

**Meeting Held at
Devi Ahilya Vishwavidyalaya, Indore
2 & 3rd June 2014**

**Department of Higher Education, Govt. of M.P.
Under Graduate Semester wise Syllabus
as recommended by Central Board of Studies in Zoology**

उच्च शिक्षा विभाग, म.प्र. शासन
स्नातक कक्षाओं के लिये समेस्टर अनुसार पाठ्यक्रम
केन्द्रीय अध्ययन मण्डल प्राणीशास्त्र द्वारा अनुशंसित

Class / कक्षा	:	B.Sc.
Semesters / समेस्टर	:	I-VI
Subject / विषय	:	Zoology (प्राणीशास्त्र)

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Class / कक्षा	:	B.Sc.
Semester / समेस्टर	:	I
Subject / विषय	:	Zoology (प्राणीशास्त्र)
Title of Paper	:	Invertebrate
Max. Marks:		85

Unit-I

1. Elementary Knowledge of Zoological Nomenclature and International Code.
2. Classification of Lower Invertebrates (According to Parker and Haswell 7th edition)
3. Classification of Higher Invertebrates (According to Parker and Haswell 7th edition)
4. Protozoa- Type Study of Plasmodium.
5. Protozoa and Diseases.

Unit-II

1. Porifera- Type study of Sycon.
2. Types of Canal system.
3. Coelenterata- Type study of Obelia
4. Corals and Coral Reef formation.

Unit-III

1. Helminthes- Type study of Liver Fluke.
2. Nematodes and diseases.
3. Annelida- Type study of earthworm , metamerism.
4. Type Study of Hirudinaria.
5. Structure and significance of Trochophore larva.

Unit-IV

1. Arthropoda- Type study of Prawn.
2. Types study of Periplanata.
3. Larval forms of Crustacea.
4. Insect as Vectors of human diseases.

Unit-V

1. Mollusca- Type study of Pila
2. Echinodermata- External features and water vascular system of Star fish.
3. Larval forms of Echinoderms.
4. Minor Phyla – Ectoprocta & Rotifera.

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Class / कक्षा : **B.Sc.**
Semester / समेस्टर : **त्तंबजपबंस.I**
Subject / विषय : **Zoology (प्राणीशास्त्र)**

Max. Marks: **50**

PRACTICAL

The Practical's work will be based on theory syllabus and the candidates will be required

to show knowledge of the following -

1. Study of Museum Specimens, slides relevant to the type study in theory
2. Mounting (Temporary)
 - a. Mouth parts of insects
 - b. Statocyst of Prawn
 - c. Ctenidium and Osphradium of Pila
 - d. Mounting Material
3. Major Dissection
 - a. Earthworm: Digestive system, nervous system and reproductive system.
 - b. Cockroach : Digestive system, Nervous system,.
 - c. Prawn : Nervous system, Appendages.
 - d. Pila: Nervous system
- 4 Minor Dissection
 - a. Hastate plate and appendages of Prawn.
 - b. Salivary glands of Cockroach.
 - c. Radula of Pila.
 - d. Earthworm: Typhlosole

Distribution of Marks

Time 3 hours

Maximum Marks: 50

	Marks Allotted
1. Major Dissection	10
2. Minor Dissection	05
3. Temporary Mounting	04
4. Spotting (Specimens + Larva + Slides) Representative of Each phylum	16
5. Collection	05
6. Viva voce	05
7. Practical Record	05
Total	50

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Class / कक्षा	:	B.Sc.
Semester / समेस्टर	:	II
Subject / विषय	:	Zoology (प्राणीशास्त्र)
Title of Paper	:	Vertebrates & Evolution
शीर्षक		
Max. Marks अधिकतम अंक	:	85

Unit-1

1. Origin of Chordates Classification of phylum Chordata upto orders according to Parker and Haswell (Latest edition).
2. Hemichordata - External features and affinities of Balanoglossus.
3. Urochordata - Type study of Herdmania.
4. Cephalochordata - Type study of Amphioxus. Affinities of Amphioxus.

Unit-2

1. Comparison between Petromyzon and Myxine.
2. Comparative account of integuments
3. Comparative account of limb bones and girdles of vertebrates (Amphibia, Reptiles, Birds and Mammals).
4. Comparative account of digestive system.
5. Comparative account of respiratory system.

Unit-3

1. Comparative account of aortic arches and heart.
2. Comparative account of brain
3. Placentation in mammals.

Unit-4

1. Origin of life- modern concepts only.
2. Lamarckism, Darwinism.
3. Modern synthetic theories: Variations, Mutation, Isolation & speciation
4. Adaptation and mimicry
5. Micro, macro evolution and mega evolution.

