

Dept. of Zoology, Palamuru University

# **CBCS SYLLABUS**

(w.e.f.ACADEMIC YEAR 2023-24)

**FOR**  
**POST-GRADUATE DEGREE PROGRAMME**

## **Master of Science** **in Zoology**

**Itoll Semester**

**OF**  
**PALAMURU UNIVERSITY**

**Chairperson,**  
**BoSinZoology**

**palamuru University**  
**Mahabubnagar - 509202**  
**Telangana State**



**PROFESSOR & HEAD**  
**Department of Zoology, UCC**  
**Osmania University**

**CHAIRMAN**  
**Board of Studies in Zoology**  
**Palamuru University**  
**Mahabubnagar-509 001**

Department of Zoology, Osmania University  
Two Year M.Sc. (Zoology) Programme w.e.f. AY 2023-2024 onwards

Proposed Scheme for Choice Based Credit System

Semester I				Semester II			
Course	Hrs /Wk	Credits	Marks	Course	Hrs /Wk	Credits	Marks
1 Core (SB) (Zoo_101T)	4	4	100	1 Core(TTB) (Zoo_201T)	4	4	100
2 Core (ECB) (Zoo_102T)	4	4	100	2 Core (AP) (Zoo_202T)	4	4	100
3 Core(IMM) (Zoo_103T)	4	4	100	3 Core (MGDB) (Zoo_203T)	4	4	100
4 Core (ATFAI) (Zoo_104T)	4	4	100	4 Core (EFAV) (Zoo_204T)	4	4	100
5 Practical (SB&(ECB)) (Zoo_101P)	4	2	100	5 Practical (TTB) (Zoo_201P)	4	2	50
6 Practical (IMM&BSFAI) (Zoo_102P)	4	2	100	6 Practical (AP) (Zoo_202P)	4	2	50
<b>Total</b>	<b>24</b>	<b>20</b>	<b>600</b>	<b>Total</b>	<b>32</b>	<b>20</b>	<b>600</b>

\* 2 hr will be given for each paper for continuous evaluation of student provide.

*[Signature]*  
**PROFESSOR & HEAD**  
 Department of Zoology, UCS,  
 Osmania University, Hyd-07.

*[Signature]*  
**CHAIRMAN**  
 Board of Studies in Zoology,  
 Palamuru University  
 Palamuru-500 001

DEPARTMENT OF ZOOLOGY, OSMANIA UNIVERSITY

Scheme of Examination

Semester – I

S.N.	Subject Code	Subject (Title)	Instruction Hrs/week	Duration of (hrs) Exam.	Max. Marks		Total Marks	Credits
					Internal Assessment	Semester Exam.		
1.	Zoo_101T	Structural Biology	4	3	40	60	100	4
2.	Zoo_102T	Environmental and Conservation Biology	4	3	40	60	100	4
3.	Zoo_103T	Immunology	4	3	40	60	100	4
4.	Zoo_104T	Advances in Taxonomy and Functional Anatomy of Invertebrates	4	3	40	60	100	4
<b>THEORY</b>								
<b>PRACTICALS</b>								
5.	Zoo_101P	Structural Biology & Environmental and Conservation Biology	4	3	-	100	100	2
6.	Zoo_102P	Immunology & BIOSYSTEMATICS, STRUCTURE & FUNCTIONS OF INVERTEBRATES (BSFI)	4	3	-	100	100	2
<b>Total:</b>			<b>24</b>		<b>160</b>	<b>440</b>	<b>600</b>	<b>20</b>

\* 2 hr will be given for each paper for continuous evaluation process.  
periodically.

*Sumithra*

*Sumithra*

**PROFESSOR & HEAD**  
Department of Zoology, UOS  
Osmania University

**CHAIRMAN**  
Board of Studies in Zoology  
Palamuru University  
Mahabubnagar-509 001



DEPARTMENT OF ZOOLOGY, OSMANIA UNIVERSITY

Scheme of Examination

Semester – II

S.N.	Subject Code	Subject (Title)	Instruction Hrs/week	Duration of (hrs) Exam.	Max. Marks		Total Marks	Credits
					Internal Assessment	Semester Exam.		
1.	Zoo_201T	Tools, Techniques and Biostatistics	4	3	40	60	100	4
2.	Zoo_202T	Animal Physiology	4	3	40	60	100	4
3.	Zoo_203T	Molecular Genetics and Developmental Biology	4	3	40	60	100	4
4.	Zoo_204T	Evolution and Functional Anatomy of Vertebrates	4	3	40	60	100	4
	<b>PRACTICALS</b>							
5.	Zoo_201P	Tools, Techniques and Biostatistics & Animal Physiology	4	3	-	100	100	2
6.	Zoo_202P	Molecular Genetics and Developmental Biology & Evolution and Functional Anatomy of Vertebrates	4	3	-	100	100	2
<b>Total:</b>			<b>24</b>		<b>160</b>	<b>440</b>	<b>600</b>	<b>20</b>

