

**MSc- ZOOLOGY- 4<sup>th</sup> Semester**  
**PAPER CODE - ZOO-401**  
**CELL AND MOLECULAR BIOLOGY**

Unit I

1. Principle and applications of Nanodrop Spectrophotometry
2. Cell Signaling: Principle and applications of Flowcytometry
3. Working principle and applications of Fluorimeter
4. Working principle and applications of Atomic force Microscope

Unit II

5. Cell Fractionation: Differential Velocity and density Gradient centrifugation
6. Basic idea of NMR and ESR
7. Basic idea of X-ray Crystallography
8. Gel Electrophoresis: 1D and 2D- PAGE and isoelectric focusing

Unit III

9. Immunotechniques: Precipitation, immunoflorescence, ELISA and RIA
10. Methods of Protein Purification.
11. DNA protein Interaction:
12. General idea of DNA Microarray, DNA chips and affymetrix.

Unit IV

13. Stem cells: Types, Cultures and Applications
14. Methods and analysis of gene expressions
15. Methods in mutations analysis and reporter assay
16. Recombinant DNA technology: Preparation and applications.

Unit V

17. General Idea of two-hybrid system: Subtractive hybridizaion and chromosome jumping
18. General idea of RNA-ase protection assay
19. Genome Analysis: DNA finger printing, RAPD and RFLP
20. Analysis of sequences (DNA and RNA) and next generation sequencing

**Suggested Reading:**

1. The Cell: Bruce and Alberts
2. Cell Biology - PK Gupta
3. Genetics : PK Gupta and Gardner

**PAPER CODE- ZOO-402**  
**INSECT ANATOMY AND PHYSIOLOGY**

Unit I

1. Structure and Function of insect integuments
2. Mechanism of moulting and sclerotization of cuticle
3. Structure and types of spiracles
4. Respiration in aquatic and parasitic insects

Unit II

5. Structure of malpighian tubules including cryptonephridia
6. Physiology of excretion and significance of cryptonephridia
7. Structure of brain and ganglia
8. Central nervous system in different insects

Unit III

9. Structure and functions of mechanoreceptors
10. Structure and functions of chemoreceptors
11. Photoreceptors organs: simple and compounds eye
12. Sturcture and functions of fat body

Unit IV

13. Composition and functions of haemolymph
14. Insect circulatory system
15. Digestive system and associated glands of insect
16. Physiology and regulation of digestion

Unit V

17. Neuroendocrine system of insects
18. Chemistry and functions of insect hormones
19. Male and female reproductive system of insects
20. Insect pheromones

**Suggested readings:**

1. Handbook of Entomology: TV Prasad
2. An introduction of Entomology: PD Shrivastava and RP singh
3. Textbook of Entomology: KP Shrivastava

**PAPER CODE- ZOO-403(A)**  
**AQUATIC BIOLOGY AND AQUACULTURE**

Unit I

1. Aquatic Biology: science and its developments
2. Origin and classification of wetlands including lakes
3. Morphology of lakes, reservoirs and ponds
4. Physical and chemical characters of marine environments

Unit II

5. Estuaries and other brackish water environment in India
6. Physical and chemical characteristics of lakes, ponds and rivers.
7. Freshwater biota: planktons, benthos and macrophytes.
8. Food chain, food web, energy flow and trophic levels

Unit III

9. Primary productivity in inland water and its determination
10. Degradation of wetlands in India and control measures
11. Aquatic resources : invertebrates and vertebrates
12. Importance and management of aquatic resources in India

Unit IV

13. Aquatic pollution, its causes and measures
14. Migration pattern of aquatic animals, including aquatic birds
15. Habitat and importance of aquatic wild life
16. Threatened wetlands and endangered aquatic species

Unit V

17. Major sources of Pollution in river and remedies
18. Aquatic toxicology: acute and chronic toxicity.
19. Biological indicators of water pollution
20. Eutrophication and its impact of water bodies

**Suggested readings:**

1. Freshwater aquaculture - RK Rath
2. Aquatic biology- RJ Rao
3. Aquaculture - N Arumugam

**PAPER CODE- ZOO-403(B)**  
**REPRODUCTIVE ENDOCRINOLOGY**

Unit I

1. Introduction; Reproduction in Myth and Legend
2. Sexual Differentiation and Development
3. Development of the Male Reproductive Organs
4. Male Gross Anatomy Plus Spermatogenesis; Testicular Descent; Erection; Ejaculation.

Unit II

5. Male Reproductive Endocrinology.
6. Blood Testis Barrier; Spermatogenic Waves and Cycles.
7. Semen Physiology; Sperm Anatomy.
8. Overview of Female Reproductive Anatomy; Folliculogenesis.

Unit III

9. Development of the Female reproductive organs
10. Oogenesis; Atresia, Endocrine Control of Ovarian Function.
11. Female: Ovulation; Corpus Luteum Formation.
12. Prostaglandins and Role in Reproduction; luteolysis.

Unit IV

13. The Estrous Cycle; The Menstrual Cycle.
14. Gestation; Prenatal Development and Placentation.
15. Hypothalamus and pituitary; Neuroendocrine Control of Reproduction.
16. Steroidogenesis ; Mechanism of Action of Hormones.

Unit V

17. Sperm and Ova Transport; Sperm Capacitation and Acrosome Reaction; Fertilization.
18. Early Embryonic Development and Maternal Recognition of Pregnancy
19. Human Contraception and Human Reproductive Technologies.
20. Diseases and Conditions of the Reproductive System

**Suggested readings:**

1. Human Physiology - CC Chatterjee
2. Human Reproductive Biology- Richard E. Jones, Kristin H. Lopez
3. Reproductive Endocrinology and Infertility- Dan I Lebovic