Unit-5

1. Fossils, methods of fossilization, determination of age of fossils.
2. Study of extinct forms: Dinosaurs and Archaeopteryx.
3. Zoogeographical distribution.
4. Evolution of man.
5. Geological time scale and Insular fauna.

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Class / कक्षा : **B.Sc.**
Semester / समेस्टर II : **Practical**
Subject / विषय : **Zoology (प्राणीशास्त्र)**

Practicles

1. Major and minor dissection of commercially available species of local fishes/ rat (Efforts may be done to use computer simulation technique).
2. Study of museum specimens (Vertebrates)
3. Study of specimens of evolutionary importance viz living fossils, connecting links, extinct animals, fossils: Limulus, Latimeria, Dinosours, Asiatic Chital, Archeopteryx, Peripatus, etc.
4. Osteology :Limb bones and girdle bones.
5. Study of Geological time scale chart.
6. Study of Histological Slides (Vertebrates).

Distribution of Marks

Time 3 hours

Maximum Marks: 50

	Marks Allotted
1. Major dissection	08
2. Minor dissection	04
3. Spotting	16
4 Identification and comments upon bones (any two)	04
5. One spot showing evolution/ Exercise	04
5. Mounting	04
6. Viva -voce	05
7. Record	05
	Total 50

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Class / कक्षा : **B.Sc.**
Semester / समेस्टर : **III**
Subject / विषय : **Zoology (प्राणीशास्त्र)**
Title of Paper : **Cell biology and
 Developmental Biology**

Max. Marks

85

Unit-I	1. History of Cell Biology. 2. Cell Theory , Prokaryotic and eukaryotic Cells. 3. Microscopy : Principle and application of Compound microscope & Electron microscope. 4. Structure and transport across the plasma membrane. 5. Extra nuclear organization of cell.
Unit-II	1. Nuclear organization of cell. 2. Nucleo cytoplasmic interactions. 3. Amitosis , mitosis and meosis. 4. Cell death : Necrosis and Apoptosis.
Unit-III	1. Spermatogenesis 2. Oogenesis 3. Fertilization 4. Parthenogenesis 5. Patterns of cleavage.
Unit-IV	1. Frog and Chick embryology upto the formation of three germinal layers. 2. Fate map construction in frog and chick. 3. Gastrulation in Frog and chick up to the formation of germinal layers.
Unit-V	1. Concept of competence 2. Determination and differentiation 3. Extra embryonic membranes in chick 4. Concept of regeneration 5. Stem cells..

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Semester / समेस्टर III	:	Practical
Subject / विषय	:	Zoology (प्राणीशास्त्र)

1. Study of type of cells through histological preparations
2. Study of embryological slides
3. Study of embryo, through window preparation in fertilized bird egg
4. Smear/ squash preparation techniques
5. Study of mitosis, meiosis, oogenesis, spermatogenesis

Distribution of Marks

Time 3 hours
Marks: 50

Maximum

Marks Allotted

1. Spotting (5 spots)	10
2. Squash preparation/ smear preparation	05
3. Identification of embryological stages (2 slides)/ window preparation	07
4. Identification of stage in cell division	05
5. Microtomy techniques/ double or single staining	08
6. Viva	10
7. Record	05
Total	50

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Class / कक्षा	:	B.Sc.
Semester / समेस्टर	:	IV
Subject / विषय	:	Zoology (प्राणीशास्त्र)
Title of Paper	:	Genetics
Maximum Marks	:	85

Unit I: Heredity & Variation, Gene and Genetic Material

1. Chromosome: The Physical basis of heredity and transmitters of heredity.
2. Types of chromosomes: Lampbrush, salivary gland and Beta Chromosomes.
3. Nucleocytoplasmic interactions : Ultra structure of nucleus, nucleolus, Role of nucleus and nucleolus in nucleocytoplasmic interactions including Synthesis & Export of RNA, transport of proteins
4. Heredity and Variation : Sources of variation, Genotype, phenotype and environmental variations (elementary idea)
 - Mendel's laws of heredity
 - Kinds of variations
 - Genetic basis of variation.
- 5 (a) Chemistry of Gene ; Nucleic Acids and their structure.
 - (b).Concept of DNA replication.
 - (c).Nucleosome (Solenoid model).
 - (d) Split genes, overlapping genes and Pseudo genes.
 - (e) Genetic Code.

