

**Department of Higher Education, Govt. of M.P.
Under Graduate Semester wise Syllabus
As recommended by Central board of Studies and
Approved by H E the Governor of M.P.**

Session 2011-12

Class -B.Sc.

Semester -I

Subject -Zoology

Title of Paper : Invertebrate and Cell Biology

Max. Marks -85

Unit-1

1. Introduction to Taxonomy of Animals.
2. Classification of Non Chordates upto classes according to Parker and Haswell.(7th Edition)
 - a. Classification of lower Invertebrates.
 - b. Classification of higher invertebrates.
3. Protozoa – Type study of Plasmodium.
4. Porifera – Type study of Sycon

Unit-2

1. Coelenterata – Type study of Obelia Coral reefs and their economic Importance.
2. Helminthes – Type study of Liver Fluke.
3. Annelida – Type study of Earthworm, Metamerism, Trochophore Larva.

Unit-3

1. Arthropoda – Type study of Prawn.
- 2 Mollusca – Type study of Pila.
3. Echinodermata – External Features of Star Fish and Echinoderm Larvae.

Unit-4

1. The cell – History of Cell Biology, Cell theory, Prokaryotic and Eukaryotic cell.
2. Microscopy : Compound and Electron Microscopy.

Unit-5

1. Nuclear Organization of cell.
2. Extra nuclear organization of cell.
3. Cell reproduction – Amitosis, mitosis, meiosis.

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Session 2011- 2012
Class B.Sc.
Semester I
Subject Zoology

MM. 50

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. Scales of Teleost fish
 - e. 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.
- 4 Minor Dissection
 - a. Hastate plate and appendages of Prawn.
 - b. Salivary glands of Cockroach.
 - c. Radula of Pila.
5. Cell Biology
 - a. Study of Prokaryotic and eukaryotic cell.
 - b. Study of DNA and RNA models.
 - c. Squash preparation of chromosomes from onion root tip.
 - d. study of meiosis in grasshopper testis.

List of Books :

1. Parker and Haswell, Text Book of Zoology, Vol-I (Invertebrate) 7th
2. Edition A.Z.T.B.S. Publishers and Distributors New Delhi 110051.
3. Animal Biology Vol – I – Adhikari, Ganguli & Sinha.
4. Introduction to Cytology – Veerbala Rastogi.
5. Text Book of Cytology – Dallela & Verma
6. Laboratory Techniques by Swaroop, Arora & Pathak.
7. Cell & Molecular Biology – De Robertis & DeRobertis
8. Cell Biology C.B. Powar
9. Development Biology – Veerbala Rastogi
10. Embryology – M.P. Arora.
11. Unified Zoology – U.K. Tiwari and V.K. Singh
12. Unified Zoology – Dr. S.M. Saxena
13. Unified Zoology – H.N. Baizal
14. Unified Zoology – Dr. A.K. Kushrestha
15. Books of Hindi Granth Academy

Department of Higher Education, Govt. of M.P.
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As recommended by Central board of Studies and
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Session 2011- 2012
Class - B.Sc.
Semester -II
Subject -Zoology
Title of Paper : Vertebrates &
Developmental Biology

Max. Marks 70

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.

Unit-2

1. Urochordata – Type study of Herdmania (excluding Development).
- Cephalochordata – Type study of Amphioxus. Affinities of Amphioxus.

Unit-3

1. Comparison between Petromyzon and Myxine-their habitat and distribution.
2. Comparative account of limb bones and girdles of vertebrates (Amphibia, Reptiles, Birds and Mammals).

Unit-4

1. Parthenogenesis.
2. Gametogenesis.
3. Fertilization, Patterns of cleavage

Unit-5

1. Frog and chick embryology upto the formation of three germinal layers.
 - 2 Fate map construction in frog & chick
- Gastrulation in frog and chick upto the formation of germinal layers.
3. Concept of competence, determination and differentiation.
 4. Extra embryonic membranes in chick.
 5. Concept of regeneration

List of Books :