2 hr will be given for each paper per week for continuous evaluation program

*[Handwritten signature]*

*[Handwritten signature]*

**PROFESSOR & HEAD**  
 Department of Zoology, UCS  
 Osmania University, Hyd-07  
**CHAIRMAN**  
 Board of Studies in Zoology  
 Palamuru University  
 Mahabubnagar-509 001

Semester – I  
CORE PAPER

Paper I: Structural Biology [SB]

- UNIT I – Basic concepts of Biomolecules and Structural Biology** 15 Hrs
- 1.1 Biomolecules and their significance – carbohydrates, proteins, amino acids, nucleic acids and lipids.
  - 1.2 Chemistry and structure of mono, oligo and polysaccharides; Deoxy sugars, amino sugars and glycosides.
  - 1.3 Classification and structures of proteins – primary, secondary, tertiary and quaternary.
  - 1.4 Classification, structure and function of lipids, fatty acids, triglycerides; phospholipids, cerebrosides, steroids.
  - 1.5 Nucleic acids – Structure of DNA and RNA, DNA polymorphism, RNA types.
- UNIT II – Enzymes and Metabolism** 15 Hrs
- 2.1 Classification, nomenclature and properties of enzymes – catalysis and energy of activation; Enzyme kinetics, Michaelis–Menten Constant; ( $K_m$  values) and LB plot; mechanism of enzyme action and regulation of enzyme activity.
  - 2.2 Metabolism of carbohydrates – Glycolysis; TCA cycle; Gluconeogenesis; biological oxidation; the role of the respiratory chain in energy capture; ATP synthesis.
  - 2.3 Catabolism of amino acids – Transamination, deamination and decarboxylation.
  - 2.4 Oxidation and biosynthesis of fatty acids.
  - 2.5 Metabolic disorders of different biomolecules (carbohydrates, proteins, lipids).
- UNIT III – Cellular Organization** 15 Hrs
- 3.1 Molecular organization and functions of cell membranes.
  - 3.2 Cell permeability – Transport across the cell membrane; transport of small molecules; Carrier proteins; Ion pumps; membrane-bound enzymes.
  - 3.3 Cell communications – Intercellular communication and gap junctions; chemical signalling between the cells; strategies of chemical signalling.
  - 3.4 Signalling mediated by intracellular receptors; signalling mediated cell surface receptors –second and third messengers; C-AMP, G-proteins,  $Ca^{++}$ , Inositol Triphosphate ( $IP_3$ ) and prostaglandins.
  - 3.5 Cell cycle; molecular events in the cell cycle; mitotic spindle.
- UNIT IV – Synthetic Biology** 15 Hrs
- 4.1 DNA replication – Semi conservative, enzymology of DNA replication, replication of circular DNA, initiation, elongation and termination of replication process; Proofreading function of DNA polymerases.
  - 4.2 Enzymatic synthesis of RNA; Regulation of genetic code – Wobble's concept, translation in prokaryotes and eukaryotes.
  - 4.3 Protein synthesis – Events of protein synthesis; transcription in prokaryotes and eukaryotes; post-transcriptional processing.
  - 4.4 DNA repair mechanism – High fidelity of DNA sequence – Repair of damage caused by UV light, Eukaryotes repair systems.
  - 4.5 Synthetic genomics – Basics theoretical and computational modelling of the replicating system.

CHAIR PERSON  
Board of Studies in Zoology  
Osmania University, HYD-7.

New CBCS Syllabus for 2023-24 onwards

## M.Sc. Zoology

### PRACTICALS

- 1 Determination of proteins by Biuret method/ Folin Phenol method.
- 2 Determination of glucose by Somogyi / Anthrone method.
- 3 Determination of lipids by Vanillin method.
- 4 Determination of glycogen by Kemp's method.
- 5 Estimation of cholesterol.
- 6 Determination of enzyme activities of SDH and LDH.
- 7 Effect of substrate concentration and pH on SDH activity.
- 8 Protein fractionation using sodium sulphate.
- 9 Extraction of DNA and RNA.
- 10 Electrophoretic analysis of proteins/DNA.
- 11 Feulgen reaction method for DNA localization.
- 12 Preparation and characterization of a synthetic molecule.
- 13 Submission of assignment **To be submitted at the time of Internal Examination –[ 5 Marks]**

### SUGGESTED BOOKS

- 1 Textbook of Biochemistry by Harper.
- 2 Textbook of Biochemistry by Lehninger.
- 3 Textbook of Biochemistry by Stryer and Stryer.
- 4 Textbook of Biochemistry by Conn and Stumpf.
- 5 Textbook of Biochemistry by A.B.V. Rama Rao.
- 6 Cell and molecular biology by De Robertis and De Robertis, 8<sup>th</sup> ed.
- 7 Molecular Biology by Friefielder.
- 8 Molecular cell biology by Darnell, Lodish and Baltimore (Scientific American Books).
- 9 Molecular biology by H. D. Kumar.
- 10 Biochemistry and molecular biology by W. H. Elliot and D.C. Elliot (OU Press).
- 11 Molecular Biology of Cell by Bruce Alberts et al.
- 12 Cell by Karp.
- 13 Synthetic Biology – Tools and Application by Humin Zhao

  
  
  
  
CHAIR PERSON  
Board of Studies in Zoology  
Osmania University. HYD-7.