Unit II: Linkage and Chromosomal Aberrations

1. Gene Linkage: Kinds and Theories of linkage, significance of linkage.
2. Crossing over: Types and mechanism.
3. Theories of sex determination.
4. Sex linked inheritance (Haemophilia, Colour blindness)

Unit III: Cytoplasmic Inheritance, Gene Expression and Regulation

1. Cytoplasmic inheritance: Maternal effect on limnea (Shell Coiling), Kappa particles in Paramecium.
2. Transcription in Prokaryotes and Eukaryotes
3. Translation in Eukaryotes
4. Gene Expression: Regulation of protein synthesis, transcription in Prokaryotes and Eukaryotes.
- 5: Gene Expression: Lac operon model

Unit IV: Mutation and Applied Genetics

1. Mutation

2. Structural and numerical changes in chromosomes.
3. Causes of mutation.
4. Mutagens- classification, Types & effects.

Unit V: Human Genetics & Genetic Engineering

1. Human chromosomes, Elementary idea of Human Genome Project
2. Common genetic diseases in man (Autosomal syndromes, sex chromosome syndromes, diseases due to mutation-Sickle cell anaemia, Albinism & Alkaptonuria.
3. Multiple factors and blood groups.
5. Techniques used in recombinant DNA technology. Construction of Chimeric DNA, Elementary idea of plasmids & vectors.
6. Gene cloning and Polymerase Chain Reaction (PCR) ,Gel Electrophoresis,Northern & Southern Blotting.
7. Gene therapy.
8. DNA finger printing.

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Class / कक्षा : **B.Sc.**
Semester / समेस्टर : **चत्तंबजपबंस IV**
Subject / विषय : **Zoology (प्राणीशास्त्र)**

Practical

1. Identification of spots related to theory.
2. Squash preparation of onion root tip / Chironomous larva salivary gland/ grass hopper testis.
3. Study of instruments techniques related to applied genetics - PCR, Gel electrophoresis, DNA fingerprinting etc.
4. Problems based on genetics.
5. Study of chromosomal DNA (Isolation and demonstration)

Distribution of Marks

Time 3 hours

Maximum Marks: 50

Marks Allotted

1. Spotting (5 Spots)	10 Marks
2. Squash preparation	05 Marks
3. Study of instruments / techniques related to applied genetics	05 Marks
4. Problems on Genetics	10 Marks
5. Viva-Voce	05 Marks
6. Extraction of chromosomal DNA	05 Marks
7. Practical Record and Collection	10 Marks

Total 50 Marks

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Class / कक्षा	:	B.Sc.
Semester / समेस्टर	:	V
Subject / विषय	:	Zoology (प्राणीशास्त्र)
Title of Paper	:	Animal Physiology and Biochemistry
Max. Marks		85

Unit I: Nutrition, Metabolism

1. Physiology of digestion in mammals
2. Protein Metabolism: Deamination, Decarboxylation. Transamination of amino acids, and Ornithine cycle.
3. Carbohydrate metabolism- Glycogenesis, Glycogenolysis, glycolysis, The Citric acid cycle, Gluconeogenesis.
4. Lipid Metabolism-Beta oxidation of fatty acids.

Unit II: Respiration Excretion and Immune System

1. Mechanism and of respiration in mammals(transport of gases, chloride shift)..
2. Physiology of Excretion- urea and urine formation in mammals
3. Innate and acquired immunity, immune cells and lymphed system, immune response: cellular and humoral

Unit III: Regulatory Mechanisms and Enzymes

1. Thermoregulation.
2. Definition and nomenclature of enzymes, classification of enzymes.
3. Mechanism of enzyme action.
4. Vitamins and Co-enzymes

Unit IV: Neuromuscular Co- ordination

1. Introduction to functional anatomy of human brain
2. Types of neurons and glial cells
3. Theory of muscle contraction and its biochemistry.
4. Physiology of nerve impulse conduction.

Unit V: Endocrine system and Reproductive system

1. Structure and functions of Pituitary Gland.
2. Structure and functions of Thyroid Gland.
3. Structure and functions of Adrenal Gland.
4. Structure and functions of Parathyroid, Thymus and Islets of langerhan's.
5. Physiology of Male reproductive organ and female reproductive organ.

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Class / कक्षा	:	B.Sc.
Semester / समेस्टर V	:	Practical
Subject / विषय	:	Zoology (प्राणीशास्त्र)

1. Detection of protein, carbohydrate and lipid.
2. Study of Human salivary enzyme activity in relation to pH.
3. Detection of nitrogenous waste products - Ammonia & Urea
4. Blood pressure measurements
5. Exercise on Haematology - Counting of RBC /WBC and Blood grouping in blood samples.
6. Estimation of Haemoglobin and sugar in blood samples.
7. Histological study of various endocrine glands -T. S. of Thyroid, T. S. of Pituitary gland , T. S. of Adrenal gland , T. S. of Testis, T. S. of Ovary.
8. Histological study of Alimentary canal & various digestive organs - T.S of Stomach , T.S of Intestine ,T.S of Pancreas, and T. S. of liver.
9. Histological study of Visceral organs - T.S of Lungs, L.S. of Kidney
10. Histological study of Muscles - Striated, Unstriated & Cardiac muscle.

