

# **UNIVERSITY OF KOTA**

**FACULTY OF SCIENCE**

**M. SC. ZOOLOGY**

**SYLLABUS AND SCHEME OF  
SEMESTER EXAMINATION FOR THE  
ACADEMIC YEAR**

**2023-24**



**Semester-I: (July - December 2023)**

**Semester-II: (January - June 2024)**

**UNIVERSITY OF KOTA**

**MBS Marg, Near Kabir Circle, Kota (Rajasthan) 324 005**

**Syllabus Edition: 2023 (as per NEP 2020)**

**University of Kota**  
**Master of Science (M. Sc.) Program**  
**Subject/Discipline: Zoology**  
**Scheme of Semester I & II**

| Semester                   | Number, Code or ID and Nomenclature of Paper |               |      |                                       | Duration of Exam (in Hrs.) | Teaching Hrs./Week |           |              | Distribution of Assessment Marks     |            |                                    |            |            |            |
|----------------------------|--|---------------|------|---------------------------------------|----------------------------|--------------------|-----------|--------------|--------------------------------------|------------|------------------------------------|------------|------------|------------|
|                            |  |               |      |                                       |                            |                    |           |              | Continuous/Internal Assessment (30%) |            | Semester/External Assessment (70%) |            | Total      |            |
| Semester-I                 | Number of Paper                              | Code/ID Paper | Code | Nomenclature of Paper                 |                            | Teaching           |           | Credit Point | Max Marks                            | Min Marks  | Max Marks                          | Min Marks  | Max Marks  | Min. Marks |
|                            |  |               |      |                                       |                            | Th.                | Pr.       |              |                                      |            |                                    |            |            |            |
| Semester-I                 | Paper- 1.1                                   | ZOO-12201     | DCC  | Invertebrate: Structure and Functions | 3                          | 4                  | -         | 4            | 30                                   | 12         | 70                                 | 28         | 100        | 40         |
|                            | Paper- 1.2                                   | ZOO-12202     | DCC  | Biochemistry                          | 3                          | 4                  | -         | 4            | 30                                   | 12         | 70                                 | 28         | 100        | 40         |
|                            | Paper- 1.3                                   | ZOO-12203     | DCC  | Cell Biology                          | 3                          | 4                  | -         | 4            | 30                                   | 12         | 70                                 | 28         | 100        | 40         |
|                            | Paper- 1.4                                   | ZOO-12204     | DCC  | Evolution and Biostatistics           | 3                          | 4                  | -         | 4            | 30                                   | 12         | 70                                 | 28         | 100        | 40         |
|                            | Paper- 1.5                                   | ZOO-12205     | DCC  | Practical Lab Course-I                | 6                          | -                  | 8         | 4            | -                                    | -          | 100                                | 50         | 100        | 50         |
|                            | Paper- 1.6                                   | ZOO-12206     | DCC  | Practical Lab Course-II               | 6                          | -                  | 8         | 4            | -                                    | -          | 100                                | 50         | 100        | 50         |
|                            | <b>TOTAL (SEMESTER-I)</b>                    |               |      |                                       |                            |                    | <b>32</b> |              | <b>24</b>                            | <b>120</b> | <b>48</b>                          | <b>480</b> | <b>212</b> | <b>600</b> |
| Semester-II                | Paper- 2.1                                   | ZOO-12211     | DCC  | Immunology and Biotechnology          | 3                          | 4                  | -         | 4            | 30                                   | 12         | 70                                 | 28         | 100        | 40         |
|                            | Paper- 2.2                                   | ZOO-12212     | DCC  | Animal Taxonomy                       | 3                          | 4                  | -         | 4            | 30                                   | 12         | 70                                 | 28         | 100        | 40         |
|                            | Paper- 2.3                                   | ZOO-12213     | DCC  | Genetics                              | 3                          | 4                  | -         | 4            | 30                                   | 12         | 70                                 | 28         | 100        | 40         |
|                            | Paper- 2.4                                   | ZOO-12214     | DCC  | Animal Physiology                     | 3                          | 4                  | -         | 4            | 30                                   | 12         | 70                                 | 28         | 100        | 40         |
|                            | Paper- 2.5                                   | ZOO-12215     | DCC  | Practical Lab Course-I                | 6                          | -                  | 8         | 4            | -                                    | -          | 100                                | 50         | 100        | 50         |
|                            | Paper- 2.6                                   | ZOO-12216     | DCC  | Practical Lab Course-II               | 6                          | -                  | 8         | 4            | -                                    | -          | 100                                | 50         | 100        | 50         |
|                            |  |               |      | GEC                                   | CBCS Paper                 | 1.5                | 2         | -            | 2                                    | -          | -                                  | 50         | 20         | 50         |
| <b>TOTAL (SEMESTER-II)</b> |  |               |      |                                       |                            | <b>32</b>          |           | <b>26</b>    | <b>120</b>                           | <b>48</b>  | <b>530</b>                         | <b>232</b> | <b>650</b> | <b>280</b> |

## **Detailed Scheme of Continuous Assessment (CA) and End of Semester Examination (EoSE) for the M. Sc. Semester - I & II**

### **1. Scheme of Continuous Assessment or Internal or Mid Term Assessment:**

- (a) The continuous or internal or mid-term assessment (30% weightage of the maximum marks) for each theory paper shall be taken by the faculty members in the Department during each semester. There will be two internal assessment tests (i.e. First Internal Assessment Test or First Mid-Term Test and Second Internal Assessment Test or Second Mid-Term Test) each of 15% weightage for each theory paper. Each internal assessment test shall be of one-hour duration for theory paper and shall be taken according to academic calendar which will be notified by the Department / University.
- (b) For practical papers, there will be only one external or semester or end term assessment (100% weightage of maximum marks) and there will be no continuous or internal or mid-term assessment.
- (c) A student who remains absent (defaulter) or fails or wants to improve the marks in the internal assessment may be permitted to appear in the desired paper(s) (only one time) in the same semester with the permission of the concerned Head of the Department. A defaulter / improvement fee of Rupees 250/- per paper shall be taken from such candidates. Duly forwarded application of such candidates by the teacher concerned shall be submitted to HOD who may permit the candidate to appear in the internal assessment after production of satisfactory evidence about the reason of his/her absence in the test(s) and deposition of the defaulter / improvement fee. A record of such candidates shall be kept in the Department.
- (d) Regular attendance of the student shall be considered in the internal assessment. If the attendance / regularity factor is similar for all the students, then it may be merged with the weightage of second internal assessment test (class test/home assignment/quiz, seminar, etc.).
- (e) Paper wise consolidated marks for each theory paper and dissertation / seminar (i.e. total marks obtained during various modes of internal assessment) obtained by the students (out of the 30% weightage of the maximum marks of the paper) shall be forwarded by the Head of the Department (in two copies) to the Controller of Examination of the University within a week from the date of last internal assessment test for incorporation in the tabulation register.
- (f) The consolidated marks obtained by the students will also be made known to them before being communicated by the Head of the Department concerned to the University for Final Incorporation in the tabulation register. If any discrepancies are discovered or pointed out by the students, the same shall be looked into by the concerned faculty member and corrections made wherever necessary. The decision of the Head of the Department before the communication of marks to the University shall be final. No corrections shall be made in the internal assessment marks after the declaration of the result by the University.