Semester – I  
CORE PAPER

Paper II: Environmental and Conservation Biology [ECB]

**UNIT I – Basic Concepts of Ecology**

15 Hrs

- 1.1 Laws of limiting factor, Laws of Minimum, Laws of Tolerance and Tragedy of Commons.
- 1.2 Types of ecosystems – Freshwater, marine and terrestrial.
- 1.3 Micronutrients and macronutrients.
- 1.4 Population characteristics and dynamics – A conceptual approach and Growth curves

**UNIT II – Community Organization and Structure**

15 Hrs

- 2.1 Community analysis, species diversity, ecotone concept and edge effect; ecological niche and niche overlap; the concept of biome.
- 2.2 Concepts of productivity; Biogeochemical cycles; eutrophication of lakes; biological indicator and water quality.
- 2.3 Pollution ecology: Inorganic pollutants and their impact  $SO_2$ ,  $NO_2$ , CO, Phosphates, heavy metals (Arsenic, Lead and Mercury); radioactive nucleotides and their impact on the biological system.
- 2.4 Acid rain sources and its impact on the biological system; greenhouse effect and ozone depletion.

**UNIT III – Biogeography of India, Habitats and Resources**

15 Hrs

- 3.1 Classical concepts of biogeography – continental drift and Plato tectonic theory; endemism, refugia.
- 3.2 Biogeographical regions of India and their salient features.
- 3.3 Concepts of natural resources – renewable and non-renewable resources.
- 3.4 Overexploitation of resources – deforestation, water table depletion and land degradation.

**UNIT IV – Natural Resource Management**

15 Hrs

- 4.1 Environmental Impact Assessment – principle, scope and purpose.
- 4.2 Role of ecological restoration in conservation; displacement and settlement of local communities.
- 4.3 Major conservation movements in India; NGOs in conservation efforts.
- 4.4 National legislation for protecting biological resources

  
**CHAIR PERSON**  
Board of Studies in Zoology  
Osmania University, HYI









## M.Sc. Zoology


### PRACTICALS

- 1 Draw the biogeographical regions of India and provide in brief the salient features of each biogeographical zone.
- 2 Estimation of total alkalinity of water and soil.
- 3 Estimation of phosphates in the water sample.
- 4 Estimation of nitrates and nitrites in the water sample.
- 5 Estimation of magnesium in the water sample.
- 6 Estimation of calcium in the water sample.
- 7 Biological indicators of water quality and their population dynamics – Collection of the water sample.
- 8 Identification of zooplanktons, and their ecological significance.
- 9 Enumeration and identification of the freshwater biodiversity of the local habitats.
- 10 Enumeration and identification of the terrestrial biodiversity of the local habitats.
- 11 Estimation of particulate matter in the air.
- 12 Submission of assignment **To be submitted at the time of Examination – [5 Marks]**

### Suggested Books

- 1 Caughley, G., and A. Gunn. 1996. Conservation Biology in Theory and Practice. Blackwell Science, Cambridge, Massachusetts, U.S.A.
- 2 Cox, G. W. 2005. Conservation Biology: Concepts and Applications. McGraw-Hill, Dubuque, Iowa, U.S.A.
- 3 Dasmann, R., 1981. Wildlife Biology, 2nd ed. John Wiley and Sons, NY.
- 4 Dobson, A. P. 1996. Conservation and Biodiversity. Scientific American Library, New York, New York, U.S.A.
- 5 Jeffries, M. J. 1997. Biodiversity and Conservation. Routledge, New York, New York, U.S.A.
- 6 Mills, L. Scott 2006. Conservation of Wildlife Populations. Blackwell Science, Oxford, U. K.
- 7 Milner-Gulland, E. J., and R. Mace. 1998. Conservation of Biological Resources. Blackwell Science, Oxford.
- 8 Morris, W. F., and D. F. Doak 2002. Quantitative Conservation Biology: Theory and Practice of Population Viability Analysis. Sinauer Associates, Sunderland, Massachusetts, U.S.A.
- 9 Sinclair, A. R. E., J. M. Fryxell, and G. Caughley 2006. Wildlife Ecology, Conservation and Management, Blackwell Publishing.
- 10 Soulé ME (ed) 1986. Conservation biology: the science of scarcity and diversity- Sinauer, Sunderland.
- 11 Bram F. Noble 2005. Introduction to Environmental Impact Assessment: A Guide to Principles and Practice. Oxford University Press, London.
- 12 John A. Wiens and Michael R. Moss 2005. Issues and Perspectives in Landscape Ecology. Cambridge University Press, London.
- 13 Aparna Sawhney 2004. The New Face of Environmental Management in India. Ashgate Publishing Ltd., Sheffield.

New CBCS Syllabus for 2023-24 onwards

  
CHIEF EXAMINER  
Board of Studies in Zoology  
Osmania University, HYD-1.


