

BARKATULLAH UNIVERSITY, BHOPAL

FOURTH SEMESTER

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| 1. Course Code : | 9. Maximum marks : 600 |
| 2. Course Name : M.Sc. Zoology | 10. Minimum Passing percentage : 36 |
| 3. Total Paper : 04 | 11. Project work : 100 |
| 4. Compulsory Paper : 02 | 12. Project work passing marks :: 36 |
| 5. Optional Paper : 02 | |
| 6. Practical : 02 | |
| 7. Practical Passing mark: 18 each marsh | |
| 8. Project : Y | |

Sub. code	Subject Name	Theory									Practical		Total	
		Paper					CCE		Total Marks		Max.	Min.	Max.	Min.
		1 st	2 nd	3 rd	Max.	Min.	Max.	Min.	Max.	Min.				
Compulsory paper Theory														
	Animal Behavior and Neurophysiology	85	0	0	85	131	15	5	100	36	0	0	100	18 36
	Gamete Biology, Development and Differentiation	85	0	0	85	131	15	5	100	36	0	0	100	18 36
	Optional (special paper) Group-1 (a) Fish (Ichthyology) structure and Function or	85	0	0	85	131	15	5	100	36	0	0	100	18 36
	(b) Cell Biology or	85	0	0	85	131	15	5	100	36	0	0	100	18 36
	(c) Entomology or	85	0	0	85	131	15	5	100	36	0	0	100	18 36
	(d) Wild life conservation or	85	0	0	85	131	15	5	100	36	0	0	100	18 36
	(e) Biology of vertebrates Immune system	85	0	0	85	131	15	5	100	36	0	0	100	18 36
	(f) Limnology or (g) Acquaculture } Included in III Sem. as a compulsory paper	85	0	0	85	131	15	5	100	36	0	0	100	18 36

Sub. code	Subject Name	Theory									Practical		Total	
		Paper					CCE		Total Marks		Max.	Min.	Max.	Min.
		1 st	2 nd	3 rd	Max.	Min.	Max.	Min.	Max.	Min.				
	Optional (special paper) Group-2 (a.) Pisci culture and economic importance of fishes (Ichthyology)	85	0	0	85	43	15	5	150	38	0	0	150	38
	or (b) Cellular organization and molecular organization	85	0	0	85	43	15	5	150	38	0	0	150	38
	or (c.) Applied entomology	85	0	0	85	43	15	5	150	38	0	0	150	38
	or (d.) Environment & Biodiversity conservation	85	0	0	85	43	15	5	150	38	0	0	150	38
	or (e) Molecular endocrinology and reproductive technology	85	0	0	85	43	15	5	150	38	0	0	150	38
	or (f) Limnology and fish productivity	85	0	0	85	43	15	5	150	38	0	0	150	38
	Or (g) Applied aquaculture	85	0	0	85	43	15	5	150	38	0	0	150	38
	Or (h) Protein Nucleic acids and metabolic regulation	85	0	0	85	43	15	5	150	38	0	0	150	38
	or (i) Sericulture	85	0	0	85	43	15	5	150	38	0	0	150	38
	or (j) Neurotoxicology	85	0	0	85	43	15	5	150	38	0	0	150	38
	or (k) Microbial ecology and biology of parasitism	85	0	0	85	43	15	5	150	38	0	0	150	38
	Practical – I Based on paper Ist and IInd theory paper	0	0	0	0	0	0	0	0	0	50	18	50	18
	Practical – II Based on optional paper from group -1 and Group-2 50 or (25+25)													
	Project JOP Work	0	0	0	0	0	0	0	0	0	50	18	50	18

* Student has choice to opt one paper each (special paper) from group 1 and group-2
In Barkatullah University five optional paper – Group-I (a,b,c,d,e)
and Group-II (a,b,c,d,e)

** Those optional papers which are not included in the syllabus, can be made at university level.

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~~Session 2019-2020~~
Subject - Zoology

Class	: M.Sc
Semester	: IV
Subject	: Zoology
Title of Subject Group	: ANIMAL BEHAVIOUR AND NEUROPHYSIOLOGY
Paper No.	: Paper- I (Compulsory)
Max. Marks	: 85

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>

			(d.) Environment & Biodiversity conservation or (e) Molecular endocrinology and reproductive technology or (f) Limnology and fish productivity Or (g) Applied aquaculture Or (h) Protein Nucleic acids and metabolic regulation or (i) Sericulture or (j) Neurotoxicology or (k) Microbial ecology and biology of parasitism		
		Practical-1	Based on paper Ist and IInd theory paper	50	100
		Practical-2	Based on optional paper from group -1 and Gruop-2	50 or 25+25	
		Project	JOP Work	50	50

* Student has choice to opt one paper each (special paper) from group 1 and group-2
In Barkatullah University five optional paper – Group-I (a,b,c,d,e)
and Group-II (a,b,c,d,e)

** Those optional papers which are not included in the syllabus, can be made at university level.

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~~Session 2017-2018~~

Subject - Zoology

Class	: M.Sc
Semester	: IV
Subject	: Zoology
Title of Subject Group	: ANIMAL BEHAVIOUR AND NEUROPHYSIOLOGY
Paper No.	: Paper- I (Compulsory)
Max. Marks	: 85

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, Massachsets, USA.
6. Bradbury, J.W. and S.L. Vehrencamp. Principles of Animal Communication. Sinauer Assoc. Sunderland, Massachsets, USA.

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~~Sesstog - 2019-2021~~

Subject - Zoology

Class	: M.Sc
Semester	: IV
Subject	: Zoology
Title of Subject Group	: Gamete Biology, Development and differentiation
Paper No.	: Paper- II (Compulsory)
Max. Marks	: 85

Unit-1	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. Cell commitment and differentiation. 2. Germ cell determinants and germ cell migration. 3. Development of gonads. 4. Melanogenesis.