Distribution of Marks

Time 3 hours

Maximum Marks: 50

Marks Allotted

1. Spotting (10 Spots).	20Marks
2. Biochemical tests	05 Marks
3. Physiological Experiment (RBC/WBC Count/ Blood Group / Hb)	10 Marks
4. Exercise on enzyme activity	05 Marks
4. Viva-Voce.	05 Marks
5. Practical Record and Collection.	05Marks

Total

50Marks

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Class / कक्षा	:	B.Sc.
Semester / समेस्टर	:	VI
Subject / विषय	:	Zoology (प्राणीशास्त्र)
Title of Paper	:	Ecology and Applied Zoology
Max. Marks:		85

Unit-I Concept of Ecology :

1. Abiotic and biotic factors
2. Energy flow in ecosystem : Food chain and Food web
3. Biogeochemical cycle : CO_2 N and P
4. Population Concept – Characteristics of population. Factors affecting Population growth, Pollution indicators.

Unit-II Habitat Ecology

1. Fresh water , marine and terrestrial habitat
2. Ecological division of India.
3. Biodiversity : Natural resources and their conservation with special reference to forests.

Unit-III Man and Environment

1. Wild life conservation(Laws , National Parks and Sanctuaries of MP)
2. Endangered species of India.
3. Types of pollution : Air, water, soil, thermal and noise pollution.
4. Urbanisation and effect of human population on environment.

Unit-IV Aquaculture

1. Prawn culture: Culture of fresh water prawn , methods of prawn fishing , preservation and processing of prawns
2. Pearl culture and pear industry.
3. Frog culture: Breeding and selection.
4. Major carp culture : Management of ponds , preservation and processing of fishes.
5. Maintenance of Aquarium.

Unit-V Economic Entomology

1. Sericulture: Species of silkworm, life history of *Bombyx mori*, Sericulture Industry in India.
2. Apiculture – Life cycle of the species methods of bee keeping, products of bees, enemies of bees.
3. Lac culture: Lifecycle, and association with the host plant.
4. Common pests: Stored grains: *Sitophilus oryzae* and *Tribolium Castanaeum*, Vegetable pest: *Piers brassicae* and *Dacus cucurbitae*..
5. Biological control of insect pests.

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Class / कक्षा : **B.Sc.**
Semester / समेस्टर VI : **Practical**
Subject / विषय : **Zoology (प्राणीशास्त्र)**

1. Study of fresh water, marine and terrestrial fauna
2. Water analysis- Dissolved Oxygen, Chloride, pH, hardness, turbidity, temperature
3. Pond ecosystem
4. Wild life: Endangered and threatened species
5. Study of specimen related to micro and mega evolution: Commensalism, symbiosis, mimicry, parasitism, colouration, etc.
6. Study of various fossils: Limulus, Latimera, Dinosaurs, Archaeopterux
7. Models of ecosystem
8. Study of life cycles of animals of economic importance
9. Study of planktons
10. Study of pests

Distribution of Marks

Time 3 hours

Maximum Marks: 50

Marks Allotted

1. Physicochemical analysis of water bodies	10
2. Excercise based on applied zoology (life cycles)	05
3. Excercise based on museum keeping techniques	05
4. Spotting	16
5. Models of ecosystem	04
6. Viva	05
7. Recrd	05
Total	50

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Suggested Books for B.Sc. Zoology

Books of Granth Academy

Parker & Haswell: Text Book of Zoology Vol-I & II

Jordan, E.L. and Verma, P.S.: Chordata Zoology

Nigam, H.C.: Zoology of Chordates

Rastogi, V.B.: Developmental Biology

Arora, M.P.: Embryology

Karp: Cell and Molecular Biology

Sheelar & Bianchi: Cell and Molecular Biology

Lewin: Genetics (Latest edition Strickberger: Genetics

Berry, A.K. Animal Physiology and Biochemistry

Prosser: Comparative Animal Physiology

Lehninger: Biochemistry

Bisen, P.S. Laboratory Protocols in Applied Life Sciences

Bisen, P.S.: Introduction to Instrumentation in Life Sciences

Odum, E.P.: Fundamental Ecology

Agrawal, K.C.: Biodiversity

Colbert: Evolution

Natrajan, S.S.: A Manual; of Fresh Water Aquaculture

Sharma, P.D.: Environmental Biology & Toxicology

Swaroop & Pathak: Laboratory Techniques in Modern Biology