- UNIT I – Introduction to Immunology** 15 Hrs
- 1.1 Evolution of Immune system - Invertebrates and Vertebrates.
  - 1.2 Immune system – Innate and adaptive immunity.  
Humoral mediated immunity and cell-mediated immunity.
  - 1.3 Cells involved in the immune system, the role of macrophages in immunity
  - 1.4 The Lymphoid tissues – primary and secondary lymphoid organs, lymphatic traffic.
- UNIT II – Immunoglobulins and Complement system** 15 Hrs
- 2.1 Antigens nature, epitope, haptens, antigen-presenting cells, adjuvants. Antigenicity
  - 2.2 Immunoglobulin's structure, function and classification of antibodies.
  - 2.3 Monoclonal antibodies and their application.  
Antigen antibody reactions immunological techniques-  
Principles and application of ELISA, RIA, immunoprecipitation, FISH and GISH.
  - 2.4 Complement system – Components of the complement system, pathways classical and alternative, biological consequences of complement activation and complement significance.
- UNIT III – Hypersensitivity Reactions and Autoimmune Diseases** 15 Hrs
- 3.1 Hypersensitivity – Classification of hypersensitivity reactions;  
Type – I – Anaphylactic hypersensitivity;  
Type – II – Antibody-mediated cytotoxic hypersensitivity.
  - 3.2 Type – III – Immunocomplex mediated hypersensitivity.  
Type – IV – Cell-mediated (Delayed) hypersensitivity.
  - 3.3 Autoimmune diseases – Organ-specific autoimmune diseases –  
Grave's disease, insulin-dependent *diabetes mellitus* (type-I diabetes).
  - 3.4 Autoimmune diseases – Systemic autoimmune diseases –  
Systemic Lupus Erythematosus (SLE), Rheumatoid arthritis.
- UNIT IV – Transplantation and Tumour Immunology** 15 Hrs
- 4.1 Transplantation – Barriers to transplantation.
  - 4.2 Genetic predisposition for graft rejection, prevention of rejection.
  - 4.3 Tumour immunology – Immunity to tumours, tumor Vaccine development and Immune based techniques.
  - 4.4 Immunosurveillance.

  
CHAIR PERSON  
Board of Studies in Zoology  
Osmania University. HYD-7.




## M.Sc. Zoology

### PRACTICALS

- 1 Slide agglutination test – A,B,O blood groups.
- 2 HIV test (Tridot method).
- 3 RDT Kit for Malaria/ Dengue (Source for kit – NVBDCP).
- 4 RPR Test for Syphilis.
- 5 Widal test for diagnosis of enteric fever.
- 6 Blood smear preparation and identification of lymphocytes.
- 7 Identification of histological slides of lymphoid tissues - Spleen, thymus, lymph node and bone marrow.
- 8 Single Radial immunodiffusion for estimating the concentration of antibodies and antigens.
- 9 Immunization schedules and rising of antibodies.
- 10 Demonstration of Immuno-electrophoresis.
- 11 Submission of assignment [To be submitted at the time of Internal Examination – [5 Marks]

### Suggested Books

- 1 Immunology, Kuby, W.F. Freeman, U.S.A.
- 2 Fundamentals of Immunology, W. Paul.
- 3 Essentials of Immunology, I.M. Roitt.
- 4 Immunology A Foundation Text by Basiro Davey.
- 5 An introduction to immunology, by Ian R. Tizard.

  
CHAIR PERSON  
Board of Studies in Zoology  
Osmania University. HYD-7.







Semester – I  
CORE PAPER

**Paper IV: Biosystematics, Structure & Functions of Invertebrates**

**UNIT I – Advances in Taxonomy** 15 Hrs

- 1.1 Basic concepts of biosystematics, taxonomy and classification; Branches of taxonomy – Cytotaxonomy, Chemotaxonomy, Numerical Taxonomy, and Cladistics Taxonomy.
- 1.2 Taxonomic hierarchy of ranks; Species concepts – Biological, Evolutionary, and Phylogenetic.
- 1.3 Recent trends in biosystematics – Molecular taxonomy and Integrative approaches.
- 1.4 International Code for Zoological Nomenclature (ICZN) – Operative principles, interpretation and application of important rules.

**UNIT II – Nutrition & Respiration in Invertebrates** 15 Hrs


- 2.1 Patterns of feeding and digestion in metazoan
- 2.2 Filter feeding mechanism in polychaeta Reproduction and development in Cnidaria.
- 2.3 Modifications in the digestive system of invertebrates with special reference to Arthropoda & Mollusca Reproduction, development and larval forms of Platyhelminthes.
- 2.4 Respiration: Respiratory pigments, Organs of respiration-gills, trachea and lungs, mechanism of respiration

**UNIT III – Excretory and Nervous systems in Invertebrates** 15 Hrs

- 3.1 Organs of excretion- coelome, coelomoducts, Nephridia, Malpighian tubules. Mechanism of excretion and osmoregulation
- 3.2 Nervous system: Coelenterates and Echinodermata Shell and foot & their functions in Mollusca.
- 3.3 Nervous system: arthropods (Crustaceans and insects) and Molluscs Cephalopoda)
- 3.4 Eusociality in insects and Autotomy and regeneration in echinoderms.