1. Parker and Haswell, Text Book of Zoology, Vol –II (Chordata)
A.Z.T.B.S. Publishers and Distributors New Delhi 110051
2. Jordan, E.L. and P.S. Verma, Chordata Zoology and Elements of
Animal Physiology. S. Chand & Co. Ltd., Ram Nagar, New Delhi
3. Nigam, H.C. Zoology of Chordates, Vishal Publishers Jalandhar –
144008
4. Laboratory Techniques by Swaroop, Arora & Pathak.
5. Chordate Embryology – Dallela and Arora
6. Cell & Molecular Biology – De Robertis & DeRobertis
7. Development Biology – Veerbala Rastogi
8. Embryology – M.P. Arora
9. Chordate Embryology – P.S. Verma
10. Embryology – Mundra.
11. Unified Zoology – U.K. Tiwari and V.K. Singh
12. Unified Zoology – Dr. S.M. Saxena
13. Unified Zoology – H.N. Baizal
14. Unified Zoology – Dr. A.K. Kulshrestha
15. Books of Hindi Granth Academy

Department of Higher Education, Govt. of M.P.
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Session 2011- 2012
Class -B.Sc.
Semester - II
Subject - Zoology

Max. Marks -50

The practical work will be based on theory syllabus and the candidates will be required to show knowledge of the following :

1. Study of museum specimens and slides relevant to theory paper.
2. Osteology
 - a. Girdles and limb bones of : Frog, Varanus, Fowl and Rabbit
3. Cell Biology.
 - Study of DNA and RNA Models.
 - a. Preparations of polytene chromosome in chironomous larva
 - b. Squash preparation of chromosome from Onion root tip.
 - c. Study of Meiosis in Grasshopper testis.
- 4 Embryology : Study of different developmental stages of frog and chick – whole mounts and sections.

**B. Sc. III SEMESTER
SUBJECT-ZOOLOGY
PAPER-I GENETICS**

M.M.35

Lectures: 9

UNIT- I

1. Chromosome – Physical basis of heredity and transmitters of heredity.
2. Types of chromosomes - Lampbrush, Salivary gland and Beta chromosome.
3. Heredity and variations -Environmental Variations (elementary idea).
4. Nucleocytoplasmic interactions.

UNIT- II

Lectures: 9

1. Sources of variations – Genotype and Phenotype.
2. Gene linkage: Theories of linkage, significance of linkage.
3. Crossing over – Mechanism of genetic recombination.
4. Linkage Maps.

UNIT – III

Lectures: 9

1. Sex chromosome system: Chromosome theory & sex determination.
2. Sex Linked inheritance (Haemophilia, colour blindness).
3. Types of Mutations.
4. Causes of mutations, mutagens. Classification, types and effects.

UNIT – IV

Lectures: 9

1. Structural changes in chromosome.
2. Numerical changes in chromosome.
3. Human chromosome & maps.
4. Common genetic disease in man – Sickle cell Anaemia, Albinism & Alkaptonuria.

UNIT – V

Lectures: 9

1. Multiple factors & Blood groups.
2. Twins, physical traits, mental traits.
3. Cytoplasmic Inheritance – Maternal effects in Limnea shell coiling.
4. Carbon dioxide sensitivity in Drosophila & kappa particles in paramecium.

**B. Sc. III SEMESTER
SUBJECT-ZOOLOGY
PAPER II GENETICS**

M.M.35

UNIT- I

Lectures: 10

1. Gene: Introduction and chemistry of gene.
2. Nucleic acids – Structure of DNA and RNA.
3. Concept of DNA replication.

UNIT- II

Lectures: 09

1. Gene expression—Regulation of protein synthesis, transcription in Prokaryotes.
2. Gene expression - Translation in Prokaryotes Operon Model.
3. Transcription and translation in Eukaryotes.

UNIT- III

Lectures: 08

1. Genetic Code.
2. Nucleosome concept (Solenoid Model)
3. Split genes, overlapping genes, pseudogenes.

UNIT- IV

Lectures: 09

1. Techniques used in recombinant DNA technology.
2. Uses of vectors, linkers, adaptors and gene library.
3. Gene cloning and its significance.

UNIT-V

Lectures: 09

1. Polymerase Chain Reaction (PCR).
2. Gene therapy.
3. DNA Fingerprinting.

**B. Sc. II SEMESTER
SUBJECT-ZOOLOGY
PRACTICAL**

1. Identification of spots related to theory.
2. Squash preparation of onion root tip / chironomous salivary gland/grass hopper testis.
3. Study of blood groups.
4. Problems on genetics.