Unit-5	<ol style="list-style-type: none"> 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.
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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~~

Subject - Zoology

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

M.M. : 50

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

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Subject - Zoology

Class	:	M.Sc
Semester	:	IV
Subject	:	Zoology
Title of Subject Group	:	General Practical-I
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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~~Session-2010-2011~~

Subject - Zoology

Class	: M.Sc
Semester	: IV
Subject	: Zoology
Title of Subject Group	: Ichthyology (Fish) Structure and Function
Paper No.	: Paper- III A (Optional)
Max. Marks	: 85

Unit-1	<ol style="list-style-type: none">1. Origin and evolution of fishes2. Classification of fishes as proposed by Berg3. Fish integument4. Locomotion
Unit-2	<ol style="list-style-type: none">1. Alimentary canal and digestion2. Accessary respiratory organs3. Air bladder and its functions4. Weberian ossicles their homologies and functions
Unit-3	<ol style="list-style-type: none">1. Excretion and osmoregulation2. Acoustico-lateral line system3. Luminous organs4. Colouration in fishes
Unit-4	<ol style="list-style-type: none">1. Sound producing organs2. Deep sea adaptations3. Hill stream adaptations4. migration in fishes
Unit-5	<ol style="list-style-type: none">1. Sexual cycle and fecundity2. parental care in fishes3. Early development and hatching4. Poisonous and venomous fishes.

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~~SECRET - 2011-2012~~

Class	: M.Sc
Semester	: IV
Subject	: Zoology
Title of Subject Group	: Cell Biology
Paper No.	: Paper- III B (Optional)
Max. Marks	: 85

Unit-1	<ol style="list-style-type: none"> 1. Molecular organization of eukaryotic chromosomes : structure of nucleosome particles and higher order compaction of mitotic chromosomes, chromatin remodeling 2. specialized chromosomes: structural organization and functional significance of polytene chromosomes 3. DNA methylation and DNA Aase-1 Hypersensitivity in relation to gene activity and chromatin organization. 4. specialized chromosomes II : structural organization and functional significance of lampbrush chromosome. 5. Organisation and significance of heterochromatin.
Unit-2	<ol style="list-style-type: none"> 1. Structural organization of Eukaryotic genes, interrupted genes and overlapping genes and their evolution 2. Gene families: organization, evolution and significance 3. Transposable genetic elements of prokaryotes and eukaryotes Gene imitation and molecular mechanism of occurrence of mutation repair mechanism
Unit-3	<ol style="list-style-type: none"> 1. Organisation of eukaryotic transcriptional machinery promoter enhancers transcription factors polymerase activators and repressors. 2. DNA binding domains of transcription apparatus zinc finger steroid receptors hemeo domains HILIX-loop, Helix and Leucine Zipper. 3. Eukaryotic transcription of Eukaryotic transcriptional control. 4. Environmental modulation of gene activity (stress response) stress genes and stress proteins 5. Molecular basis of thalasemias muscular dystrophy cystic fibrosis

Unit-4	<ol style="list-style-type: none"> 1. DNA rearrangement 2. Amplification during development with special response to <ol style="list-style-type: none"> (a) Ciliates (b) Chlorine gene (c) 58 RNA genes 3. Drosophila development <ol style="list-style-type: none"> (a) Cleavage (b) Gastrulation <p>Origin of Anterior –Posterior (Maternal effect genes and segmentation genes)</p>
Unit-5	<ol style="list-style-type: none"> 1. Drosophila development II origin of dorsal ventral polarity 2. Basic idea of homeotic selector genes and homeotic mutation 3. Basic idea of organization of homeoboxes 4. Evolutionary significance of homeoboxes

Suggested Readings :

1. Robertis, De and Robertis Cell and molecular biology Lea and Febiger.
2. Watson Hopkis Roberts Steitz Weiner, Molecular Biology of the Gene the Benjamin, Cummings Publishin Company inc.
3. Bruce A; berts Bray ewis Raff Roberts Watson Molecular Biology of the Cell, Garland Publishing inc.
4. Watson Gilman Witkowski Zoller Recombinant DNA Scientific American Books.
 - a) Karp Gerald Cell Biology.
 - b) Lewin B., Genes VII.
 - c) King Cell Biology.
 - d) Kaniel L. Hartl, Elizabeth W. Jones. Genetics Principals and Analysis, Jones and Bartlett Publishers.
5. Kuby, Immunology, W.H. Freeman and Company.
6. Roitt Male Snustad Immunology.

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~~Session - 2019-2020~~

Class	: M.Sc
Semester	: IV
Subject	: Zoology
Title of Subject Group	: Entomology
Paper No.	: Paper- III C (Optional)
Max. Marks	: 85

Unit-1	<ol style="list-style-type: none"> 1. Insect head types and modification as per their habit and habitat 2. Modification of mouth parts and feeding behavior 3. Structure types and function of antennae 4. Hypothetical wing venation
Unit-2	<ol style="list-style-type: none"> 1. Structure of cuticle and pigment 2. Sclerotisation and tanning of the cuticle 3. Structure of alimentary canal and Physiology of digestion 4. Malpighian tubules – anatomical organization , Transport mechanism
Unit-3	<ol style="list-style-type: none"> 1. Structure of circulatory system 2. Cellular elements in the haemolymph 3. Cell mediated and humoral immunity 4. Structure of compound eye and Physiology of Vision
Unit-4	<ol style="list-style-type: none"> 1. Sound Production in insect 2. Structure and function of endocrine glands 3. Pheromones 4. Embryonic membranous up to the formation of blastoderm
Unit-5	<ol style="list-style-type: none"> 1. Metamorphosis 2. Insecticide effects on CNS 3. Important pest of Soybean <ul style="list-style-type: none"> • Modern concept of pest management