**UNIT IV – Minor Phyla** 15 Hrs

- 4.1 General organization and affinities of Ctenophora, Nemertea, Bryozoa, Entoprocta, Chaetognatha
- 4.2 Larval forms of free-living invertebrates (Coelenterata, Annelida, Arthropoda, Mollusca and Echinodermata)
- 4.3 Larval forms of helminthes and crustacean
- 4.4 Evolutionary significance of larval forms.

  
CHAIR PERSON  
Board of Studies in Zoology  
Osmania University, HYD-7.





## M.Sc. Zoology

### PRACTICALS

- 1 Specimen studies - Salient characteristics, identification and classification of representative types of invertebrate groups from Protozoa, Porifera, Cnidaria, Ctenophora, Annelida, Mollusca, Arthropoda, Echinodermata, and Hemichordata.
- 2 Collection and identification of invertebrates in pond water.
- 3 Preparation of permanent slides of zooplanktons (minimum three different types of species).
- 4 Collection and identification of parasites from the cockroach.
- 5 Dissections -
  1. Minor – a) Reproductive system of cockroach, b) Mouthparts of cockroach
  2. Major – a) Nervous system of prawn
- 6 Submission of assignment **To be submitted at the time of Practical Examination – [5 Marks]**

### Suggested Books

- 1 Principles of Systematic Zoology (2nd Edition) by E. Mayr and P.D. Ashlock.
- 2 Five Kingdoms - An Illustrated Guide to the Phyla of Life on Earth by Lynn Margulis & M.J. Chapman.
- 3 A Textbook of Zoology Vol. I by Parker and Haswell (Revised).
- 4 The Invertebrates Vol. I to Vol. VI by L. H. Hyman.
- 5 Invertebrate structure and function by E. J. W. Barrington.
- 6 Invertebrate Zoology by P. A. Meglitsch (Oxford Press).
- 7 Life of Invertebrates by Russel Hunter.
- 8 Invertebrate Zoology by Rupport and Barnes (Saunders College Publishing Co.).
- 9 Life of Invertebrates by S. N. Prasad.
- 10 Evolutionary Biology by Eric C. Mitkoff.
- 11 Worms and Man by D. W. T. Crompton.
- 12 Parasitology by Noble and Noble.
- 13 Regeneration by S. M. Rose-Appleton.

  
  
  
  
CHAIR PERSON  
Board of Studies in Zoology  
Osmania University, HYD-7

Paper I: Tools, Techniques and Biostatistics [TTB]

**UNIT I – Tools and Separation Techniques**

15 Hrs

- 1.1 Principles of Microscopic Techniques: light, UV, confocal phase contrast, Fluorescent Microscopy; Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM).
- 1.2 Homogenization; cell fractionations; Types of Centrifugations, principles and applications of Preparative, analytical and ultra-centrifugation.
- 1.3 Chromatography Techniques; Adsorption Chromatography, TLC, Ion Exchange Chromatography, Gel Chromatography, HPLC, Affinity Chromatography.
- 1.4 Electrophoresis Techniques - Principles and applications of continuous disc, iso-electro focusing and isotachopheresis.

**UNIT II – Separation and Imaging Techniques**

15 Hrs

- 2.1 Spectroscopy Techniques: principles and applications: Fluorescence, UV, Visible, Infrared, NMR, Gc-MS, FTIR
- 2.2 Radioisotope Techniques: Principles and application of Geiger-Muller and scintillation counter. Principles and applications of tracer techniques in biology; radioactive isotopes and autoradiography.
- 2.3 Electrophysiological Techniques: Single neuron recording, patch-clamp recording.
- 2.4 Imaging Techniques: PET, MRI, fMRI, ECG and CAT.

**UNIT III – Biostatics-I: Introduction, Measure and theories of probability**


15 Hrs

- 3.1 Introduction to biostatistics; Statistical data & tabulation of data. Frequency distribution; graphical representation of data
- 3.2 Measures of central tendency – Mathematical average (Mean – Arithmetic, Geometric & Harmonic Mean) and Positional Averages (Median and Mode);
- 3.3 Measures of dispersion (or variability) – types, range, quartile deviation, mean deviation, variance, standard deviation, coefficient of variance.
- 3.4 Basics of Probability – Concept of probability, addition and multiplication laws of probability and application to the problems of biology. Normal, Binominal and Poisson distribution

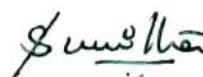
**UNIT IV – Biostatistics-II: Hypothesis testing and inferential statistics**

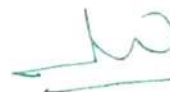
15 Hrs

- 4.1 Sampling concept, sampling, distribution of mean, standard error, random variable concept, expectation and variance of random variable
- 4.2 Statistical estimations- types methods and application; statistical hypothesis- types testing (Hypothesis, Null Hypothesis, Alternative Hypothesis) Decision Making (Types -I Type -II errors), Determination ( Fixation of levels of Significance)
- 4.3 Parametric tests- student's t-test; analysis of variance (ANOVA or F- ratiion one way and two way analysis); Chi-Square test ( Test of independence and Test of Goodness of Fit)
- 4.4 Correlation and regression analysis concepts and their application

  
CHAIR PERSON  
Board of Studies in Zoology  
Osmania University, HYD-7.









