

# **Zoology Syllabus For PhD Entrance Exam**

## **1. Animal Taxonomy and Diversity**

- **Taxonomy:**
  - Principles and rules of taxonomy
  - Nomenclature and classification systems (Linnaean, Cladistics)
  - Importance of phylogenetics in taxonomy
- **Animal Diversity:**
  - **Non-Chordates:**
    - Protozoa: General characteristics, classification, and examples
    - Phyla from Porifera to Echinodermata: Morphology, reproduction, and adaptations
  - **Chordates:**
    - Characteristics and diversity of Fishes, Amphibians, Reptiles, Birds, and Mammals
    - Comparative anatomy and adaptations of major organ systems
  - **Economic Importance:**
    - Role of animals in ecosystems, agriculture, medicine, and industry

## **2. Molecular Biology and Genetics**

- **Molecular Biology:**
  - Structure and function of DNA and RNA
  - Central dogma: Transcription, translation, and genetic code
  - Gene regulation and mutations
- **Genetics:**
  - Mendelian and non-Mendelian inheritance
  - Chromosomal theory of inheritance
  - Gene mapping and population genetics

## **3. Cell Biology and Biotechnology**

- **Cell Biology:**
  - Structure and function of cell organelles
  - Cell membrane dynamics and signaling pathways
  - Cell cycle and its regulation
- **Biotechnology:**
  - Genetic engineering: Tools (PCR, CRISPR) and techniques
  - Applications in medicine, agriculture, and conservation
  - Ethical considerations in biotechnology

## **4. Animal Physiology and Biochemistry**

- **Animal Physiology:**
  - Systems: Digestion, respiration, circulation, excretion, neurophysiology, and endocrinology
  - Mechanisms: Sliding filament theory (muscle contraction), nerve impulse transmission
- **Biochemistry:**
  - Structure and function of biomolecules (proteins, lipids, carbohydrates, nucleic acids)
  - Metabolic pathways and their regulation
  - Enzyme kinetics

## 5. Developmental Biology and Reproductive Biology

- **Developmental Biology:**
  - Gametogenesis, fertilization, cleavage, blastulation, gastrulation
  - Induction, differentiation, and morphogenesis
  - Concepts of regeneration and stem cell applications
  - Teratology: Abnormal development and environmental impacts
- **Reproductive Biology:**
  - Male and female reproductive systems
  - Assisted reproductive technologies (ART)

## 6. Ecology and Biodiversity

- **Ecology:**
  - Ecosystem structure, function, and dynamics
  - Energy flow and nutrient cycles (carbon, nitrogen)
  - Population dynamics and community interactions (competition, predation, mutualism)
- **Biodiversity:**
  - Biodiversity hotspots and conservation strategies
  - Human impacts on ecosystems and restoration ecology
  - Conservation policies (e.g., Project Tiger, CITES)

## 7. Evolution and Comparative Anatomy

- **Evolution:**
  - Origin of life: Theories and experimental evidence
  - Basics of evolutionary biology (Darwinism, Neo-Darwinism)
  - Molecular evidence, adaptive radiation, and speciation
- **Comparative Anatomy:**
  - Comparative study of organ systems in vertebrates and invertebrates: Digestive, circulatory, nervous, and reproductive systems
  - Evolutionary trends in anatomical structures

## 8. Animal Behavior and Applied Zoology

- **Animal Behavior:**
  - Innate and learned behaviors, animal communication
  - Behavioral ecology: Mating systems, foraging strategies, social behaviors
  - Applications in animal husbandry, pest control, and conservation biology
- **Applied Zoology:**
  - Parasitology: Classification, lifecycle, and host-parasite interactions
  - Aquaculture, sericulture, and apiculture: Principles and practices
  - Emerging zoonotic diseases and the One Health approach

## 9. Immunology

- Innate and adaptive immunity
- Antigen-antibody interactions
- Vaccines and immunotherapy

## 10. Research Methodology and Biostatistics

- **Research Methodology:**
  - Research design and hypothesis formulation
  - Data collection methods and analysis
  - Scientific writing and publishing papers
- **Biostatistics:**
  - Data types, sampling methods, measures of central tendency and dispersion
  - Hypothesis testing, t-test, chi-square, ANOVA
  - Regression and correlation

## 11. Tools and Techniques in Biology

- Microscopy: Types and applications
- Chromatography, electrophoresis, and spectrophotometry
- Molecular techniques: PCR, DNA sequencing, CRISPR
- Field techniques: Sampling methods, mark-recapture, GIS, and radio telemetry

## Elective Modules

1. **Fish Biology**
  - Morphology, physiology, and reproduction of fishes
  - Fisheries management and conservation
2. **Forensic Biology**
  - DNA fingerprinting, entomology, and forensic applications
3. **Environmental Sciences and Wildlife Biology**
  - Ecosystem services, wildlife habitats, and conservation techniques
4. **Applied Entomology**
  - Role of insects in agriculture and pest management strategies