar & Manju Tembhe - Fish and Fisheries.
- S.K. Gupta - Fish and Fisheries
- K.P. Vas - Fish and Fisheries.
- Jhingan - Fish and Fisheries.

Session - 2010-2011 ~~2010-11~~
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	04
4.	Viva Voce		05
5.	Collection		
Total			50 Marks

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Dr. P. K. Sanghvi
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5/5/11
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Session - 2010-2011-~~2011-2012~~

2016-17

Class

: M.Sc

Semester

: IV

Subject

: Zoology

Title of Subject Group

: General Practical

Paper No.

: Paper- I & II (Compulsory)

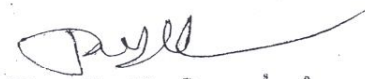
Animal behavior and gamete biology

1. Exercise on Animal behavior


- Taxes
- Reflexes
- Biological clocks
- Social behavior
- Learning behavior
- 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


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

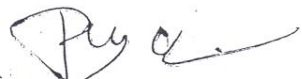
paper III(a) and IV (a) 2016-17

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

Time: 5 hour

M: M 50


1. Major dissection Nervous system of Walago, Mystus, Labeo, Tored.	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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(18.08.18)