Suggested Readings :

1. The Insect: Structure and function by R.F. Chapman
2. Comparative Insect physiology, Biochemistry and Pharmacology .Vol :1-13.
Edited by G.A. Kerkut and L.I. Gilbert.
3. Entomophagous Insect by Clausen
4. Entomology bu Gilbert
5. Principles of Insect Physiology by Wigglesworth.
6. Fundamentals of Entomology by Elzinga
7. Hand book of economic Entomology for South India by Ayyar.
8. Insect cytogenetics by R.E.F.Symposium.
9. Insects and plants by Sting, Lawton and southwood.
10. Insect and hygiene by Busvine.
11. Insect Physiology by Wigglesworth.
12. Insect morphology by Mat Calf and Flint
13. Applied Agricultural Entomology by Dr. Lalit Kumar Jha

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~~2020-21~~ - ~~2021-22~~

Class	: M.Sc
Semester	: IV
Subject	: Zoology
Title of Subject Group	: Wild Life Conservation
Paper No.	: Paper- III D (Optional)
Max. Marks	: 85

Unit-1	<p>1. Wild life -</p> <p>(a) Values of wild life - positive and negative.</p> <p>(b) Our conservation ethics.</p> <p>(c) Importance of conservation.</p> <p>(d) Causes of depletion.</p> <p>(e) World conservation strategies.</p> <p>2. Habitat analysis, Evaluation and management of wild life.</p> <p>(a) Physical parameters - Topography, Geology, Soil and water.</p> <p>(b) Biological Parameters - food, cover, forage, browse and cover estimation.</p> <p>(c) Standard evaluation procedures - remote sensing and GIS.</p> <p>3. Management of habitats -</p> <p>(a) Setting back succession.</p> <p>(b) Grazing logging.</p> <p>(c) Mechanical treatment.</p> <p>(d) Advancing the successional process.</p> <p>(e) Cover construction.</p> <p>(f) Preservation of general genetic diversity.</p>
Unit-2	<p>1. Population estimation.</p> <p>(a) Population density, Natality, Birth rate, Mortality, fertility schedules and sex ratio computation.</p> <p>(b) Faecal analysis of ungulates and carnivores - Faecal samples, slide preparation, Hair identification, Pug marks and census method.</p>

	<p>2. National Organization.</p> <p>(a) Indian board of wild life.</p> <p>(b) Bombay Natural History Society.</p> <p>(c) Voluntary organization involved in wild life conservation.</p> <p>3. Wild life Legislation - Wild Protection act - 1972, its amendments and implementation.</p>
Unit-3	<p>Management planning of wild life in protected areas.</p> <p>2. Estimation of carrying capacity.</p> <p>3. Eco tourism / wild life tourism in forests.</p> <p>4. Concept of climax persistence.</p> <p>5. Ecology of perturbation.</p>
Unit-4	<p>Management of excess population & translocation.</p> <p>2. Bio- telemetry.</p> <p>3. Care of injured and diseased animal.</p> <p>4. Quarantine.</p> <p>5. Common diseases of wild animal.</p>
Unit-5	<p>Protected areas National parks & sanctuaries, Community reserve.</p> <p>2. Important features of protected areas in India.</p> <p>3. Tiger conservation - Tiger reserve in M.P, in India.</p> <p>4. Management challenges in Tiger reserve.</p>

Suggested Readings :

1. Gopal Rajesh : Fundamentals of wild life management
2. Agrawal K.C : Wild life India
3. Dwivedi A.P (2008) : Management wild life in India
4. Asthana D.K : Environment problem and solution
5. Rodgers N.A & Panwar H.S : Planning of wild life / Protected area Network in India]
vol. the report, wild life Institute of India Dehradun.
6. Odum E.P : Fundamentals of Ecology
7. Saharia V.B : Wild life in India
8. Tiwari S.K : Wild life in Central India
9. E.P Gee : Wild life of India
10. Negi S.S : Wild life conservation (Natraj Publishers)

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

~~कक्षा -~~ ~~विषय~~

Class	: M.Sc
Semester	: IV
Subject	: Zoology
Title of Subject Group	: Biology of vertebrates immune system
Paper No.	: Paper- III E (Optional)
Max. Marks	: 85

Unit-1	<ol style="list-style-type: none"> 1. Tissues of Immune system- Primary lymphoid organs, structure and functions (Thymus and Bursa of Fabricius) 2. tissues of Immune system- Secondary lymphoid organs, structure and functions (Spleen, lymphnode and Payers patches) 3. Antigen processing 4. Antigen presentation
Unit-2	<ol style="list-style-type: none"> 1. T-cell lineage and receptors 2. T-cell activation 3. B-cell lineage and receptors 4. B-cell activation
Unit-3	<ol style="list-style-type: none"> 1. Immunoglobulin structure, Biological and physical properties of immunoglobulin 2. Gene model for Immunoglobulin gene structure 3. Generation of antibody diversity (Light and heavy chain) 4. Immunization
Unit-4	<ol style="list-style-type: none"> 1. Immediate type of hypersensitivity reaction of Anaphylectic type-1. 2. Antibody dependent cytotoxic type II reaction. 3. Complex mediated type III reaction 4. Delayed type cell mediated hypersensitivity type IV reaction.
Unit-5	<ol style="list-style-type: none"> 1. Enzyme linked immunosorbent assay (ELISA) technique and its applications. 2. Immunofluorescence technique(Direct & Indirect and Sandwich antibody labelling techniques . 3. Immunodiffusion techniques (Mancini and oucheterlony immunodiffusion techniques) <p>Monoclonal antibody technology (Hybridoma technology)</p>

