

PG Department of Zoology, University of Kashmir.

Syllabus for Integrated Ph.D. Programme Entrance Test -2016-17

1. TAXONOMY AND BIOSYSTEMATICS- Introduction to taxonomy, systematics and biosystematics. Theories of biological classification. Taxonomic characters and collection. Curating process. Taxonomic keys- kinds, merits & demerits.

I.C.Z.N: Principles and articles (General account), Taxonomic ranks and categories. Homonymy, Synonymy and Law of priority. Typification and different Zoological types. Systematic Literature - kinds & significance.

Species concepts (Morphological and Biological) – their merits & demerits. Intraspecific Categories and their taxonomic status. Variations (genetic & non-genetic) and their evolutionary significance. Speciation : allopatric, sympatric and parapatric with examples.

Chemotaxonomy: definition and approaches. Numerical taxonomy. Cytotaxonomy with special reference to chromosome evolution (primates and grasshoppers). Molecular taxonomy (construction of molecular phylogenetic tree- DNA, RNA, Protein (enzyme). DNA Bar-coding : concept and significance, C-value and C-value paradox.

2. STRUCTURE AND FUNCTION OF INVERTEBRATES- Origin and development of coelom. Acoelomates. Pseudocoelomates. Coelomates : Protostomia, Deuterostomia and atrium in amphioxus.

Larval forms of Crustaceans and insects. Larval forms of Parasites (Trematodes and Cestodes). General characters and organization of Ectoprocta and Entoprocta. General character and organization of lophophora.

Flagella and Ciliary movement in Protozoa. Hydrostatic movement in Coelenterata and Echinodermata. Patterns of feeding & digestion in lower Metazoa. Filter feeding in Polychaeta & Mollusca.

Organs of respiration - gills (Bivalves), book lungs (Archnids) and Trachea (Insects). Mechanism of Respiration in Molluscs and Insects. Organs and mechanism of excretion – Nephridia (annelids and Malpighian tubules (Insects). Primitive nervous system (Echinodermata) and advanced nervous system in Mollusca (Cephalopoda).

3. ECOLOGY AND LIMNOLOGY - Demography: Life tables, Survivorship curves and net reproductive rate. Population growth -Exponential and logistic growth patterns, growth models- (time lag models). Life history strategies: r and k selection, Clutch size and Sex ratio. Population regulation –Extrinsic and intrinsic mechanisms.

Salient Features of Community Ecology. Major Biomes and Biological Communities. Biodiversity components, importance, status and loss. Species diversity, measurement of diversity and factors affecting the species diversity.

Fate of heat in water- Thermal stratification. Dissolved Oxygen in water and its dynamics. Free Carbon dioxide and pH in water. Nutrients: Macro and Micro. Planktonic communities : classification and distribution. High altitude lakes of Jammu and Kashmir - General Account. Benthic communities of Inland waters. Eutrophication in valley lakes.

4. IMMUNOLOGY AND STRUCTURAL BIOLOGY- Phagocytosis and inflammation. Cell-mediated immunity. Humoral immunity. Immune mechanism in relation to Helminth infections. Complement system – general account.

Theory of Immune surveillance. Host immune response to tumors. Tumor escape mechanisms. Tumor immune therapy: non specific and antigen specific treatment. Conjugated proteins-structure and function. Assembly of macromolecular complexes-ribosome and plasma membrane. Application of Nano Science in Biology. Organization of animal tissues.

Protein folding denaturation. Conformation of nucleic acids (A, B and Z – DNA), tRNA and micro-RNA. Cot curve. Protein - ligand, protein - protein, protein - nucleic acid interactions.

5. COMPARATIVE ANATOMY OF VERTEBRATES- Receptors. Auditory Organs, Visual Organs, Organs of Olfaction and Taste. Evolution of lungs. Kidney and Heart Blood. Girdles in vertebrates (Birds & Mammals), Limbs in Vertebrates. Jaw suspension. Urinogenital system in Vertebrates. Brain, Spinal cord, Peripheral Nervous system and Autonomous Nervous system.

6. ANIMAL BEHAVIOUR- Habitat and food selection. Optimal foraging theory. Home range, Territoriality and Dispersal. Genetic and environmental components in the development of behaviour.

Social organization in insects and primates. Social behaviour in insects -Nesting behaviour, Parental care and defensive behaviour. Parental care and Nesting habits in birds. Altruism concept and types. Communication-Chemical, Light and Audio. Evolution of sex and reproductive strategies.Mating system. Courtship. Sexual selection and alternative mating tactics Biological clock characteristics, range types, mechanism and controlling centres. Orientation, kinesis, taxis, echolocation and navigation. Migration in insects. Migration in Mammals with special reference to flying and aquatic mammals. Learning behaviour in vertebrates

7.TOOLS & TECHNIQUES AND QUANTITATIVE BIOLOGY - Electron Microscope, SEM, TEM, X-Ray Microscope, and Phase contrast Microscope, Polarization Microscope, Ultramicroscopy, Fluorescence Microscope and Photomicrography. Auto radiography, Spodography, Histo-Cytochemical Techniques. Cell and Tissue Culture, Smears and Squash preparations.