Recommended Books

1. Hartl Jones, Genetics- Jones and Bariett Publishers.
2. Karp, Cell and Molecular Biology- Wiley John.
3. Lodish, Molecular Cell Biology- WH Freeman and Company.
4. Sheelar & Bianchi, Cell & Molecular Biology- John Wiley and Sons.
5. Alberts, Alexander Johnson, Julian Lewis Molecular Biology of The cell- Garland Publishing.
6. Lewin, Genes VIII- Oxford.
7. Gardener, Principles of Genetics- Wiley John
8. B D Singh, Genetics- Kalyani Publications.
9. Verma & Agrawal, Cell Biology, Genetics, Molecular Biology Evolution- S Chand.
10. Old & Primrose, Principles of Genetics-Blackwell Science.
11. Strickberger, Genetics- Prentice Hall.
12. Robert & Tamarin, Principles of Genetics- McGraw Hill.
13. Genetics - Verma P.S. and V.K. Agarwal , S. Chand & Co.
14. Principles of Genetics—Gardner, Wiley Eastern Pvt. Ltd.
15. Genetics -- Winchester, Oxford IBH Publ.
16. Geneics-- Stickberger, Macmillan Pubcl.
17. Genetics – P.K. Gupta, Rastogi,(Hindi and Eng. Edi.).
18. Genetics – M.P. Arora. Himalaya Publication house.

B. Sc. IV SEMESTER
SUBJECT-ZOOLOGY
PAPER I-ANIMAL PHYSIOLOGY

M.M.35
Lectures- 09

UNIT-I

1. Physiology of digestion in Mammals .
2. Metabolism of Protein-Deamination, Transamination and Decarboxylation.
3. Metabolism of carbohydrates- (A) Glycolysis (B) Glycogenolysis (C) Gluconeogenesis
(D) Krebs Cycle
3. Metabolism of Fat- β oxidation.
4. Definition, Nomenclature & Classification of Enzymes

UNIT- II

Lectures- 09

1. Physiology of respiration in Vertebrates.
2. Osmoregulation
3. Physiology of Excretion in Mammals
4. Thermoregulation

UNIT- III

Lectures- 09

- 1 Structure and Properties of Nervous Tissue.
2. Conduction of nerve impulse.
3. Types of muscles and their properties.
5. Physiology of muscle contraction and theories

UNIT- IV

Lectures- 09

1. . Structure and function of thyroid and parathyroid gland.
2. Structure and function of adrenal gland.
3. Structure and function of thymus
4. Structure and function of islets of Langerhans.

UNIT- V

Lectures- 09

1. Structure and function of pituitary gland
2. Physiology of male reproductive system in mammals
3. Physiology of female reproductive system in mammals
4. Oestrous & Menstrual cycle .

**B. Sc. IV SEMESTER
SUBJECT-ZOOLOGY
PAPER-II APPLIED ZOOLOGY**

**M.M.35
Lectures- 09**

UNIT – I

1. Definition and scope of aquaculture.
2. Prawn Culture-Culture of fresh water prawn.
3. Methods of prawn fishing ,preservation and processing of prawns.
4. Pearl Culture and Pearl Industry.
5. Frog Culture, Breeding and Selection

UNIT – II

Lectures- 09

1. Edible fresh water fishes .
2. Fish culture-Management of ponds.
3. Presevation and processing of fishes.
4. Transport and marketing of fishes.

UNIT – III

Lectures- 09

1. Composite fish farming.
2. Planktons and their role in fisheries.
3. Maintenance of aquarium .
4. Economic importance of fishes

UNIT – IV

Lectures- 09

1. Sericulture – Species of silkworm , life history of silkworm – Bombyx mori.
2. Sericulture industry in India .
3. Apiculture – Methods of Bee Keeping , Products of Bee and enemies of Bee .
4. Lac culture .
5. Introduction to Poultry Farming .

UNIT- V

Lectures- 09

1. Stored grain pests – Sitophilus oryzae & Tribolium castanaeum .
2. Vegetable pests- Leucinodes orbonalis , Pieris brassicae & Dacus cucurbitae .
3. Biological control of Insect pests.
4. Chemical control of Insect pests.