List of practicals:

1. Demonstration of various routes of immunization in mammalian model
 - a. Intraperitoneal
 - b. Subcutaneous or intra muscular
 - c. Caudal
2. Demonstration of collection of blood from various routes.
 - a. Cardiac puncture
 - b. Intra-orbital sinus puncture
 - c. Cardiac vein
3. Demonstration and identification of different components of reticuloendothelial system mainly the major lymphoid organs in situ in mammalian model , like spleen, thymus, bone marrow, and Peyer's patches
4. Detailed histological structure of major lymphoid organs like spleen, thymus, Bone marrow, Bursa of Fabricius , Mesenteric lymphnode, and Peyer's patches.
5. Demonstration of antigen and antibody reaction through simple experiments
 - a. Agglutination
 - b. Immunodiffusion
 - c. Immunoelectrophoresis
 - d. ELISA

Scheme of Practical examination

	MM 50
1. Immunological exercise No.1	10 Marks
2. Immunological exercise No.2	10 Marks.
3. Spotting	16Marks
4. Viva voce	08 Marks
5. Practical record	06 Marks
Total	50 Marks

Suggested Readings :

1. Kuby, Immunology, W.H. Freeman, U.S.A.
2. W. Paul. Fundamentals of Immunology.
- I.M. Roitt. Essential Immunology, ElBS Edition.

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~~Syllabus - 2019-2021~~

Class	:	M.Sc
Semester	:	IV
Subject	:	Zoology
Title of Subject Group	:	Pisci Culture and Economic Importance of Fishes (Ichthyology)
Paper No.	:	Paper- IV A (Optional)
Max. Marks	:	85

Unit-1	<ol style="list-style-type: none"> 1. Collection of fish seed from natural resources. 2. Dry bundh breeding of carps. 3. Wet bundh breeding of carps. 4. Hypophysation and breeding of Indian major camps.
Unit-2	<ol style="list-style-type: none"> 1. Drugs useful in induced breeding of fish 2. Types of ponds required for fish culture farms 3. Management of hatcheries, nurseries and rearing ponds 4. Management of stocking ponds
Unit-3	<ol style="list-style-type: none"> 1. Composite fish culture 2. Prawn culture and pearl industries in India. 3. Fisheries resources of MP 4. Riverine fishries.
Unit-4	<ol style="list-style-type: none"> 1. Costal fishries in India 2. Offshore and deep sea fishery's in India 3. Role of fishries in rural development 4. Sewage fed fishries
Unit-5	<ol style="list-style-type: none"> 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 5. Transport of live fish & fish seed.

Suggested Readings : Paper III A & IV A

1. JR. Norman - The History of fishes.
2. Nagaraja Rao - An introduction to fisheries.
3. Lagler Ichthyology.
4. Herclen Jones Fish migration.
5. Marshal 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. 1 & IX.
11. Gunther Sterba C.N.H.-Freshwater fishes of the world
12. W. Lanharn -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 Ternbhre -Fish and Fisheries.
20. S.K. Gupta -Fish and Fisheries
21. K.P. Vishwas -Fish and Fishries.
22. Jhingaran -Fish and Fishries.

**M.Sc. IV sem. Ichthyology practical examination scheme based on
paper III(a) and IV (a)**

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

Time: 5 hour

M: M 50

1. Major dissection Nervous system of Walago, Mystus, Labeo, Torpedo.	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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~~Section - 2019-2020~~

Class	: M.Sc
Semester	: IV
Subject	: Zoology
Title of Subject Group	: Cellular Organization and Molecular Organization.
Paper No.	: Paper- IV B (Optional)
Max. Marks	: 85

Unit-1	<ol style="list-style-type: none"> 1. General organization and characterizes of viruses (Examples SV 40 and HIV). 2. Yeast : Structure, reproduction and chromosome organization: Basic ideas of its applications as vectors for gene cloning. 3. Molecular organization of reoiratory chain assemblies, ATP / ADP Translocase and F₀F₁ AT pase. 4. Cell cycle: Cell cycle control in mammalian cells and xenopus.
Unit-2	<ol style="list-style-type: none"> 1. Cytochemistry of Golgin complex and its role in cell seretion., 2. Peroxisomes and training of paroxysmal proteins. 3. Nucleouls : Structure and Biogenesis and functions of lysosomes. 4. Intracellular digestion : Ultrastructure and function of lysosomes.
Unit-3	<ol style="list-style-type: none"> 1. Synthesis and targeting of mitochondrial proteins. 2. Secretary pathways and translocation of secretary proteins across the EPR membrane. 3. Genome complexity: C- value [aradox and cot value]. 4. DNA sequences of different complexity.
Unit-4	<ol style="list-style-type: none"> 1. Difference between normal cells and cancer cells. <ol style="list-style-type: none"> a. Biochemical changes. b. Cytoskeleton changes. c. Cell surface changes. 2. Genetic basis of human cancer. 3. Chromosomal abnormalities in human cancer.