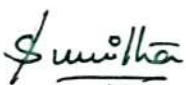

## M.Sc. Zoology

### PRACTICALS

- 1 To fix a tissue with Bouin's fixative and stain using hematoxylin-eosin stain for histochemical studies
- 2 Separation of AMINO ACIDS by paper chromatography
- 3 Quantitative detection of total carbohydrates using Anthrone technique
- 4 Quantitative detection of total lipids using sulpho-phosphovanillin technique
- 5 Quantitative detection of total proteins using Lowry et al's Biuret technique
- 6 Graphic presentation of data – bar diagram, histogram, frequency polygon and pie chart
- 7 Calculation of measures of central tendencies – mean, median and mode
- 8 Calculation of measures of dispersions – range, mean deviation, standard deviation, variance and coefficient of variance
- 9 Computation of test of significance – comparison of sample mean with population mean and two sample means.
- 10 Calculate the coefficient of correlation between two variable
- 11 Computation of liner regression
- 12 Computation of one way analysis of variance ( ANOVA)
- 13 Using Chi Square test, test the independence of two variables
- 14 Submission of assignment [To be submitted at the time of INENRAL Examination – 5 Marks]

### Suggested Books


- 1 Principles and techniques of Practical Biochemistry Ed. B.L. Williams & K. Wilson, Arnold Publishers
- 2 Practical Biochemistry by Plummer
- 3 Immunology – Roit
- 4 Cell and Molecular Biology – DeRobertis
- 5 Cell and Molecular Biology – Ladish et al.
- 6 Statistical methods, Snedecor, G.W. and W.G. Cochran, Iowa State Univ. Press
- 7 Biometry by W. H. Freeman and Francisco
- 8 Fundamentals of Biometry by L.N. Balaram (1980)
- 9 Biostatistics by N. Gurumani
- 10 Techniques in life sciences – by Tembhare

  
  
  
  
CHAIR PERSON  
Board of Studies in Zoology  
Osmania University, HYD-7.

Semester – II  
CORE PAPER

Paper II: Animal Physiology [AP]

- UNIT I – Digestion, Respiration & Circulation** **15 Hrs**
- 1.1 Cellulose digestion –Ruminant and non-ruminant digestion; absorption in mammals; events of absorptive and post-absorptive states and their regulation (endocrine and neural).
  - 1.2 Respiration – Cascade of oxygen transport to tissues at high altitude; adaptation to diving.
  - 1.3 Responses to CO<sub>2</sub> and O<sub>2</sub> rich environment; oxygen toxicity; hypercapnea, control of respiration.
  - 1.4 Circulation - Cardiac cycle and principles of hemodynamics; blood coagulation, haematome formation; Anti-coagulants.
- UNIT II – Osmoregulation, Excretion & Thermoregulation** **15 Hrs**
- 2.1 Osmoregulation – Osmoregulatory problems in brackish water, fresh water and marine organisms; osmotic problems in terrestrial animals; hormonal control of osmoregulation.
  - 2.2 Excretion – Urine formation, counter-current mechanism; juxtaglomerular apparatus, rennin-angiotensin system; hormonal regulation – ADH and aldosterone.
  - 2.3 Detoxification of nitrogen products; purine cycle and miscellaneous detoxification pathways.
  - 2.4 Thermal physiology – temperature regulation in poikilotherms, homeotherms and heterotherms, and their mechanisms of survival; central control of homeothermy.
- UNIT III – Muscle Physiology, Neurophysiology & Receptors** **15 Hrs**
- 3.1 Comparative molecular structure and function of skeletal, smooth and cardiac muscles; energy metabolism in skeletal muscle, muscle fatigue.
  - 3.2 Types of neurons and glial cells.
  - 3.3 Basis and significance of membrane potentials, equilibrium potentials, their change during the stimulus, Na, K currents in the action potential.
  - 3.4 Types of synapses, synaptic transmission - electrical and chemical; synaptic inhibition and neurotransmitters.
- UNIT IV – Endocrinology, Bioluminescence & Stress Physiology** **15 Hrs**
- 4.1 Structure and function of endocrine glands of invertebrate hormones.
  - 4.2 Structure and function of endocrine glands of invertebrate hormones.
  - 4.3 Mechanism of hormone action - Peptide and steroid hormones.
  - 4.4 Bioluminescence - Luminescent organisms - Neural control; Biochemistry and significance of luminescence.

  
CHAIR PERSON  
Board of Studies in Zoology  
Osmania University, HYD-7.






## M.Sc. Zoology

### PRACTICALS

- 1 Estimation of blood chlorides under hetero osmotic media.
- 2 Cold and heat stress on metabolic rate in tilapia fish/crab.
- 3 Effect of heat stress on glycogen levels in tilapia fish/crab.
- 4 Estimation of Acetylcholinesterase activity.
- 5 Estimation of phosphorylase activity.
- 6 Adrenalin and insulin induced changes in blood glucose levels in rat/mice.
- 7 Kymographic recordings of twitch, tetanus and fatigue.
- 8 Estimation of Hb, ESR and blood clotting time.
- 9 Cell fragility.
- 10 Submission of assignment. [To be submitted at the time of Internal Examination – 5 Marks]

### Suggested Books

- 1 Principles of Animal Physiology by D.W. Wood.
- 2 Principles of Animal Physiology by Gordon.
- 3 Animal Physiology-Adaptations and environment by Schmidt-Nielson.
- 4 Principles of Animal Physiology by Wilson.
- 5 Text Book of Medical Physiology by Guyton.
- 6 General & Comparative Animal Physiology by William Hoar.
- 7 Comparative Animal Physiology by Florey.
- 8 Comparative Animal Physiology by L.C. Prosser.
- 9 Human Physiology by Vander.