(g) Consolidated marks communicated to the University shall be in whole number and not in fraction. Marks awarded for the various internal assessments in each paper shall be added up and then round off to the next whole to avoid any fraction.

**2. Scheme of End of Semester Examination (EoSE):** There will be theory paper and practical paper at the End of Semester Examination. The theory paper will consist two parts i.e. Part-A and Part-B with the following scheme:

**Part-A** will consist of 10 compulsory questions. There will be at two questions from each unit and answer to each question shall be limited up to 20 words. Each question will carry two marks. Total 20 Marks.

**Part-B** will consist of 10 questions. At least two questions from each unit will be set and student will have to answer five questions, selecting at least one question from each unit. The answer to each question shall be limited to 400 words. Each question carries 10 Marks. Total 50 Marks.

| Question No. | Part/Unit     | Marking        |
|--------------|---------------|----------------|
|              | <b>PART-A</b> | <b>10x2=20</b> |
| 1.           | (i)           | 2              |
|              | (ii)          | 2              |
|              | (iii)         | 2              |
|              | (iv)          | 2              |
|              | (v)           | 2              |
|              | (vi)          | 2              |
|              | (vii)         | 2              |
|              | (viii)        | 2              |
|              | (ix)          | 2              |
|              | (x)           | 2              |
|              | <b>PART-B</b> | <b>5x10=50</b> |
| 2.           | Unit-I        | 10             |
|              | <b>OR</b>     |                |
| 3.           | Unit-I        | 10             |
| 4.           | Unit-II       |                |
|              | <b>OR</b>     | 10             |
| 5.           | Unit-II       |                |
| 6.           | Unit-III      | 10             |
|              | <b>OR</b>     |                |
| 7.           | Unit-III      | 10             |
| 8.           | Unit-IV       |                |
|              | <b>OR</b>     | 10             |
| 9.           | Unit-IV       |                |
| 10.          | Unit-V        | 10             |
|              | <b>OR</b>     |                |
| 11.          | Unit-V        |                |

**3. The Practical paper will comprise the scheme of examination as per the syllabus of the theory paper of the subject.**

**Note: A student will have to pass in theory Examination, Practical Examination and Continuous Assessments separately.**

**University of Kota**  
**M. Sc. ZOOLOGY (2023-24)**  
**(Course Code-12200)**  
**Semester-I**

|                  |          |              |          |  |
|------------------|----------|--------------|----------|--|
| <b>ZOO-12201</b> | <b>:</b> | <b>Z-1.1</b> | <b>:</b> | INVERTEBRATE: STRUCTURE AND FUNCTIONS                  |
| <b>ZOO-12202</b> | <b>:</b> | <b>Z-1.2</b> | <b>:</b> | BIOCHEMISTRY   |
| <b>ZOO-12203</b> | <b>:</b> | <b>Z-1.3</b> | <b>:</b> | CELL BIOLOGY   |
| <b>ZOO-12204</b> | <b>:</b> | <b>Z-1.4</b> | <b>:</b> | EVOLUTION AND BIostatISTICS                            |
| <b>ZOO-12205</b> | <b>:</b> | <b>Z-1.5</b> | <b>:</b> | PRACTICAL/LAB COURSE-I (based on Paper Z-1.1 & Z-1.2)  |
| <b>ZOO-12206</b> | <b>:</b> | <b>Z-1.6</b> | <b>:</b> | PRACTICAL/LAB COURSE-II (based on Paper Z-1.3 & Z-1.4) |

Scheme for the each **Theory Paper:**

| Teaching Hrs. for each paper/week | Credit Points for each paper | Continuous assessment |      | Semester assessment |      | Max marks | Min. marks | Paper Duration |
|-----------------------------------|------------------------------|-----------------------|------|---------------------|------|-----------|------------|----------------|
|                                   |                              | MM                    | Pass | MM                  | Pass |           |            |                |
| 04                                | 04                           | 30                    | 12   | 70                  | 28   | 100       | 40         | 3 Hrs.         |

Scheme for the **Practical Paper:** There will be two practical of 100 marks of each at the End of Semester (EoS) as: **Practical-I** (based on Paper Z-1.1 and Z-1.2) and **Practical-II** (based on Paper Z-1.3 and Z-1.4).

| Nomen        | Day    | Duration | Max. Marks | Min. Marks |
|--------------|--------|----------|------------|------------|
| Practical-I  | Day-I  | 6 hrs.   | 100        | 50         |
| Practical-II | Day-II | 6 hrs.   | 100        | 50         |

**UNIT-WISE DETAILED SYLLABUS**  
**M. Sc. (Semester-I) Zoology**  
**Course Code: 12200**

**ZOO-12201: Paper- Z-1.1: INVERTEBRATE-STRUCTURE AND FUNCTIONS**

**UNIT I**

1. **Introduction:** The concept of “Invertebrate” and “Vertebrate” animal groups, a study of the general body plan of invertebrates. Elementary idea of the animal diversity in marine, estuarine and fresh water environments.
2. **Locomotory mechanisms:** a) Amoeboid movements, ultra-structure of cilia and flagella: ciliary and flagellar movements; molecular and physiological mechanisms involved in the three kinds of movements. b) Myonemes and muscle fibers in invertebrate structure and their role in locomotion. c) Locomotion in relation to hydrostatics, coelom, metamerism, arthropodization. d) An outline of flight mechanism in insects.
3. **Feeding mechanisms:** a) amoeboid feeding. b) ciliary feeding. c) Filter feeding. d) Parasitic mode of feeding. e) Feeding mechanisms in insect and echinoderms.

**UNIT - II**

1. **Respiration:** a) Respiration in lower invertebrates (Protozoans to helminthes). b) Gills and Lophophores. c) Gills and lungs in Mollusca. d) Gills, trachea and lung like structures in Arthropods. c) Physiology of respiratory pigments in invertebrates.
2. **Excretion:** a study of structural and functional organization of excretory systems in various invertebrate groups and a survey of various excretory products met with in them.
3. **Osmoregulation and ionic regulation:** a survey of principal mechanisms in fresh water, marine and terrestrial forms.