Unit-5	<ol style="list-style-type: none"> 1. General idea of onchogens and proto onchogens. 2. Onchogence and cancer. 3. Transforming Agents. 4. Tumor Supressor geanes. 5. Receptor – Ligand interaction and signal transduction. <p>Cross – talk among various signaling pathways.</p>
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Reference of Book:

1. DeRobertis and De Robertis Cell and Molecular Biology. Lea and Febiger.
2. We Watson Hopking reberts steits, Weiner molecular biology of the gene, the Benjamin / Cummings Publishin Company Inc.
3. Bruce alberts, Bray, Lewis, Raff, Roberts, Watson molecular Biology of the cell garland publishing inc.
4. P.K. Gupta, Molecular Cell Biology Rastogi Publication.
5. Watson Gilman Witkowski, Zoller Recomdinant D.N.A. scientific American Books.
6. Gerald Karp. Cell Biology.
7. Lewin B. Genes VII.
8. King Cell Biology.
9. Baniel L. HArtl Elizabeth W. Jones, Genetics Principles and analysis . Jones and Bartlett Publisher.
10. Lodish, Berk Zipursky, Matsudaira Baltimore Dernell Molecular Cell Biology W.H. Freeman and company.
11. J. Travers Immunology current Biology limited.
12. Kubey Immunology W.H. Freeman and Company.
13. Riott, Male snustad Principles of genetics john weley and sons Inc.

Practical List

1. Preparation of mitotic chromosome from bone marrow
2. Karyotype preparation any animal
3. Calculation of *mitotic index*(in bone marrow or in root tip cells)
4. Demonstration of mitochondria, Golgi body ,RNA,DNA in tissue section ,any tissue
5. Sex chromatin demonstration
6. Study of Electron micrographs of pro and eukaryotic cells
7. Karyotype preparation of human syndromes from books

8. G&C banding in mitotic chromosomes
9. Gel Electrophoresis (PAGE) for protein
10. Polytene chromosome preparation
11. Meiosis –slide preparation in testis or in Anther
12. Study of mutants of Drosophila w.m.
13. Histochemical localization of age pigment
14. Demonstration of Alkaline Phosphatase/Ascorbic acid
15. Slides of cancerous tissue

Scheme of Practical Examination Based on Paper III(b) and IV (b)

		MM: 50
1.	Demonstration of mitochondria/ Golgi body /RNA/DNA in tissue section (any one)	06
2.	Calculation of mitotic index or Preparation of mitotic chromosomes (in Bone marrow or <i>Allium</i> root tips)	06
3.	Demonstration Meiosis (anther/testis)	05
4.	Separation of Protein by PAGE or Histochemical demonstration of age pigment or Demonstration of Alkaline Phosphatase or Ascorbic acid in any tissue (plant/animal)	05
5.	Spotting on - <u>Drosophila</u> mutants (w.m) Karyotype of human syndromes Permanent slides of cytology Electron micrographs Chromosomal aberrations (Total 08 spots, 1.5 mark each)	12
6.	Viva voce	08
7.	Practical Record	08
Total Marks		50

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~~Section - 2018-19~~

Class	: M.Sc
Semester	: IV
Subject	: Zoology
Title of Subject Group	: Applied Entomology
Paper No.	: Paper- IV C (Optional)
Max. Marks	: 85

Unit-1	<p>Classification according to imms</p> <ol style="list-style-type: none"> 1. Classification of apterygota upto families. 2. Classification of following insect orders (a) orthoptera (b) hemiptera (c) diptera. 3. Classification of following insect order (a) hymenoptera (b) lepidoptera (c) coleoptera 4. Collection and preservation of insects.
Unit-2	<ol style="list-style-type: none"> 1. Insect pest-Management strategies and tools 2. Biological control 3. Genetic control 4. Chemical control
Unit-3	<ol style="list-style-type: none"> 1. Pests of Cotton 2. Pests of sugarcane 3. Pests of paddy 4. Pests of stored food grains 5. Pests of citrus fruits and mango 6. Pests of pulses 7. House hold insect pests

Unit-4	<ol style="list-style-type: none">1. Insects in relation to forensic science2. Insects migration, population fluctuation and factors3. Insects of medical and veterinary importance4. Ecological factors affecting the population and development of insects
Unit-5	<ol style="list-style-type: none">1. Mulberry and non mulberry sericulture2. Apiculture3. Lac culture4. Insects as human food for future.

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Class	: M.Sc
Semester	: IV
Subject	: Zoology
Title of Subject Group	: Practical work (Entomology)
Paper No.	: Paper- III & IV C (Optional)
Max. Marks	: 50

1. Study of museum specimens of different orders and families of insects.
2. Study of permanent slides.
3. Taxonomic identification of insects.
4. Dissection major - Nervous system of grasshopper and cockroach.
Reproductive system of cockroach male and female.
Minor - honey bee sting and tentorium of grasshopper.
5. Taxonomical identification of egg, larva & pupa.
6. Collection and preservation of insects.
- 7.

Scheme of practical exam (III & IV C)

1. Major dissection	08
2. Minor dissection	05
3. slide preparation	05
4. Spotting	10
5. Taxonomical identification	08
6. Identification of egg, larva and pupa	04
7. Collection & record	05
8. Viva	05

Total Marks – 50

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~~2019-2020~~ - ~~2020-2021~~

Theory / Practical

Session		2019-2020
Class		M.Sc.
Semester		IV
Subject	(English)	Zoology
	(हिन्दी)	
Paper		IV(d) (Optional)
Title of the paper	(English)	Environment & Biodiversity Conservation
	(हिन्दी)	
Medium of instructions (Teaching)		English / हिन्दी / Both (दोनों)
Question Paper Language		English / हिन्दी / Both (दोनों)
Max. Marks		85

Unit		Syllabus	Periods
Unit I	(English)	<ul style="list-style-type: none"> • Basic concept of Environmental Biology Scope and Environmental Science • Biosphere and Biogeochemical cycles. • Environmental monitoring and impact assessment. • Environmental and sustainable development. • Water conservation, rain water harvesting, water shed management. 	
Unit II	(English)	<ul style="list-style-type: none"> • Cause, effects and remedial measure of Air pollution, Water pollution. • Noise, radioactive and thermal pollution. • Agriculture pollution • Basic concepts of Bioaccumulation. • Solid waste management. 	
Unit III	(English)	Global warming and disaster management <ul style="list-style-type: none"> • Cause of global warming • Impact of global warming – acid rains and ozone depletion, green house effect. • Control measures of global warming (a) Afforestation (b) reduction in the use of CFCS • Disaster management -floods, earthquake, Cyclones landslides. • Environmental legislation. 	

