



बिरसा मुंडा ट्रायबल युनिवर्सिटी Birsa Munda Tribal University

राजपिपला, जि० नर्मदा Rajpipla, Dist. Narmda

Established by Tribal Development Department, Govt. of Gujarat

School of Science M.Sc. (ZOOLOGY) Programme

**Subject Code & Name: - MS01CZOO03: Practical Based on
MS01CZOO01 & MS01CZOO02**

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				Internal		External	
L	T	P	Total	TH	PWE	TH	PWE
--	--	4	4	--	50 %	--	50 %

Programme Name	M.Sc. ZOOLOGY
Semester	I
Course Code	MS01CZOO03
Course Title	Practical Based on MS01CZOO01 & MS01CZOO02
Course Content Type (Th./Pr.)	Practical
Course Credit	4
Sessions+ Lab. Per Week	8
Total Teaching/Lab. Hours	60 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

- To develop practical understanding of invertebrate diversity, morphology and functional adaptations through the study of representative specimens and life history stages.
- To acquire hands-on skills in cytological techniques including staining, chromosome preparation, mitosis, meiosis and microscopic observations.
- To understand the principles of molecular biology through nucleic acid estimation, chromosome organization and gene regulation studies.

Prerequisites (if any)

- Basic knowledge of Zoology, Cell Biology, Genetics and Molecular Biology at the undergraduate level.
- Familiarity with the structure and functions of cells, chromosomes, DNA, RNA and major invertebrate groups.
- Ability to handle laboratory equipment such as microscopes and follow standard laboratory safety procedures.



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Learning Outcomes

On the Completion of this course, students will able to:

1. Identify and classify major invertebrate groups and explain their feeding, respiratory, excretory, reproductive, and developmental adaptations.
2. Perform and interpret cytological and molecular biology experiments, including staining techniques, chromosome analysis, and nucleic acid estimation.
3. Analyze chromosome organization and gene regulation mechanisms and apply laboratory skills for advanced biological studies and research.

Detailed Contents

UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
List of Practical (Practical are demonstrated using charts, models and multimedia videos)		
1	Study of classification outline of Invertebrates (Protists to Hemichordate) with examples	
2	Study of Feeding mechanism in Invertebrates	
3	Study of Respiratory organs of Invertebrates	
4	Study of Excretory organs of Invertebrates	
5	Study of Reproduction in Invertebrates	
6	Study of Invertebrate Larva	
7	Observation of prokaryotic and eukaryotic cells by staining techniques	
8	Observation of cytoplasmic organelles through prepared slides	
9	Study of mitosis in onion root tip by squash method	
10	Study of meiosis in <i>Tradescantia</i> bud by squash method	
11	Study of preparation of chromosome spreads and karyotype analysis	
12	Vital staining of mitochondria using Janus Green B	
13	Observation of nucleus and nucleolus using Feulgen staining	
14	Chromatin and Chromosome Organization Practical	
15	Preparation of polytene chromosome squash	
16	Study cell junctions with help of chart	
17	Demonstration of Barr body in human cheek cell/ leucocytes	
18	Estimation of DNA by DPA method	
19	Estimation of RNA by Orcinol method	
20	Study of Operons: Lac operon and Tryptophan operon with help of chart	





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Text Book(s)

- 1 Practical Zoology: Invertebrates by S.S. Lal, Rastogi Publications
- 2 Laboratory Manual in Cell Biology by C.B. Powar, Himalaya Publishing House
- 3 Practical Cell Biology by P.S. Verma & V.K. Agarwal, S. Chand Publishing
- 4 Experimental Cell Biology by Veer Bala Rastogi, New Age International Publishers
- 5 Practical Molecular Biology by H.S. Chawla, Oxford & IBH Publishing
- 6 Laboratory Manual in Biochemistry by J. Jayaraman, New Age International Publishers
- 7 An Introduction to Practical Biochemistry by David T. Plummer, McGraw-Hill Education
- 8 Experiments in Molecular Biology by Robert Schleif & Pieter C. Wensink, Springer
- 9 Molecular Cloning: A Laboratory Manual by Joseph Sambrook & David W. Russell, Cold Spring Harbor Laboratory Press

Reference Books

- 1 Invertebrate Zoology by E.L. Jordan & P.S. Verma, S. Chand Publishing
- 2 Modern Textbook of Zoology: Invertebrates by R.L. Kotpal, Rastogi Publications
- 3 Invertebrate Zoology, Ruppert by Fox & Barnes, Brooks/Cole
- 4 Molecular Biology of the Cell by Bruce Alberts et al., Garland Science
- 5 Cell Biology by Gerald Karp, Wiley India
- 6 Cell and Molecular Biology by De Robertis & De Robertis, Lippincott Williams & Wilkins
- 7 Cell Biology by C.B. Powar, Himalaya Publishing House
- 8 Principles of Gene Manipulation and Genomics by Sandy B. Primrose & Richard Twyman, Wiley-Blackwell
- 9 Molecular Biology of the Gene by James D. Watson et al., Pearson
- 10 Molecular Biology by David P. Clark & Lonnie D. Russell, Academic Press
- 11 Lewin's Genes by Jocelyn E. Krebs, Elliott S. Goldstein & Stephen T. Kilpatrick Jones & Bartlett Learning



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Web Resources

1. JoVE Science Education – <https://www.jove.com/science-education-library>
2. NCBI Bookshelf – <https://www.ncbi.nlm.nih.gov/books>
3. OpenStax Biology – <https://openstax.org/details/books/biology-2e>
4. HHMI BioInteractive – <https://www.biointeractive.org>
5. Learn Genetics (University of Utah) – <https://learn.genetics.utah.edu>
6. DNA Learning Center (DNALC) – <https://www.dnalc.org>
7. Cell Image Library – <https://www.cellimagelibrary.org>
8. Biology LibreTexts – <https://bio.libretexts.org>
9. Virtual Labs (Amrita University) – <https://vlab.amrita.edu>
10. ePG Pathshala – <https://epgp.inflibnet.ac.in>
11. Zoology Notes – <https://www.zoologynotes.com>
12. Microbe Notes – <https://microbenotes.com>
13. BYJU'S Biology – <https://byjus.com/biology>
14. Easy Biology Class – <https://www.easybiologyclass.com>
15. Biocyclopedia – <https://biocyclopedia.com>

Required Software(s) (if any)

L:: Lecture, **T::** Tutorial, **P::** Practical

PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)