**UNIT – III**

1. **Structural and functional organization of nervous systems and receptors:** a) Plan of nervous systems in the Coelenterates, Platyhelminthes, Annelids, Arthropods, Molluscs and Echinoderms: structural and functional complexities of brain and ganglionic structures. b) Receptors: Structural and functional organization of the mechanoreceptors. chemoreceptors and photoreceptors.
2. **Endocrine system:** Endocrine organs: Structure, functions and their hormones. Role of neurosecretions and hormones in developmental events of insects and crustaceans.
3. **Reproduction:** a) Reproduction in Protozoa b) Reproduction in Porifera c) Reproduction in Metazoa: Sexual reproduction; Parthenogenesis. d) Reproduction in Metazoa: Asexual reproduction in Coelenterata and Polychaeta. e) Larval forms of invertebrates and Significance.

#### UNIT - IV

1. Criteria for phylogenetic interrelationships between Invertebrate phyla.
2. Origin of Parazoa, Mesozoa and Metazoa. Origin of Radiata (Coelenterata and Ctenophora). Origin of Bilateria from Radiata (Importance of Planula larva and Ctenophores).
3. Phylogenetic significance of Rhynchocoela. Interrelationship of important Pseudocoelomate groups, Rotifera, Gastrotricha, Kinorhynca, Nematomorpha and Entoprocta.

#### UNIT - V

1. **Affinities and evolutionary significance** of the unsegmented lesser protostome phyla (Priapulida, Echiuroidea and Sipunculida).
2. **Phylogenetic relationships** between the coelomate protostome phyla (Annelida, Onychophora, Arthropoda & Mollusca). Affinities and evolutionary significance of the Lophophorate coelomate phyla (Brachiopoda, Phoronida & Ectoprocta).
3. **Affinities** of the invertebrate deuterostome phyla (Chaetognatha, Echinodermata, Pogonophora & Hemichordata).

#### Reference/Text Books:

1. L. H. Hyman: The Invertebrates; McGraw Hill Publication.
2. E. J. W. Barrington: Invertebrate Structure and Function 2/e PB
3. J. Pechenik: Biology of the Invertebrates; McGraw Hill Publication; 7<sup>th</sup> edition.
4. Parker, T. J. and Haswell, W. A., Textbook of Zoology, Vol. 1 (Invertebrates)
5. P. A. Meglitsch: Invertebrate Zoology (2<sup>nd</sup>ed.) Published by Oxford Univ. Press
6. D. T. Anderson: Invertebrate Zoology; Oxford University Press
7. B. Schierwater: Invertebrate Zoology: A Tree of Life Approach
8. Ruppert, E. E. and Barnes, R. D., Invertebrate Zoology, Saunders College Publishing
9. Clarkson & Clarkson: Invertebrate Palaeontology and Evolution; International Economy Ed.
10. R. C. Brusca: Invertebrates 3<sup>rd</sup> Edition; Oxford University Press.
11. R. L. Kotpal: Modern Text Book of Zoology: Invertebrates; Rastogi Publication
12. P.S. Verma: Invertebrate Zoology; S. Chand and Company.
13. R. L. Kotpal: Protozoa to Echinodermata Series; Rastogi Publication.

### UNIT I

1. **Introduction:** Basic chemical concepts: a study of the chemical bonds and functional groups.
2. **Biocatalysts:** Classification and nomenclature of the enzymes; nature of enzymes, enzyme specificity; factors affecting enzyme activity; enzymatic and non-enzymatic catalysts; coenzymes and their functions. Enzymes and prosthetic groups.
3. **Energy considerations:** Biological oxidation & reduction. Fundamental reactions of biological oxidation; redox potential and electron transport system.

### UNIT II

1. **Carbohydrate** – Classification, structure, general properties and functions of polysaccharides and complex carbohydrates; amino sugars, proteoglycans and glycoproteins.
2. **Lipids** – Classification, structure, properties and functions of fatty acids, essential fatty acids, fats, phospholipids, sphingolipids, cerebrocides, steroids, bile acids, prostaglandins, lipoproteins and lipopolysaccharides.
3. **Nucleic acids** – Classification, structure, properties and functions of nucleic acids. Primary, secondary and tertiary structure of nucleic acids, DNA forms, conformations and Denaturation.

### UNIT III

1. **Proteins** – Peptide synthesis: chemical and Merrifield synthesis. Primary (peptide conformation, N- and C- terminal, peptide cleavage), Secondary ( $\alpha$ -helix, sheet, random coil, Ramachandran plot), Tertiary and Quaternary structures of proteins.
2. **Vitamins** – Classification, structure, properties and functions of vitamins.
3. **Hormones** – Classification, structure, properties and functions of Hormones.

### UNIT IV

1. **Metabolic pathways** of protein (General reactions of amino acid metabolism - Transamination, decarboxylation, oxidative & non-oxidative deamination of amino acids.)
2. **Metabolic pathways** of carbohydrates (Glycolysis, various forms of fermentations in micro-organisms, citric acid cycle, its function in energy generation and biosynthesis of energy rich bond, pentose phosphate pathway and its regulation. Gluconeogenesis, glycogenesis and glycogenolysis, glyoxylate and Gamma aminobutyrate shunt pathways, Cori cycle, Entner-Doudoroff pathway, glucuronate pathway. Metabolism of disaccharides.)
3. **Metabolic pathways** of lipids (hydrolysis of tri-acylglycerols,  $\alpha$ -,  $\beta$ -,  $\omega$ - oxidation of fatty acids. Oxidation of odd numbered fatty acids – fate of propionate, role of carnitine, degradation of complex lipids. Fatty acid biosynthesis & Lipid biosynthesis) and nucleic acids (Biosynthesis and degradation of purine and pyrimidine nucleotides and its regulation).

## UNIT V

1. **Bioanalytical Techniques:** Spectroscopy – Concepts of spectroscopy, Visible and UV spectroscopy, Laws of photometry. Beer-Lambert's law, Principles and applications of colorimetry.
2. **Bioanalytical Techniques:** Chromatography – Principles of partition chromatography, paper, thin layer, ion exchange and affinity chromatography, gel permeation chromatography, HPLC and FPLC.
3. **Bioanalytical Techniques:** Electrophoretic techniques – Principles of electrophoretic separation: Continuous, zonal and capillary electrophoresis, different types of electrophoresis including paper, cellulose and gel. Electroporation, SDS-PAGE gel electrophoresis.