Unit IV	(English)	<p>Natural Resources :-</p> <p>Forest -</p> <ul style="list-style-type: none"> - Use and over exploitation of forests. - Timber extraction. <p>Land</p> <ul style="list-style-type: none"> - Land degradation. Landslides. - Soil-ersion and desertification. <p>Water</p> <ul style="list-style-type: none"> - Use and over utilization of surface and ground water - Floods. Drought dams- benefits and problems <p>Mineral</p> <ul style="list-style-type: none"> - Use and exploitation , - Environmental effect of extracting and using mineral resources <p>Food</p> <ul style="list-style-type: none"> - World food problem - Effects of modern agriculture and overgrazing <p>Energy</p> <ul style="list-style-type: none"> - Conventional and nonconventional energy resources. - Using of alternate energy sources <ul style="list-style-type: none"> • Role of an individual in conservation of natural resources <p>Equitable use of resources for sustainable life</p>	
Unit V	(English)	<ul style="list-style-type: none"> • Conservation of Biodiversity - Biodiversity crisis – habitat degradation poaching of wild life. - Socio economic and political causes of loss of biodiversity. - In situ and exsitu conservation of biodiversity - Value of biodiversity. - Hot spots of Biodiversity. 	

Recommended Books	(English)	
	(हिन्दी)	

List of books of for paper III D & IV D

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

II- PRACTICAL SYLLABUS

Wild life conservation, Environment & Biodiversity

1. Identification and comments upon wild life animals.
2. Study of endangered species.
3. Study of local birds and their habit habitats
4. Study of ecosystem
5. Study of local Biodiversity.
6. Distribution of wild life India. (National parks and sanctuaries)
7. Soil and water analysis.
8. Interspecific relationship – Naturalism, Symbiosis, Mutualism, Commensalism, Parasitism, Predation Competition.
9. Field – expedition and project report
10. Viva- voce
11. Practical Record & collection.

Scheme

Time : 5 hour

Max marks 50

Spotting	10
Endangered species / interspecific relationship	10
Soil & water analysis	5
Field expedition	10
Viva voce	5
Practical Record/ collection	10
	50

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~~Section -~~

Class	: M.Sc
Semester	: IV
Subject	: Zoology
Title of Subject Group	: Molecular Endocrinology and Reproductive Technology
Paper No.	: Paper- IV E (Optional)
Max. Marks	: 85

Unit-1	<ol style="list-style-type: none"> 1. Definition and scope of molecular endocrinology. 2. Chemical nature of hormones. 3. Purification and characterization of hormones. 4. Production of hormone by r DNA technology
Unit-2	<ol style="list-style-type: none"> 1. Structure – function relationship in hormones comparative analysis and evolutionary perspectives. 2. Eicosanoids and hormone action. 3. Concentration and transport of hormones in the blood. 5. Genetic analysis of hormonal disorders.
Unit-3	<ol style="list-style-type: none"> 1. Hormonal regulation of energy metabolism. 2. Hormonal antagonism. 3. Hypothalamic nuclei and their physiological function. 4. Endocrine – Immune interaction
Unit-4	<ol style="list-style-type: none"> 1. Extraction and estimation of pregnanediol from urine. 2.Extraction of Gonadotrophin from urine. 3.Bioassay of Androgen. 4.Bioassay of progesterone.
Unit-5	<ol style="list-style-type: none"> 1. Contraception. 2. Multiple ovulation and embryo transfer technology. 3. Study of estrous cycle by vaginal smear technology. 4. Surgical technique–castration, ovariectomy, vasectomy, tubectomy and laprotomy.

Suggested reading material (All latest edition)

1. Benjamin Lewin – Genes VII/ VIII, oxford University press.
2. Lodish etal- Molecular Cell Biology.
3. Zarrow, M.X., Yochin J.M. and Machrthy, J.L. – Experimental Endocrinology.
4. Chatterji C.C.- Human Physiology (Vol- II).
5. Bentley, P.J. – Comparative Vertebrate endocrinology.
6. Hadley Mac. E.- Endocrinology.
7. Chinoy, N.J. Rao, M.V., Desarai, K.J. and High land, H.N. – Essential techniques in reproductively physiology and Endocrinology.
8. Norris, D.O. – Vertebrate Endocrinology.

List of Practical:

1. Purification of any protein hormone.
2. Assay of steroid dehydrogenase.
3. Isolation and characterization of steroid / prostaglandin.
4. Assay for protein phosphorylation by c AMP dependant protein – Kinase.
5. Histological studies of endocrine glands.
6. Cytological studies of endocrine gland.
7. Histochemical studies of endocrine glands.
8. Study of vaginal histology during estrus cycle.
9. Demonstration of estrus cycle study by vaginal smear technique.
10. Hitological demonstration of glycogen during reproductive cycle and pregnancy.
11. Effect of testosterone, estradiol and progesterone.
 - a. Male reproductive study by weight/ Volume measurement.
 - b. Female reproductive study by weight/ Volume measurement.
12. Study of accessory reproductive structure after castration or ovariectomy.
13. Sperm count.
14. Demonstration of surgical technique.
 - a. Castration b. Ovariectomy c. Laparotomy d. Vaseetomy e. Tubectomy etc.
15. Demonstration of perfusion technique for the fixation of endocrine tissue.
16. Implantation of endocrine gland/tissue.

