

Syllabus for Ph.D. Entrance Test

Zoology

UNIT- I

Biology of Non-Chordates and Chordates :Organisation of coelom- Acoelomata, Pseudocoelomata, Locomotion-Amoeboid, Ciliary and Flagellar movements in Protozoa, Origin of chordates-origin, evolution and adaptive radiation in Cyclostomata and Pisces, economic Importance of Fishes, Reptiles and Birds.

UNIT-II

Cell Biology and Genetics : Structure and function of cells and intracellular organelles (of both prokaryotes and eukaryotes), Mechanism of cell division (mitosis and meiosis) and cell differentiation; Cell-cell interaction, Malignant growth, Immune cells, Structure of prokaryotic and eukaryotic cell, Membrane structure and function, Intracellular compartments, protein sorting, secretory and endocytic pathways, Cytoskeleton, Nucleus, Mitochondria and chloroplasts and their genetic organisation, cell cycle, Structure and organisation of chromatin, polytene and lampbrush chromosomes, Biochemistry and molecular biology of cancer, Oncogenes, Chemical carcinogenesis

Principles of Mendelian inheritance, chromosome structure and function, Gene Structure and regulation of gene expression, Linkage and genetic mapping, Extrachromosomal inheritance (episomes, mitochondria and chloroplasts), Mutation, DNA damage and repair, chromosome aberrations, Transposons, Sex-linked inheritance and genetic disorders, Somatic cell genetics, Genome organisation (in both prokaryotes and eukaryotes). Genetic and metabolic disorders, Hormonal imbalances, Drug metabolism and detoxification, Genetic load and genetic counselling.

UNIT-III

Physiology and Biochemistry : Response to stress, Active transport across membranes, hormones, Nutrition (including vitamins), Circulation, Physiology of reproduction, Sensory responses in animals, Neurophysiology and neuroendocrinology.

Structure of atoms, molecules and chemical bonds, Principles of physical chemistry, Thermodynamics, kinetics, dissociation and association constants, Van der Waal's electrostatic, hydrogen bonding and hydrophobic interactions, Structure, function and metabolism of carbohydrates, lipids and proteins, Enzymes and coenzyme, Respiration and photosynthesis, Enzyme kinetics (negative and positive cooperativity), Regulation of enzymatic activity, Active sites, Coenzymes, Activators and inhibitors, Isoenzymes, Allosteric enzymes, Ribozyme and Abzyme. Metabolism: Glycolysis and TCA cycle, Glycogen breakdown and synthesis, Gluconeogenesis, interconversion of hexoses and pentoses, Amino acid metabolism, Coordinated control of metabolism, Biosynthesis of purines and pyrimidines, Oxidation of lipids, Biosynthesis of fatty acids, Triglycerides, Phospholipids, Sterols. Energy metabolism (concept of free energy), Thermodynamic principles in biology, Energy rich bonds, Weak interactions, Coupled reactions and oxidative phosphorylations, Group transfers, Biological energy transducers, Bioenergetics.

UNIT-IV

Molecular Biology and Recombinant DNA Technology: The law of DNA constancy and C-value paradox, Numerical and structural changes in chromosomes, genome organization, organisation of chromatin, polytene and lampbrush chromosomes, Mitochondria and chloroplasts and their genetic organization. Fine structure of gene, Eukaryotic genome organisation (structure of chromatin, coding and non-coding sequences, satellite DNA), DNA damage and repair, DNA replication, amplification and rearrangements. Organization of transcriptional units: Mechanism of transcription of prokaryotes and eukaryotes, RNA processing, Ribonucleoproteins, Structure of mRNA, Genetic code and protein synthesis. Regulation of gene expression in pro- and eukaryotes, Attenuation and antitermination, Operon concept, DNA methylation, Heterochromatization, Transposition, Regulatory sequences and transcription factors, Environmental regulation of gene expression. Genomics, Proteomics.

Recombinant DNA technology - Principles and methods of genetic engineering and Gene targeting, DNA ligases, Topoisomerases, Gyrases, Methylases, Nucleases, Restriction endonucleases, Plasmids and bacteriophage based vectors for cDNA and genomic libraries. Applications of recombinant DNA technology in agriculture, health, pharmaceutical and other industry. Cell and tissue culture in plants and animals, Primary culture, Cell line, Cell clones, Callus cultures, Transgenic biology.

UNIT-V

Evolutionary Biology, Animal behaviour and Parasitology: Origin of life (including aspects of prebiotic environment and molecular evolution), Concepts of evolution, Theories of organic evolution, Mechanisms of speciation, Hardy-Weinberg genetic equilibrium, genetic polymorphism and selection, s.

Learning, social and sexual behaviour of animals, Animal Communication, Parental care, Circadian rhythms, Mimicry, Migration of fishes and birds, Sociobiology, Parasitology: Important human and veterinary parasites (protozoans and helminths), Life cycle and biology of Plasmodium, Trypanosoma, Ascaris, Wuchereria, Fasciola, Schistosoma and Leishmania, Molecular, cellular and physiological basis of host-parasite interactions.

UNIT-VI

Environmental biology, Biodiversity and Taxonomy: Concept and dynamics of ecosystem, components, food chain and energy flow, productivity and biogeochemical cycles, Types of ecosystems, Population ecology and biological control, Community structure and organisation, Environmental pollution, Sustainable development, Radiation and Chemical hazards, Wild life Conservation and its Management.

Species concept, Biological nomenclature theories of biological classification, Structural biochemical and molecular systematics, DNA finger printing, numerical taxonomy, Biodiversity, characterization, generation, maintenance and loss, Magnitude and distribution of biodiversity.

UNIT-VII

Developmental Biology: Gametogenesis in animals , Molecular events during fertilization, Cleavage patterns and fate maps, Concepts of determination, competence and induction, totipotency and nuclear transfer experiments, Cell differentiation and differential gene activity. Morphogenetic determinants in egg cytoplasm, Role of maternal contributions in early embryonic development, Genetic regulation of early embryonic development in *Drosophila*, Homeotic genes

UNIT-VIII

Entomology: Arthropods and vectors of human diseases (mosquitoes, lice, flies, and ticks), Mode of transmission of pathogens by vectors, Chemical biological and environmental control of arthropod vectors, Biology and control of chief insect pests of agricultural importance, Plant host-insect interaction, insect-pest management, useful insects, Silkworm.

UNIT-IX

Research Methodology- Introduction to research methodology: Meaning of research, Objectives of research, Types of research, research approaches, Significance of research , Criteria of good research What is a research problem? Selecting the problem, Necessary of Defining the problem, Technique involved in defining the problem, An illustration, Conclusion. Meaning of research design, need for research design, Contents , Methods of data collection- Collection of primary data, Observation Method, Interview method, Collection of data through questionnaires, Laboratory and Animal Management- Animal models and alternatives, animal facility and safety methods, Breeding-breeding and maintenance of small lab animals(mice, rats, guinea pigs, hamsters and rabbits), Commitment for the purpose of control and supervision on experimental animals(CPCSEA), Report writing - Kinds of reports, Survey, research and documentation, preparation of research report, Steps involved in writing a good report, graphs, dissertation and thesis, Style of thesis writing.

Principles and practice of statistical methods in biological research, samples and populations; Basic statistics—average, statistics of dispersion, coefficient of variation, Standard error, Confidence limits, Probability distributions (binomial, Poisson and normal); Tests of statistical significance, Simple correlation of regression, Analysis of variance.