### Reference/Text Books:

1. Lehninger Principles of Biochemistry: International Edition; David L. Nelson
2. Fundamentals of Biochemistry: Voet and Voet; John Wiley and Sons Inc.
3. Harper's Biochemistry: Murray, Granner & Rodwell; McGraw Hill Publication
4. Biochemistry and Molecular Biology: Elliot and Elliot; DC Oxford University Press.
5. Biochemistry: John T. Tansey; John Wiley and Sons Inc.
6. Biochemistry: Stryer et al; W.H.Freeman & Co Ltd
7. Biotechniques; Theory & Practice: S.V.S. Rana; Rastogi Publication.
8. Biochemistry, 6e: U. Satyanarayana.
9. Principles of Gene Manipulation and Genomics, 7th. Edition: SB Primrose
10. Gene Cloning and DNA Analysis: An Introduction; TA Brown
11. Principles and Techniques in Practical Biochemistry: Wilson & Walker; CUP
12. Biochemistry: M. N. Chatterjea; JayPee Publication
13. Fundamental of Biochemistry: Jain and Jain; S. Chand and Company.

## ZOO-12203: Paper-Z-1.3: CELL BIOLOGY

### UNIT I

1. **Microscopy:** A general idea of properties of light, lenses and magnification power. An elementary knowledge about principles and functioning of microscopes: - light (dissecting and compound), interference, polarizing, fluorescence, phase contrast, UV and electron (SEM and TEM).
2. **Cytological techniques:** Centrifugation and ultracentrifugation, intravital and supravital staining, preparation of cell cultures, isolation and fractionation of cell.

3. **The evolution of the Cell:** - From molecules of the First Cell; From Prokaryotes to Eukaryotes; From Single Cell to multi-cellular Organisms.

#### UNIT II

1. **Plasma membrane** and intracellular compartments: Structure and functions of membrane, Endocytosis and exocytosis; principles of membrane transport, carrier proteins, ion channels.
2. **Structure and functions** of endoplasmic reticulum. Signal recognition particles, ER signal peptides; signal transduction.
3. **Vesicular traffic organelles:** Structure and functions of Golgi complex and lysosomes, transport from Golgi bodies to lysosomes.

#### UNIT III

1. **Structure and functions** of microbodies, glyoxysomes, peroxysomes, and sphaerosomes. Structure and functions of ribosomes.
2. **Energy transducer organelles:** Structure, functions and evolution of mitochondria and plastids; their role as energy transducers.
3. **Structure** of cilia, flagella, vacuoles and cytoskeleton – Microtubules, Actins filaments.

#### UNIT IV

1. **Nucleus:** Structure of interphase nucleus, pore complex, nucleoplasm and nucleolus.
2. **Chromosomes:** Chromatin organization in dividing and non-dividing cells, structure of chromosomes, solenoid model, importance of C-value paradox, centromere and telomere,
3. **Karyotype banding techniques**, FISH, GISH, Mc FISH, cytometry; giant and mini chromosomes.

#### UNIT V

1. **Cell cycle** and mitosis: Stages of cell cycle (G1, S, G2 and M stage), centriole cycle,
2. **Mechanism** of mitosis, anaphasic movements. Mechanism of meiosis, nondisjunction.
3. **Regulation** of cell division and abnormalities: Genetic regulation of cell cycle, check points, cyclins, MPF, chalones, mitotic poisons; molecular origin of cancer; apoptosis.

#### Reference/Text Books:

1. Cell Biology: Gerald Carp; NJ Wiley and Sons.
2. Cell And Molecular Biology: De Robertis E.D.P.; Lippincott Williams & Willkins
3. Molecular Biology of the Cell: Bruce Alberts et al; 7<sup>th</sup> edition. W.W.Norton & Company
4. Molecular Cell Biology: Lodish et al; WH Freeman Company
5. Molecular Cell Biology: Weaver R.F.; Mcgraw Hill Company
6. Essential Cell Biology: Bruce Alberts; W.W.Norton & Company
7. Cell Biology: Philip Newsom; Syrawood Publishing House

8. Textbook of Cell Biology: Samantha Granger; Delhi Book Store
9. Mitosis and Meiosis: Helder Maiato and Melina Schuh.
10. The Digital Cell-Cell Biology as a Data Science: Stephen J. Royle
11. The Cell-A Molecular Approach: Geoffrey Cooper; OHP, UK
12. Principles of Cell Biology: Plopper and Ivankovic; Jones & Bartlett Learning
13. Histology-A Text & Atlas: With Correlated Cell and Molecular Biology: Ross and Pawlina.
14. Genes: Lewin B; Pearson Educational Internation, UK
15. Cell Biology: C.B. Powar: Himalaya Publication

## **ZOO-12204: Paper-Z-1.4: EVOLUTION AND BIOSTATISTICS**

### **UNIT – I**

1. Concepts of evolution and theories of organic evolution, Geological time-scale.
2. Lamarckism and Darwinism, New concepts regarding Lamarckism & Darwinism.
3. Hardy-Weinberg law of genetic equilibrium. A detailed account of destabilizing forces: (i) Natural selection (ii) Mutation (iii) Isolation and its role in species formation (iv) Genetic drift (v) Migration (vi) Meiotic drive. Patterns and mechanisms of reproductive isolation, Models of speciation (Allopatric, Sympatric, Parapatric).

### **UNIT – II**

1. Molecular population genetics, Patterns of change in nucleotide and amino acid sequences, Ecological significance of molecular variations, Emergence of Non-Darwinism Hypothesis.
2. Genetics of quantitative traits in populations, Genotype-environment interactions, Inbreeding depression and heterosis, Molecular analysis of quantitative traits, phenotypic plasticity
3. Genetics of speciation. Phylogenetic and biological concept of species.

### **UNIT – III**

1. Molecular Evolution: Gene Evolution, Evolution of gene families, Molecular drive, Assessment of molecular variation. Origin of higher categories: Micro-and Macro-evolution
2. Characteristic of evolution Extinction, replacement, irreversibility of specialization etc.
3. Adaptation diversity & nature of adaptation: adaptive radiations, occupation of new environments & niches, mimicry and coloration.
4. Role of Remote Sensing for sustainable development.

### **UNIT – IV**

1. Biostatistics Objective & significance: important terms & symbols, graphs (bar diagrams, histograms, frequency polygons, line diagrams).
2. Frequency distributions & centering constants (Mean, Median and Mode).

3. Measures of variation (Standard deviation, Variance, Standard error of the Mean). Sampling variation of proportions, Significance of difference in proportions.

#### UNIT - V

1. Student t-test, Chi-square test. Rates and ratios
2. Correlation and Regression. Analysis of Variance (ANOVA)
3. Probability distributions: Binomial, Poissons and normal.