Scheme of practical Examination

	MM: 50
1. Experiments on molecular endocrinology / Reproductive technology.	10 Marks
2. Surgical / Experimental Techniques	08 Marks
3. Histochemical / Histological techniques.	08 Marks
4. Spotting 1 to 5	10 Marks.
5. Viva Voce	08 Marks
6. Practical Record	06 Marks
Total	50 Marks

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~~Syllabus - 2019-2020~~

Class	: M.Sc
Semester	: IV
Subject	: Zoology
Title of Subject Group	: Limnology and Fish Productivity
Paper No.	: Paper- IV F (Optional)
Max. Marks	: 85

Unit-1	<ol style="list-style-type: none"> 1. Basic principal and development of science of limnology. 2. Morfomaty, Origin and Classification of Lake systems of the world. 3. Saprobien system indicator organisms and water quality monitoring. 4. Waste water treatment. 5. Aquatic macrophytes and their control.
Unit-2	<ol style="list-style-type: none"> 1. Light and its relation in fresh water. 2. Heat and its relation in fresh water. 3. Role of oxygen and Carbon-dioxide in freshwater. 4. Role of organic and inorganic Carbon in freshwater.
Unit-3	<ol style="list-style-type: none"> 1. Aspects of primary productivity in freshwater. 2. Role of physicochemical characteristics in freshwater. 3. Plankton its role in freshwater. 4. Characteristics Bethic Biota, their substrate preference and significance
Unit-4	<ol style="list-style-type: none"> 1. Fresh water resources in India and their quality. 2. Wetland and its management. 3. Fishery and management of reservoir. 4. Inland fish breeding.
Unit-5	<ol style="list-style-type: none"> 1. Reverine fisheries. 2. Fish production in pond and its management. 3. Indian cultivable fishes and their crop potential in India. 4. Preservation processing transport and marketing of fish.

List of Practicals:

1. Soils Analysis.
 - a. Particulate analysis.
 - b. Moisture content.
 - c. Total organic carbon.
 - d. Estimation of Phosphate.
 - e. Estimation of Nitrates.
 - f. Estimation of Na, K, Ca, Mg.
2. Mapping and Drawing techniques.
3. Study of aufwuch communities.
 - a. Study of Sponges.
 - b. Study of Ectoprocta.
 - c. Study of epineustic communities.
4. Water analysis.
 - a. Estimation of dissolved oxygen.
 - b. Estimation of pH.
 - c. Estimation of Alkalinity.
 - a. Carbonates.
 - b. Bicarbonate.
 - c. Free CO₂
 - d. Phosphate.
 - e. Nitrate.
 - f. Silicate.
 - g. Calcium, Magnesium.
 - h. Chlorophyll.
 - i. Conductivity.
 - j. B.O.D.
 - k. C.O.D.
 - l. Total Solids.
 - m. Redox potential.
5. Plankton study.
 - a. Study and identification of phytoplankton.
 - b. Study and identification of Zooplankton.
 - c. A collection of common plankton organism to be submitted by the student in the form of slides.
6. Benthic study.

Collection techniques.
Isolating techniques of benthic fauna.
Identification of benthic macro invertebrates.
Field techniques of pollution monitoring.
7. Productivity studies.
 - a. Estimation of primary productivity.
 - a. Lentic locale.
 - b. Lotic locale.
 - b. Estimation of secondry productivity.
8. Ageing and growth techniques of fish.
 - a. Scales preparation and ageing.
 - b. Tagging technique.
 - c. Growth rate study (From hatched embryos).
9. Identification of late fry and fingerlings.

10. Induced breeding technique.
11. Gonadectomy and Thyroidectomy.
12. Oxygen consumption levels and metabolic rates of some food fishes.
 - a. *Heteropneustes*.
 - b. *Cyprinus carpio*.
13. Behavioural studies of fish.
 - a. Agnostic behaviour.
 - b. Schooling.
14. Proximate analysis of fish muscle.
 - a. Red muscle.
 - b. White muscle.
15. Fecundity and Ova diameter of some fishes.
16. Sexing of some fishes.
17. Techniques of estimating fish populations.
18. Estimation of:
 - a. Conditioning factor.
 - b. L/wt relationship.
 - c. Fish maturity.

Scheme of Practical Examination:

		MM : 50
1.	Major Limnological Exercise	12 Marks.
2.	Minor Limnological Exercise	08 Marks.
3.	Estimation (Two)	16 Marks.
4.	Practical record	08 Marks.
5.	Viva voce	06 Marks.

Total 50 Marks

List of Reference:

1. E.P. Odum – Fundamental of Ecology.
2. R.G. Wetzel – Limnology.
3. P.S. Welsch – Limnology.
4. P.S. Welsch – Practical limnology.
5. R.G. Wetzel - Laboratory guide of Limnology.
6. J. Schwocrbel – Principles of Limnology.
7. K.A. Ruttner – Fundamentals of Limnology.
8. Hutchinson – A Treatise on Limnology Vol- 1 & 2.
9. V.G. Cole – Limnology.

10. G.A. Cole – Limnology.
11. W.T. Edmondson – Fresh water Biology.
12. R.W. Pennak – Freshwater invertebrates on N. America.
13. J.G. Needham and P.R. Needham – A Guide to freshwater invertebrates.
14. G.T. Tonapi – Freshwater animals of India.
15. S. Krishan Swamy – A Guide to the study of freshwater organism.
16. G.W. Prescott – Freshwater Algae.
17. Deshikachary – A guide for identification of Algae.
18. Published by International Biological program- I.B.P. Hand Books Nos. 1 & 2.
19. H.L. Goltermann – Chemical analysis of freshwaters.
20. K.S. Rao & Suresh Jain – Limnological methods & Principles of fish productivity.
21. O.P. Lind – Practicals Limnology.
22. H.B.N. Hynes – Biology of Running waters.
23. L. Klein – River pollution Vols. I & II.