  
CHAIR PERSON  
Board of Studies in Zoology  
Osmania University, HYD-7.







Semester II  
CORE PAPER

Paper III: Molecular Genetics and Developmental Biology [MGDB]

UNIT I – Introduction to Genetics

15 Hrs

- 1.1 Mendelism; Mendelian inheritance; modification of mendelian inheritance.
- 1.2 Linkage studies, crossing over and extrachromosomal inheritance, multiple alleles blood group antigens, karyotype.
- 1.3 Genetic disorders – Chromosomal disorders; inborn errors metabolism, polygenic inheritance, pedigree analysis.
- 1.4 Bacterial genetics – Transformation, , conjugation, transduction, viral lytic and lysogenic cycle.

UNIT II – Molecular Genetics

15 Hrs

- 2.1 Introduction of DNA technology – Restriction endonucleases, methods of ligation – DNA ligases, ligation of the fragment with cohesive and blunt ends.
- 2.2 Features of vectors – Cosmids, plasmids and shuttle vector with one example representing each class construction and characterization of new cloning vectors.
- 2.3 Cloning strategies – Shotgun cloning, construction of gene libraries, genomic library and DNA library. DNA finger printing and its applications
- 2.4 Hybridization techniques – Southern blot, Northern blot, R-loop mapping methods, *In-situ* hybridization.

UNIT III – Overview of Developmental Biology

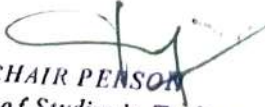
15 Hrs

- 3.1 Scope and importance of developmental biology.
- 3.2 Gametogenesis; spermatogenesis, oogenesis, vitellogenesis and chemo differentiation.
- 3.3 Fertilization, parthenogenesis and its significance.
- 3.4 Types of cleavage, mechanism of cleavage, chemical changes during cleavage.

UNIT IV – Organogenesis

15 Hrs

- 4.1 Gastrulation, metabolic events during gastrulation and rudimentary organs formation.
- 4.2 Concept of organisers and inducers; Neural tubule formation. Fate maps and stem cells
- 4.3 Role of hormones in the metamorphosis of insects and frog; regeneration in Cnidaria, Echinodermata, Amphibia (limb and tail regeneration), and Reptiles (tail regeneration).
- 4.4 Teratogenesis– Genetic and environmental; developmental mechanisms of teratogenesis

  
CHAIR PERSON  
Board of Studies in Zoology  
Osmania University, HYD-7.







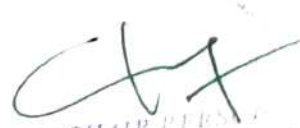
## M.Sc. Zoology

### PRACTICALS

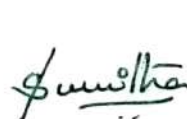
- 1 Identification of blood groups: A, B, O.
- 2 Karyotyping of human chromosomes.
- 3 Isolation and estimation of DNA in tissue.
- 4 Isolation and estimation of RNA in tissue.
- 5 Estimation of soluble and structural proteins in chick embryo (any two durations) – 24hrs, 48hrs, 72hrs, &96hrs.
- 6 Estimation of SDH activity in chick embryo (any two durations) – 24hrs, 48hrs, 72hrs, &96hrs.
- 7 Estimation of LDH activity in chick embryo (any two durations) – 24hrs, 48hrs, 72hrs, &96hrs.
- 8 Estimation of calcium in eggshell by EDTA method (any two durations) – 24hrs, 48hrs, 72hrs, &96hrs.
- 9 Identification of chick embryo developmental stages (any two durations) – 24hrs, 48hrs, 72hrs, &96hrs.
- 10 Study of cleavage patterns in *Lymnaea*.
- 11 Submission of assignment **To be submitted at the time of Examination –[5 Marks]**

### Suggested Books

- 1 General genetics by Winchester
- 2 Molecular Biology of gene by Watson et al. Vol I & II
- 3 Genetics by Strickberger
- 4 Molecular Biology by Friefielder
- 5 Genetics by P.K. Gupta
- 6 Genes by Lewis
- 7 General genetics by S. R. B. Owen
- 8 Cell and molecular biology by De Robertis and De Robertis, 8th ed.
- 11 Molecular cell biology by Darnell, Lodish and Baltimore (Scientific American books)
- 12 Molecular biology by H. D. Kumar
- 13 Biochemistry and molecular biology by W. H. Elliot and D.C.Elliot (OUPress)
- 14 Textbook of molecular biology by K. S. Sastry et al. (MacMillan Ind. Pvt. Ltd.)
- 15 Developmental Biology - patterns, problems and principles by W. Saunders Jr.
- 16 Principles of Animal Developmental Biology by S.C. Goel
- 17 Introduction to embryology by Balinsky
- 18 Developmental Biology S. Gilbert
- 19 Evolution by Savage
- 20 Process of organic evolution by Stebbings
- 21 Evolution of vertebrates by Colbert
- 22 Developmental Biology by Berryl

  
CHAIR PERSON  
Board of Studies in Zoology  
Osmania University, HYD-7.