#### Reference/Text Books:

1. Evolution: Strickberger; Jones & Bartlett Publishers
2. Evolutionary Biology: D. J. Futuyma; Sinauer Associates Inc.
3. Microevolution: L.P. Vidyarthi; Concept Publishing Company Pvt. Ltd.
4. Macroevolutionary-Theory on Macroecological Patterns: Peter W. Price; CUP, UK
5. Population Genetics: A Concise Guide; John H. Gillespie; JHU Press
6. Principles of Population Genetics: Daniel L. Hartl; Oxford University Press
7. Elements of Evolutionary Genetics: Brian Charlesworth; Roberts Suppliers
8. Ecology, Genetics, and Evolution of Metapopulations: Ilkka Hanski; Academic Press Inc
9. On the Origin of Species: Charles Darwin & James Costa; Sterling Publisher
10. Charles Darwin-Voyaging: Janet Browne; Princeton University Press
11. The Blind Watchmaker: Richard Dawkins; Penguin Books Ltd
12. Evolution: What the fossils say & why it matters: D. Prothero; Columbia University Press
13. Evolution and Speciation in Animals: T.J. Pandian; Taylor & Francis Group
14. The Encyclopedia of Animal Evolution: R.J. Berry & A. Hallam; David Bateman Ltd
15. Evolution of Animals: N.S. Sharma; Mittal Publications
16. Organic Evolution: Veer Bala Rastogi, Medtech
17. Principles and Practice of Biostatistics, 1e: B Antonisamy, Prasanna S. Premkumar, et al.
18. Elements of Biostatistics: Prasad; Rastogi Publications
19. Biostatistics: Veer Bala Rastogi; Medtech
20. Biostatistics: Basic Concepts and Methodology: Daniel and Cross; Wiley Press
21. Fundamental Statistics: Nagar and Nagar
22. Introduction to Biostatistics and Research Methods 5th edition: Rao; PHI Learning Pvt. Ltd.

## M.Sc. (Semester-I) ZOOLOGY

Syllabus of Practical-I/Lab. Course-I (based on Paper Z-1.1 & Z-1.2)

ZOO-12205: Paper-Z-1.5: Practical Lab Course I:

Total No. of laboratory hrs. 240

- I. **Invertebrates:** Identification, classification & study of distinguishing features of important representatives (Protozoa to Hemichordata).
- II. **Study of permanent prepared slides** (Protozoa to Hemichordata).
- III. **Anatomy/Dissections\*:**
  1. Reproductive, excretory, nervous & heamocoelomic systems of leech.
  2. Nervous system and general anatomy: Patella, lamellidens, Mytilus and Aplysia.
  3. General Anatomy, reproductive and nervous system of Cockroach, Grasshopper.
- IV. **Permanent preparations\* and their study:**
  1. Preparation of cultures of Amoeba, Paramecium and Euglena. Study of these protozoans using vital dyes.
  2. Permanent preparations of Amoeba. Paramecium and Euglena from cultures, vorticella from the pond water; flagellates from the gut of white ant; Rectal ciliates, Trypanosomes in the blood of house rat; lifecycle stages of Monocystis from the seminal vesicle of earthworm.
  3. Permanent preparations through various parts of Animals mentioned in III (i-iv) anatomy section and study of the structure.
  4. Permanent preparations of different materials provided for study using microtome.
- V. **Biochemistry:**
  1. Identification of protein, carbohydrates and Lipid in various tissues.
  2. Identification of different kinds of mono, di and poly saccharides in biological and chemical materials.
  3. Quantitative estimation of the following by spectrophotometric/semi-auto analyzer method in various tissues. (a) Carbohydrates: Glycogen and glucose. (b) Proteins: Total proteins. (c) Lipid: Phospholipids and cholesterol. (d) Nucleic acids: DNA and RNA. (e) Enzymes: Acid and alkaline phosphatase.
  4. Paper chromatography and Thin Layer Chromatography: One-dimensional chromatography using amino acids from purified samples and biological materials.
  5. Study of digestive enzymes in different parts of alimentary canal.
- VI. Visit to National Park/Museum/Institute/Medical College.

***\*Note: Use of animal for dissection and practical work is subject to the conditions that they are not banned under the wildlife protections act.***

**Suggested Readings:**

1. Collection, Preservation and Identification of Invertebrates: ZSI, Kolkata
2. Laboratory Exercises in Invertebrate Zoology: Alan R Holyoak; Create Space Independent Publishing Platform; 2<sup>nd</sup> edition
3. Practical Zoology Invertebrate: S. S. Lal; Rastogi Publication
4. A Manual of Practical Zoology; P. S. Verma; S. Chand and Company.
5. Manual of Practical Biochemistry 11/E: K P Sinha.
6. Practical Biochemistry: Geetha K Damodaran; JayPee Publication.

**University of Kota****M.Sc. (Semester-I) ZOOLOGY****Practical-I/Day-I****Scheme of Practical Examination and Distribution of Mark**

| <b>Duration: 6 hrs.</b>  | <b>Max. Marks:100</b> |
|--|-----------------------|
| (1) Microscopic study and identification of permanent slides 5x3 | 15 marks              |
| (2) Identification & comments on spots (5x3)                     | 15 Marks              |
| (3) Invertebrate major dissection / demonstration                | 08 Marks              |
| (4) Invertebrate minor dissection / demonstration                | 06 Marks              |
| (5) Permanent preparation  | 08 Marks              |
| (6) Exercise in Biochemistry                                     | 08 Marks              |
| (7) Seminar  | 10 Marks              |
| (8) Viva-voce  | 10 Marks              |
| (9) Class record   | 10 Marks              |
| (10) Report on field trip  | 10 Marks              |
| <b>Total</b>   | <b>100 Marks</b>      |

## M.Sc. (Semester-I) ZOOLOGY

Syllabus of Practical-II/Lab. Course-II (based on Paper Z-1.3 & Z-1.4)

ZOO-12206: Paper Z-1.6: Practical Lab Course-II:

Total No. of laboratory hrs. 240

### I. Cell Biology:

1. Squash & smear preparations of testis of cockroach / grasshopper: Acetocarmine & Feulgen staining of these preparations.
2. Study of mitosis in onion root tip/ mammalian bone marrow cells.
3. Study of giant chromosomes in the salivary gland of Chironomus larva or Drosophila larva.
4. Vital and supra-vital staining (with neutral red and Janus Green B) of cells of the testis of an insect or mammal to study the mitochondria.
5. Chromosomal study of the testis of an insect or mammal or cells of the bone marrow of a mammal.
6. Study of permanent slides of various stages of Mitosis, Meiosis and Giant Chromosomes.
7. Preparation of Vital stains and Dye.