**B. Sc. IV SEMESTER
SUBJECT-ZOOLOGY
PRACTICALS**

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. Use of Kymograph
5. Exercise on haematology – Counting of RBC & WBC in blood samples.
6. Maintenance of aquarium .
7. Study of pests -
 Stored grain pests – Sitophilus oryzae & Tribolium castaneum .
 Vegetable pests- Leucinodes orbonalis , Pieris brassicae & Dacus cucurbitae .
8. Study of Planktons – Euglena, Paramecium , Cyclops, Mysis, Daphnia.
9. 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.
10. 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.
11. Histological study of Visceral organs - T.S of Lungs, L.S. of Kidney
12. Histological study of Muscles – Striated , Unstriated & Cardiac muscle.
13. Life Cycle of Lac insect & Honey bee
14. Museum specimen – Fresh water mussel(Unio), Octopus , Sepia , Ostrea, Loligo,
 labeo, Catla , Cirrhinus , Wallago, Mystus , Channa & Clarias

Recommended Books

- 1 Animal Physiology--- Eckert, WH. Freeman.
- 2 General and Comparative Physiology -- William S. Hoar,, Printice Hall (India).
- 3 Principles of Animal Physiology – Wood D.W.
- 4 Comparative Animal Physiology --- Prosser C.L.
- 5 Animal Physiology – Verma P.S. and Sherma.
- 6 Prani Vigyan 2 Books of Hindi Grantha Academy.
- 7 Practical 2 Books of Hindi Grantha Academy
- 8 Seeley, Stephens & Tate, Human Physiology- McGraw Hill.
- 9 Guyton A C, Human Physiology- W B Saunders.
- 10 Rhoades & Tanner, Medical Physiology- Lippincot Williams..
- 11 Nagabbhushanam & Kodarkar, Text book of Animal Physiology, Oxford and IBH
- 12 Rastogi SC, Essentials of Animal Physiology- Wiley Eastern
- 13 Verma P S, Animal Physiology- S Chand.
- 14 Nigam H C, Animal Physiology- Vishal Publication.
- 15 Berry A K, A TB of Animal Physiology- Emkay
- 16 Agrawal, Srivastava & Kumar, Animal Physiology- CBS.
- 17 Moyes & Schulte, Principles of Animal Physiology-Benjamin Cummings.
- 18 Jain, J.L., Jain Sanjay, Jain Nitin -Fundamentals of Biochemistry- S. Chand & Company Ltd, 2005
- 19 Satyanarayana .U, Biochemistry- Books & Allied Pvt. Ltd
- 20 Lehninger, Principles of Biochemistry- MacMillan Worth Publishers,
- 21 H S Srivastava- Elements of Biochemistry, Rastogi Publication

**B. Sc. V SEMESTER
SUBJECT-ZOOLOGY
PAPER I-ENVIRONMENTAL BIOLOGY**

**M.M.35
Lectures- 9**

UNIT-I

- a. Concept of Ecosystem
- b. Biotic components.
- c. and abiotic components.
- d. Limiting factors .
- e. Classification of ecosystem.

UNIT-II

- a Energy flow in Ecosystem
- b. Food Chain.
- c. Food Web.
- d. Ecological pyramids.
- e. Biogeochemical cycles of CO₂, N and P.

UNIT – III

Lectures- 8

- a. Population concept
- b. Characteristics of population.
- c. Population growth .
 - a. Factors affecting population growth.

UNIT – IV

1. Community concept.
2. Succession.
3. Periodicities.
4. Indicators.

UNIT –V

Lectures-

- a. Habitat ecology
- b. Fresh water habitat – Factors and classification
- c. Terrestrial habitat– Factors and classification.
- d. Marine habitat – Factors and classification.

**B. Sc. V SEMESTER
SUBJECT-ZOOLOGY
PAPER II- WILD LIFE AND TOXICOLOGY**

M.M.35

UNIT-I

Lectures- 8

1. Wild life & its Conservation .
2. Endangered and threatened species.
3. National park and Sanctuaries .
4. Environmental Laws .

UNIT- II

Lectures- 8

1. Indian Board of Wild Life .
2. Special projects for Endangered species
3. Gir Lion project .
4. Crocodile project .
5. Musk Deer project .

UNIT-III

Lectures- 10

1. Ecological divisions of India .
2. Zoogeographical distribution of Animals
3. Natural Resources.
4. Conservation of Natural Resources.

UNIT-IV

Lectures- 10

1. Environmental degradation and Pollution .
2. Water pollution.
3. Air pollution.
4. Thermal and Noise pollution.
5. Urbanization and effect of Human pollution on environment .

UNIT- V

Lectures-10

1. Toxicology : Basic concepts
2. Heavy metal toxicity- Pb, Cd and Hg.
3. Toxicity testing – LC 50, LD50, Acute and Chronic toxicity .
4. Global Warming , Green house effect and radiation ecology .
5. Occupational health hazards and their control .