New CBCS Syllabus for 2023-24 onwards

Semester – II  
CORE PAPER

Paper IV: Evolution & STRUCTURE AND FUNCTIONS OF VERTEBRATES [ESFV]

UNIT I – Evolution of Life

15 Hrs

- 1.1 Theories of evolution – Pre-Darwinian concepts, Darwinism, Neo-Darwinism.
- 1.2 Natural Selection and adaptation; Mutation – Its types, mutation rates; Variation and Genetic drift
- 1.3 Speciation – Reproductive isolation (pre-zygotic & post-zygotic), modes of speciation (Allopatric, Sympatric & Parapatric).
- 1.4 Patterns of evolution – Sequential, divergent, convergent, gradual, punctuated, monophyletic, polyphyletic & paraphyletic.

UNIT II – Evolution of Vertebrates

15 Hrs

- 2.1 Evolution of Agnathans – a) Extinct (Conodonts, Ostracoderms & Pteraspidomorphi) and b) Living (Myxinoidea & Petromyzontiformes).
- 2.2 Evolution of Gnathostomes – a) Placodermi and b) Chondrichthyes (including Elasmobranchii & Holocephali).
- 2.3 Evolution of Teleostomi – a) Acanthodii and b) Osteichthyes (Actinopterygii & Sarcopterygii).
- 2.4 Evolution Tetrapods – a) Labryinthodonts, b) Lepospondyls and c) Lissamphibia (Urodela, Anura & Apoda).
- 2.5 Evolution of Amniotes – a) Reptilia (Mesozoic and living reptiles), b) Aves (Palaeognathae & Neognathae) and c) Mammalia (Prototheria & Theriiformes).

UNIT III – Functional Anatomy – I


15 Hrs



- 3.1 Integumentary system – Integument and its derivatives.
- 3.2 Cranial skeletal system – a) Basic plan of skull; b) Temporal fossae – its function; c) Jaw suspension and its types.
- 3.3 Post-cranial skeletal system – a) Axial skeleton; b) Appendicular skeleton; c) Joints (both axial & appendicular and their types).
- 3.4 Digestive system in Aves and Mammals – Components and function; Dentition in mammals.
- 3.5 Respiratory system in vertebrates (Fishes to Mammals) – Gills, lungs and other respiratory structures.

UNIT IV – Functional Anatomy – II

15 Hrs

- 4.1 Excretory system in vertebrates (Fishes to Mammals) – Kidney and its structure; Modes of excretion.
- 4.2 Nervous system in vertebrates (Fishes to Mammals) – Brain, spinal cord and peripheral nerves.
- 4.3 Sense organs, simple receptors, organs of olfaction and taste, Lateral line system and electric organs
- 4.4 Evolutionary significance of internal fertilization; Placenta and its types.

  
CHAIR PERSON  
Board of Studies in Zoology  
Osmania University

  
  
New CBCS Syllabus for 2023-24 onwards

## M.Sc. Zoology

### PRACTICALS

- 1 Specimen studies - Salient characteristics, identification and classification of representative types of vertebrate groups - Pisces, Amphibia, Reptilia, Aves, and Mammalia.
- 2 Collection and preparation of slides of scales of fishes.
- 3 Dissections:
  1. Minor – a) Weberian ossicles of *Labeo*, and b) Respiratory trees of *Clarius*
  2. Major – a) Cranial nerves of *Labeo* (V, VII, IX & X cranial nerves)
- 4 Submission of assignment on: Submission of assignment [**To be submitted at the time of Practical Examination – 5 Marks**]

### Suggested Books

- 1 Evolution of Vertebrates by E.H. Colbert
- 2 Evolutionary Biology by Mitkoff
- 3 Organic Evolution by Veer Bala Rastogi
- 4 Vertebrates – Comparative Anatomy, Function & Evolution (8<sup>th</sup> Ed.) by K.V. Kardong
- 5 Life of Vertebrates by J.Z. Young
- 6 A Textbook of Zoology Vol. II by Parker and Haswell (revised by Marshall)
- 7 Vertebrate Body by A.S. Romer
- 8 Chordates by Alexander
- 9 Comparative Vertebrate Anatomy by Hyman
- 10 Vertebrate Structure and Function by Waterman
- 11 Comparative Anatomy by Kent
- 12 Vertebrates by R.L. Kotpal
- 13 Chordate Zoology E. L. Jordan & P. S. Verma
- 14 Vertebrate Zoology & Evolution – Yadav B. N. & D. Kumar

  
CHAIR PERSON  
Board of Studies in Zoology  
Osmania University, HYD-7.