### II. Biostatistics:

1. Preparation of frequency tables, histogram, bar diagram and line graphs (Computer based exercise).
2. Calculation of standard deviation, variance and standard error of the mean.
3. Correlation and rank of correlation.
4. Probability & Test of significance.
5. Calculation of significance using Chi-square test.
6. Plotting the slope of a line on a graph: calculations of the slope of a line, coefficient and regression.
7. Field Trip: Study of animals in their natural habitats.

***\*Note: Use of animal for dissection and practical work is subject to the conditions that they are not banned under the wildlife protections act.***

### Suggested Readings:

1. Cell Biology : Practical Manual; Gupta, Makhija & Toteja; Prestige Publishers
2. Laboratory Manual of Cell Biology: Majumdar, Rina & Rama Sisodia.
3. Practical Use of Biostatistics: A. Bahera; Paras Medical Publisher
4. Biostatistics: S.K. Pundir; CBS Publication.

**University of Kota**  
M.Sc. (Semester-I) ZOOLOGY  
Practical-II/Day-II

**Scheme of Practical Examination and Distribution of Mark**

| <b>Duration: 6 hrs.</b>                                     | <b>Max. Marks: 100</b> |
|---|------------------------|
| 1. Preparation and study of testis of Cockroach/Grasshopper | 10 Marks               |
| 2. Study & identification of Mitosis                        | 10 Marks               |
| 3. Biostatistics Problem based on Frequency tables & Graphs | 10 Marks               |
| 4. Exercise on statistical methods                          | 10 Marks               |
| 5. Permanent preparation                                    | 05 Marks               |
| 6. Seminar  | 10 Marks               |
| 7. Viva-voce  | 10 Marks               |
| 8. Class record   | 10 Marks               |
| 9. Report on field trip                                     | 25 Marks               |
| <b>Total</b>  | <b>100 Marks</b>       |

**University of Kota**  
**M. Sc. ZOOLOGY (2023-24)**  
**(Course Code-12200)**  
**Semester-II**

|                   |                    |          |   |
|-------------------|--------------------|----------|---|
| <b>ZOO-12211:</b> | <b>Paper Z-2.1</b> | <b>:</b> | IMMUNOLOGY AND BIOTECHNOLOGY            |
| <b>ZOO-12212:</b> | <b>Paper Z-2.2</b> | <b>:</b> | ANIMAL TAXONOMY                         |
| <b>ZOO-12213:</b> | <b>Paper Z-2.3</b> | <b>:</b> | GENETICS                                |
| <b>ZOO-12214:</b> | <b>Paper Z-2.4</b> | <b>:</b> | ANIMAL PHYSIOLOGY                       |
| <b>ZOO-12215:</b> | <b>Paper Z-2.5</b> | <b>:</b> | PRACTICAL/LAB COURSE-I (Z-2.1 & Z-2.2)  |
| <b>ZOO-12216:</b> | <b>Paper Z-2.6</b> | <b>:</b> | PRACTICAL/LAB COURSE-II (Z-2.3 & Z-2.4) |

Scheme for the each **Theory Paper:**

| Teaching Hrs. for each paper | Credit Points for each paper | Continuous assessment |      | Semester assessment |      | Max marks | Min. marks | Paper Duration |
|------------------------------|------------------------------|-----------------------|------|---------------------|------|-----------|------------|----------------|
|                              |                              | MM                    | Pass | MM                  | Pass |           |            |                |
| 04                           | 04                           | 30                    | 12   | 70                  | 28   | 100       | 40         | 3 Hrs.         |

Scheme for the **Practical Paper:** There will be two practical of 100 marks of each at the End of Semester (EoS) as: Practical-I (based on Paper Z-2.1 and Z-2.2) and Practical-II (based on Paper Z-2.3 and Z-2.4).

| <b>Nomen</b> | <b>Day</b> | <b>Duration</b> | <b>Max. Marks</b> | <b>Min. Marks</b> |
|--------------|------------|-----------------|-------------------|-------------------|
| Practical-I  | Day-I      | 6 hrs.          | 100               | 50                |
| Practical-II | Day-II     | 6 hrs.          | 100               | 50                |

## **UNIT-WISE DETAILED SYLLABUS**

### **M. Sc. (Semester-II) Zoology**

**Course Code: 12200**

#### **ZOO-12211: Paper-Z-2.1: IMMUNOLOGY AND BIOTECHNOLOGY**

##### **UNIT - I**

1. Innate and Acquired Immunity; phylogeny and ontogeny of Immune system.
2. Organization and structure of lymphoid organs, cells of the immune system and their differentiation.
3. Nature of Immune responses, Nature of antigens and superantigens, factors influencing Immunogenicity, epitopes and haptens.

##### **UNIT - II**

1. Structure and functions of Antibodies, Antigen-Antibody interactions in vitro and in vivo, complement system, Major histocompatibility complex in mouse and HLA system in humans.
2. Organization and expression of Ig genes. T-cell and B-cell generation, activation and differentiation. Cytokines, cell mediated effector functions.
3. Immunological tolerance and Anti-immunity; Hyper sensitivity and immune responses to infection agents especially intracellular parasites.

##### **UNIT – III**

1. Basics: Definition, Biotechnology – an Interdisciplinary science. It's brief history, scope, significance, and limitations.
2. Genetic engineering, culture media, culture methods, restriction enzymes, cloning vectors, cell fusion, somatic hybridisation.
3. Recombinant DNA technology: Isolation of genetic materials gel-electrophoresis, amplification by PCR, insertion of r-DNA in host. Bioreactors and downstream processing.

##### **UNIT - IV**

1. Animal tissue culture: Introduction, Primary culture, cell lines and cloning. Tissue and Organ Culture, IVF, embryo- transfers.
2. Brief discussion on the chemical, Physical and metabolic functions of different constituents of culture medium. Basic techniques of mammalian cell cultures in – vitro. Microcarrier culture, cell Synchronization and cell culture.
3. Application of animal cell culture. Hybridoma technology and monoclonal antibodies.

##### **UNIT – V**

1. Biotechnology in Industry: Food, dairy, beverages, etc.
2. Biotechnology in agriculture: BT cotton, pest resistant and virus resistant plants.

3. Biotechnology in medicine: Humulin production, gene therapy, molecular diagnosis (DNA fingerprinting, ELISA), transgenic animals.