**B. Sc. V SEMESTER
SUBJECT-ZOOLOGY
PRACTICALS**

:

1. Study of Fresh water, Marine and Terrestrial Fauna .
2. Water analysis – Oxygen, chloride.
3. Estimation of pH and Total Hardness.
4. Pond ecosystem.
5. Wild life : Endangered and threatened species.

**B. Sc. VI SEMESTER
SUBJECT-ZOOLOGY
PAPER I- INSTRUMENTATION AND LAB TECHNIQUES**

M.M.35

UNIT-I

1. pH – Definition , Study of pH meter, Determination of pH.,
2. Buffer systems (Bicarbonate and Phosphate.)
3. Chromatography: Principles and Types
4. Paper Chromatography.
5. Thin layer and Column Chromatography.

UNIT – II

1. Microtome: Rocking and rotary and their working mechanism
2. Fixatives and Fixation .
3. Stains and Reagent .

UNIT – III

Microtomy :

1. Paraffin Embedding Techniques .
2. Washing and Dehydration .
3. Block making , Trimming and Section Cutting.
4. Staining and Mounting .

UNIT – IV

Lectures-10

Museum Keeping –

1. Preservation Techniques .
2. Identification of specimen.
3. Sorting of collected specimen .
4. Cataloguing
5. Curation & arrangement of collected specimen.

UNIT – V :

Lectures- 8

1. Taxidermy –
2. Description of Taxidermy
3. Process of Taxidermy taking the example of a bird.
4. Taxidermy , taking the example of a bird.

Recommended Books

- 1 I.P.D. Sharma, Environmental Biology & Toxicology- Rastogi Pub.
- 2 S.V.S. Rana, Laboratory Techniques- Narosa
- 3 Kohli & Ansari, Economic zoology- Ramesh Book Depot.
- 4 Sood. P.P., Toxicology- Mc Graw Hill
- 5 Rath, Aquaculture- Scientific Publishers
- 6 Santhanam Sukumanam Natrajan, A manual of fresh Water aquaculture- Oxford and IBH.
- 7 Bardach , Aquaculture-Wiley
- 8 Behare, Tropical Fish Farming
- 9 Shrivastava, Fishes of India- Narendra Publishing House.
- 10 Pandey. K.C., Introduction of Fishes
- 11 Tembhare, Applied Entomology- Himalaya Publishing House.
- 12 Karger , A guide to general toxicology- S. Karger Publication.
- 13 P.K. Gupta, A method of Environmental Analysis, Water, Soil & Air
- 14 Helmet F. van Ender, Pest Control and its ecology
- 15 Swaroop Arora, Pathak , Laboratory Techniques in Modern Biology- Sarup & Sons
- 16 Bhatia & Ansari , Laboratory Techniques
- 17 Gupta & Gupta, Ichthyology- S Chand.

**B. Sc. VI SEMESTER
SUBJECT-ZOOLOGY
PAPER II-EVOLUTION AND PALEONTOLOGY**

M.M.35

Lectures- 9

UNIT-I

1. Origin of Life
2. Lamarckism.
3. Neo- Lamarckism.
3. Darwinism & Neo Darwinism.

UNIT – II

1. Modern synthetic theory of evolution.
2. Microevolution and Macroevolution.
3. Megaevolution.
4. Variation.

UNIT – III

Lectures-

1. Mutation.
2. Isolation and Speciation.
3. Mimicry and Colouration

UNIT – IV

Lectures- 10

1. Volant adaptations.
2. Aquatic adaptations.
3. Desert adaptations.
4. Deep sea adaptations.

UNIT – V

Lectures- 9

1. Fossil : Methods of formation .
2. Determination of age of fossils.
3. Evolution of Man
4. Dinosaurs.
5. Archaeopteryx.

**B. Sc. VI SEMESTER
SUBJECT-ZOOLOGY
PRACTICALS**

1. Study of pH of water and soil .
2. Study of Chromatography .
3. Study of various working instruments : Centrifuge, Colorimeter and Spectrophotometer.
4. Study of different techniques for Museum Keeping.
5. Study of specimen related with Micro , Mega evolution ,Commensalisms , Symbiosis , Mimicry , Parasitism and colouration .
6. Study of various adaptations – Aquatic, desert, cave, Volant
7. Study of various fossils: Living fossil ,Limulus, Latimera, dinosaurs, Archaeopteryx,.