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

~~2019-2020~~ - ~~2019-2020~~

Class	: M.Sc
Semester	: IV
Subject	: Zoology
Title of Subject Group	: Proteins, Nucleic acids and Metabolic regulation
Paper No.	: Paper- IV H (Optional)
Max. Marks	: 85

Unit-1	Protein primary and secondary structures. Protein tertiary and quaternary structures. Purification of proteins. Protein analytical methods (Spectroscopy and X-ray crystallography).
Unit-2	Protein folding. Lipoproteins. G-protein and hormonal signaling. Signal transduction pathways.
Unit-3	1. Forces stabilizing nucleic acid structure. 2. Fractionation and analysis of nucleic acids. 3. DNA damage and repair. 4. DNA Methylation
Unit-4	1. Transfer RNA and its aminoacylation. 2. Restriction endonucleases and restriction fragment length polymorphism (RFLP). 3. Polymerase chain reaction. 4. Gene cloning
Unit-5	1. Proteins biosynthesis. 2. Mitochondrial electron transport. 3. Biosynthesis of purine nucleotides. 4. Biosynthesis of pyrimidine nucleotides.

List of Practical:

1. Standard curve preparation of proteins.
2. Quantitation of Proteins.
3. Quantitation of DNA.
4. Quantitation of RNA.
5. Standard curve preparation of DNA and RNA.
6. Verification of Beerls Law.
7. Paper and thin layer chromatography.
8. Differential centrifugation and fractionation of cytoplasmic organelles.
9. Purification of protein by column chromatography.

Scheme of Practical Examination

	MM: 50
1. Preparation of Standard curve/ verification of Berrls Law	10 Marks
2. Quantitation of protein/ DNA / RNA of purification	12 Marks
3. Separation of compuneh by paper chromatography/ TLC / Column chromatography	14 Marks.
4. Viva voce	08 Marks.
5. Practical Record	06 Marks

Total Marks**50 Marks****Reference:**

1. Biochemistry, D. Voet and J.G. Voet, John wiley & sons. Inc. New York.
2. Text Book of Biochemistry, T.M. Devlin Wiley- Leiss, New York.
3. Principles of Biochmistry, G.L. Zubey; W.W. Parson and D.E. Vance, Wm.C. Brown publisher, U.S.A.
4. Principles of Biochemistry , A.L. Lehninger, A.L. Nelson; M.M. Cox. Worth Pulisher, Inc. USA.

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

~~Syllabus - 2010-2011~~

Class	: M.Sc
Semester	: IV
Subject	: Zoology
Title of Subject Group	: Sericulture
Paper No.	: Paper- IV I (Optional)
Max. Marks	: 85

Unit-1	Introduction and Moriculture <ol style="list-style-type: none"> 1. Silk Producing Organisms. 2. Planning for profitability in sericulture. 3. Propagation of Mulberry 4. Cultural Practices
Unit-2	plant pathology and Biology of <i>Bombyx mori</i> <ol style="list-style-type: none"> 1. Diseases of mulberry plant. 2. Classification of races of <i>Bombyx mori</i> 3. Silk gland of <i>Bombyx mori</i> 4. Structure & chemical composition of silk
Unit-3	Rearing facilities and Operation <ol style="list-style-type: none"> 1. Rearing house and Rearing appliances for rearing of silk worms. 2. Disinfection operation before rearing 3. Maintenance of optimum conditions for rearing 4. Feeding, Bed cleaning and spacing
Unit-4	Moulting, mounting and Silk Worm disease <ol style="list-style-type: none"> 1. Moulting and care during moulting 2. Characteristic features of a ripe silk worm, mounting, Process of spinning & harvesting of cocoons 3. Pebrine (Protozoan disease) 4. Bacterial, Fungal and Viral disease of silk worm

Unit-5	Cocoon marketing, silk reeling and Non-mulberry silk worms 1. Cocoon Quality, testing , and grading 2. Silk reeling operation 3. Tasar culture Ericulture and Muga culture
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List of books for Sericulture:

1. Hand book of Silk Worm rearing by Masanori, Shimiza, D. Agri.
2. Sericulture Manual -2
3. Sericulture Manual -3 by S. Kishanaswamy
4. Introduction to Sericulture by Dr. (Mrs.) G. Ganga Dr. (Mrs.) J. Sulochana chetty
5. Principles of Sericulture by Hisao Aruga
6. A Manual of non mulberry Silks Sericulture Vol.-1 by Dr. M.S. Jolly. *et al*
7. Sericulture and Silk Industries by Tripurari Sharan
8. Sericulture Manual -1 Mulberry cultivation by Dr. G. Rang swami
9. Sericulture Manual -2 Silkworm rearing by Dr. S. Krishnaswami
10. Sericulture Manual -3 Silk reeling by Dr. S. Krishnaswami
11. Mulberry cultivation by Zheng, Ting-Zing
12. Silkworm rearing by Pva Pang- Chesan
13. Silk worm training manual by Sco Hotim.

Scheme of Sericulture practical (IV Semester)

Syllabus based on sericulture special IV paper of IV semester .The duration of examination shall be 2^{1/2} hours.

	MM: 50
9. Dissection / Rendita or Denier	10
10. Propagation / Preparation of Bed	10
11. Spotting	10
12. Viva	10
13. Practical Record	10

Total Marks – 50

Syllabus based on sericulture special IV paper of IV semester

1. Dissection of Silk gland/ Nervous System of Silkworm
2. Propagation of Mulberry by cutting method
3. Preparation of Bed for Silkworm rearing
4. Spotting related to special Sericulture theory paper
5. Find out the Rendita or Denier
6. Practical Record