**Reference/Text Books:**

1. Kuby Immunology: Punt, Stranford, Jones & Owen; WH Freeman
2. Paul's Fundamental Immunology: Martin Flajnik; Wolters Kluwer Health
3. Cellular and Molecular Immunology: Abbas, Lichtman & Pillai; Elsevier India
4. Roitt's Essential Immunology: Martin et al; Wiley-Blackwell
5. Basics of Immunology: Sharma & Kumar; IP Innovative Publication Pvt. Ltd.
6. Janeway's Immunobiology: Murphy et al: W.W. Norton & Co Inc.
7. Lymphatic System: V. Perez; Barcharts, Inc.
8. Textbook of Microbiology and Immunology, 3e: S.C. Parija; Elsevier India
9. Immunology Theory and Practical: A.K. Roy; Kalyani Publications
10. Genomic, Proteomics, and Biotechnology: Sobti, Mukesh & Sobti; Taylor & Francis Ltd
11. Biotechnology from A to Z: William Bains; OUP Oxford
12. Animal Biotechnology: BANR-BLS; National Academies Press
13. Biotechnology: Stephen Siler; Phil Dawson
14. Animal Biotechnology: A.K. Shrivastava; Oxford & Ibh Publishing
15. Textbook of Animal Biotechnology: B.D. Singh: The Energy and Resources Institute, TERI
16. Animal Biotechnology: P.K. Gupta; Rastogi Publication
17. Textbook of Biotechnology: H.K. Das; Wiley Publishing Inc.
18. Fundamentals of Cell Immobilisation Biotechnology: 8a; Willaert; Springer-Verlag NY Inc.

**ZOO-12212: Paper-Z-2.2: ANIMAL TAXONOMY**

**UNIT - I**

1. Introduction to the science of taxonomy; stages in Taxonomy, importance of taxonomy.
2. Rules of nomenclature. Linnaean hierarchy.
3. Principles of classification: theories of biological classification & their history.

**UNIT - II**

1. Concept of species; typological, biological, evolutionary and recognition species concepts. Concepts of superspecies and subspecies.
2. The species category; the polytypic species; population systematic intraspecific categories.
3. Methods of classification: taxonomic collection & the processes of identification.

### **UNIT - III**

1. Taxonomic characters; types and use of taxonomic characters; concept of key characters, types of variations (qualitative and quantitative) within a single population,
2. Methods of arriving on taxonomic decisions at species level; preparation and use of taxonomic keys.
3. Newer trends in taxonomy: Cytotaxonomy - importance of cytology and genetics in taxonomy. Sonotaxonomy - importance of sound, call and sonogram in taxonomy. Molecular taxonomy – importance of macromolecular composition in taxonomy.

### **UNIT – IV**

1. Classification of Invertebrates up to order with salient features and examples of each group.

### **UNIT – V**

2. Classification of Vertebrates up to order with salient features and examples of each group.

#### **Reference/Text Books:**

1. Principles of Animal Taxonomy: Simpson; Oxford IBH Publishing Company
2. Principles of Systematic Zoology: Ernst Mayr; Scientific Publishers
3. Theory and Practice of Animal Taxonomy: V.C. Kapoor; Oxford IBH Publishing Company
4. Advancement in Invertebrates Taxonomy and Biodiversity: Gupta; Agrobios International.
5. The Invertebrate: L.H. Hyman; Vol. (1-9); McGraw Hill Company
6. Invertebrate Series (Protozoa to Echinodermata): Kotpal; Rastogi Publication
7. Modern Text Book of Zoology: Invertebrates; Kotpal; Rastogi Publication
8. Modern Text Book of Zoology: Vertebrates; Kotpal; Rastogi Publication
9. Birds: Kotpal; Rastogi Publication

### **ZOO-12213: Paper-Z-2.3: GENETICS**

#### **UNIT-I**

1. Basics: Definitions of heredity, variation, gene, allele, autosomes, allosomes, haploid, diploid.
2. Homologous chromosomes, locus, homozygous, heterozygous, hemizygous, dominant, recessive, phenotype, genotype, filial generations.
3. Types of cross: monohybrid, dihybrid, test cross, back cross, reciprocal cross, probable gamete formation for cross, use of symbols.

#### **UNIT-II**

1. Laws of heredity and their variations: Works of Mendel and Morgan.
2. Incomplete dominance, multiple allele, pleiotropy, genetic interactions.

3. Linkage and crossing over: Mechanism of crossing over, linkage groups, linkage maps; accessory genetic elements (plasmids, transposons and retroelements).

#### **UNIT-III**

1. Genetics of sex: Sex linkage, sex influenced and sex-limited traits, sex determination, effects of environment on sex determination.
2. Human genetics: Abnormalities in chromosome structure and number,
3. Inborn errors of metabolism, eugenics, euphenics and euthenics, genetic counselling.

#### **UNIT-IV**

1. Molecular basis of inheritance. DNA: Structure and types of DNA; DNA as a genetic material, gene structure,
2. Replication of DNA, enzymes and accessory proteins involved in DNA replication, DNA damage and repair, gene mutation and its molecular mechanism.
3. RNA: Structure and types of RNA (r-RNA, m-RNA, t-RNA, hn-RNA, Sn-RNA, antisense-RNA); types of RNA polymerase, transcription, step initiation, chain elongation and termination; post transcriptional modification, cap and tail formation, RNA splicing.

#### **UNIT-V**

1. Translation: Mechanism of prokaryotic and eukaryotic translation, protein folding; role of chaperons.
2. Gene regulation: Gene regulation in Prokaryotes, positive and negative regulation- Lac operon, tryptophan operon; gene regulatory proteins (motifs); gene regulation in Eukaryotes.
3. Applied Molecular Biology: RNA interference, molecular mechanism of antisense molecules, ribozymes, molecular mapping- RFLP analysis and its application in forensic, disease diagnosis and generic counseling.

#### **Reference/Text Books:**

1. Mendel's Principles of Heredity: W. Bateson; Dover Publications Inc.
2. An Introduction to Modern Genetics: C.H. Waddington; Routledge; 1<sup>st</sup> edition
3. Fundamental of Genetics: B.D. Singh; MedTEch Science Press
4. Textbook on Principles of Animal Genetics and Population Genetics; ICAR Publication
5. Textbook on Principles of Animal Genetics: C.W. Fox; OUP, US
6. Genetic Engineering: Replication, Expression, Cloning, Manipulation: H.K. Das; WIPL.
7. Molecular Biology and Genetics: P.K. Gupta; Rastogi Publication
8. Cell Biology, Genetics and Molecular Biology: H. Kar; New Central Book Agency

## ZOO-12214: Paper-Z-2.4: ANIMAL PHYSIOLOGY

### UNIT-I

1. Digestion and Absorption of food in gastrointestinal tract.
2. Regulation of gastrointestinal processes.
3. Obesity and Starvation.
4. Common disorders of digestive tract.

### UNIT-II

1. Physiology and regulation of respiration.
2. Homeostasis, prevention of blood loss.
3. Cardiac cycle.
4. Blood pressure and common cardiovascular diseases.

### UNIT-III

1. Structure and mechanism of Kidney function.
2. Ionic and Osmotic balance.
3. Osmoregulation in aquatic and terrestrial environments.
4. Homeostasis.

### UNIT-IV

1. Structure and function of muscle fibers in vertebrates.
2. Molecular theory of contraction.
3. Muscle fatigue
4. Skeletal muscle disorder- Tetany, Cramps, Muscular dystrophy.

### UNIT-V

1. Electrochemical potential and membrane excitation.
2. Impulse conduction via myelinated, non-myelinated fibres and synaptic junctions.
3. Neurotransmitters and Neuromodulators.
4. Sense organs: eye and ear.

### Reference/Text Books:

1. Animal Physiology: Hill, Wyse & Anderson; Sinauer Associates Inc.
2. A Text-Book of Animal Physiology: W. Mills; Legare Street Press.
3. Eckert Animal Physiology: Mechanisms and Adaptations; Randall & French.
4. Guyton & Hall Textbook of Medical Physiology: Vaz, Kurpad & Raj; Elsevier Health
5. Berne & Levy Physiology, 8 Ed: Koeppen & Stanton; Elsevier India
6. Concise Textbook of Physiology, 3e: Khurana; Elsevier India

7. Textbook Of Physiology 10ed ( Vol 1 & Vol 2 ): A.K. Jain; Arya Publishing House
8. BRS Physiology, 7/e: Constanzo; Wolters Kluwer India Pvt. Ltd.
9. Textbook of Physiology (Vol. I & II): APC Books Publisher
10. Manual of Practical Physiology: A.K. Jain; Arya Publishing House
11. Practical Physiology: A New Approach: Jaypee Brothers Medical Publishers
12. Practical Workbook of Human Physiology: Jaypee Brothers Medical Publishers

## **M.Sc. (Semester-II) ZOOLOGY**

Syllabus of Practical-I/Lab. Course-I (based on Paper Z-2.1 & Z-2.2)

**ZOO-12215: Z -2.5-: Practical/Lab Course-I:**

**Total No. of laboratory hrs. 240**

### **I. Biotechnology/Immunology**

1. To determine the ABO blood groups by slide agglutination.
2. To conduct/demonstrate ELIZA Test
3. Demonstration of Immunological tests WIDAL, VDRL, Pregnancy.
4. To conduct Radio Immuno-diffusion.

### **II. Invertebrate Taxonomy**

1. Identification of Invertebrates using taxonomic keys.
2. Field Trip: Study of animals in their natural habitats.

***\*Note: Use of animal for dissection and practical work is subject to the conditions that they are not banned under the wildlife protections act.***

### **Suggested Readings:**

1. Immunology: Overview and Laboratory Manual: Sam-Yellowe; Springer Nature
2. A handbook of Practical and Clinical Immunology Vol 1 2ed: Talwar; CBS
3. Immunology Theory and Practical: A.K. Roy; Kalyani Publications
4. Practical Handbook on Medical Microbiology and Immunology: Banerjee et al; IJMS
5. Taxonomic Keys: Samuel Eddy; Burgess Publishing.
6. The Complete Zoo Adventure: A Field Trip in a Book: Gary Parker
7. Field Trips: Arnosky; HarperCollins Publisher

## University of Kota

### M.Sc. (Semester-II) ZOOLOGY

#### Practical-I/Day-I

#### Scheme of Practical Examination & Distribution of Mark

| <b>Duration: 6 hrs.</b>   | <b>Max. Marks: 100</b> |
|---|------------------------|
| (1) Exercise based on Biotechnology                               | 10 Marks               |
| (2) Exercise based on Immunology                                  | 10 Marks               |
| (3) Exercise in Invertebrate Taxonomy (5x5) (Using Taxonomic Key) | 25 Marks               |
| (4) Seminar based on any topic from Theory                        | 10 Marks               |
| (5) Report on Field Visit   | 25 Marks               |
| (6) Vivo-Voce   | 10 Marks               |
| (7) Record  | 10 Marks               |
| <b>Total</b>  | <b>100 Marks</b>       |

### M.Sc. (Semester-II) ZOOLOGY

#### Syllabus of Practical-II/Lab. Course-II (based on Paper Z-2.3 & Z-2.4)

**ZOO-12216: Z -2.6: Practical/Lab Course-II:**

**Total No. of laboratory hrs. 240**

#### **I. Genetics:**

1. Culture and identification of male and female *Drosophila* through prepared culture.
2. Identification of wild and mutant forms of *Drosophila*.
3. Problems based on Mendel's and gene interaction.
4. Identification of blood groups in man.
5. Demonstration of sex chromatin (Barr Bodies).

#### **II. Animal physiology**

1. Determination of osmotic potential by tissue weight method.
2. Study of ECG, Heart beat and Blood pressure.
3. Determination of hemoglobin in blood sample by haemoglobinometer/ Photometric (preferably).
4. Demonstration of the following in blood; Clotting time (CT), Bleeding time (BT), erythrocyte sedimentation rate (ESR), haemolysis and crenation, differential count of leucocytes.
5. Determination of blood urea and blood sugar value.
6. Determination of peroxide activity.
7. To carryout differential leukocyte count in human blood sample.
8. Blood film preparation and identification of cells.

9. To conduct serum preparation.
10. Separation of amino acids by Paper chromatography / Thin Layer Chromatography and calculating Rf value.
11. Visit to Pathology Lab/Medical Institute

***\*Note: Use of animal for dissection and practical work is subject to the conditions that they are not banned under the wildlife protections act.***

**Suggested Readings:**

1. A Laboratory Manual of Molecular Biology: Kumar, Gakhar & Miglani; Dreamtech Press
2. Techniques for Molecular Biology: D. Tagu; CRC Press
3. Williams Manual of Hematology: Lichtman et al; McGraw Hill
4. Manual of Hematology: Dr Neema Tiwari;
5. Hematology: Bernadette F. Rodak; Saunders Publication Inc.
6. Manual of Clinical Hematology: Bluerose Publishers Pvt. Ltd.

**University of Kota**

M.Sc. (Semester-II) ZOOLOGY

Practical-II/Day-II

**Scheme of Practical Examination & Distribution of Marks**

| <b>Duration: 6 hrs.</b>   | <b>Max. Marks: 100</b> |
|---|------------------------|
| (1) Exercise on Culture and identification of Drosophila variants | 10 Marks               |
| (2) Exercise in Genetics  | 10 Marks               |
| (3) Exercise on Blood related                                     | 15 Marks               |
| (4) Exercise in Physiology  | 10 Marks               |
| (5) Seminar   | 10 Marks               |
| (6) Field work/Assessment   | 25 Marks               |
| (7) Viva-voce   | 10 Marks               |
| (8) Class record  | 10 Marks               |
| <b>Total</b>  | <b>100 Marks</b>       |