Techniques for the preparation of Fixatives and Preservatives. Analytical techniques in bio-chemistry for small molecules for quantification. Principles and uses of pH meter and Spectrophotometer. Electrophoresis- PAGE and SDS Variability and its measures: Mean, Standard Deviation (SD) and Coefficient of Variation (CV). Probability distribution: Binomial, Poisson and Normal. Hypothesis testing: Tests of significance based on t, z and f tests and one way analysis of variance. Correlation and Regression analysis. Non-parametric Mann Whitney U- test.

Computer fundamentals -Hardware & Software. PC Software: Introduction to M/S Windows, M/S Word & M/S Excel. Introduction to Statistical package (SPSS). Introduction to Networking, Internet and its applications

8.COMPARATIVE PHYSIOLOGY AND ENDOCRINOLOGY-Feeding mechanisms and regulation. Patterns of Nitrogen Excretion among different animal groups. Bioenergetics. Thermoregulation in Animals: Homoeothermic animals, Poikilotherms and Hibernation.

Circulation of body fluids and their regulation. Gaseous Exchange and Respiratory Pigments. Muscle structure and function correlation. Receptor physiology- Mechanoreception, Photoreception and Chemoreception.

Structure and function of pituitary glands. Nature of mechanism of hormone action. Thyroid gland and its biological action. Abnormalities due to hormonal disorders in human beings. Chemical nature and Characteristics of hormones. Role of hormone in regulation of growth and development. Biosynthesis of amino acid derived hormones T3 & T4. Production of hormones by biochemical and rDNA technologies.

9. WILDLIFE MANAGEMENT AND CONSERVATION BIOLOGY- Viral diseases in birds and mammals Bacterial diseases in birds and mammals. Health care of Wild animals and birds in captivity. Predation - Problems and Principles.

Ecological zones of India with special reference to distribution of wild fauna. Important National Parks of India with concept of their creation. Methods of studying "Wildlife Census". Wildlife legislation-Acts, laws, conventions and treaties.

Measures of Conservation, Protection and Control of Wildlife. (In-situ, ex-situ and gene bank) Distribution and Conservation measures of Hangul deer and Tibetan antelope. Waterfowl: Their habitat and conservation in Jammu and Kashmir State. Status and management of endangered Butterflies and Beetles in India.

Food components selection and management implications. Wildlife habitat types and their significance. Wetlands: Threats, development and management. Prey base of carnivores in wild habitat.

10.ENVIRONMENTAL PHYSIOLOGY AND DEVELOPMENTAL BIOLOGY- Terrestrial, Freshwater and Marine life. Parasitic habitats.

Environmental stress & strain and animal response. Adaptations: Acclimation and acclimatization Concept of homeostasis. Osmoregulation in aqueous and terrestrial environments. Endothermy and Physiological mechanism of regulation of body temperature.

Vitellogenesis. Regeneration phenomenon in animals and factors affecting it. Histomorphological changes in regenerating of limbs in amphibians and tail in lizards.

Process of blastulations, gastrulation and fate map constriction in rabbits. Formation and implantation of blastocyst. Formation of Faetal membranes. Maternal-Faetal interactions. Role of hormones in pregnancy and parturition. Immunocontraception.

11. MOLECULAR BIOLOGY AND CYTOGENETICS - Molecular regulation of cell cycle. Cell permeability. Extra chromosomal inheritance (mitochondria and chloroplast). Cytoskeleton: Microtubules, Microtubular organelles and microfilament. Prokaryotic and eukaryotic plasmids. Somatic cell gene therapy. Stem cell and animal cloning technology. Biology of Aging.

DNA damage and repair. Mobile genetic elements (Tn elements). Molecular imaging of Ribosome function. Apoptosis- mechanism and significance.

Genomics, Proteomics and Human Genome. DNA Finger Printing. Cytogenetic effects of Radiation. Screening and tier testing for mutagenicity.

12. APPLIED ZOOLOGY- Plant parasitic nematodes - economic importance and control. Protozoan diseases in domestic animals and their control. Important Protozoan diseases of human beings and their control. Major helminth diseases in domestic animals and their control. Major helminth diseases in man and their control .

Lac-culture: Life history of *Laccifer lacca*, Lac culture methods, major crops/strains of lac in India Natural enemies and uses of lac. Beneficial insects - medicinal uses of insects, biological control agents of insect pests and role of insects in forensic sciences. Major insect pests of apple in Kashmir – nature/extent of damage and control Venom in arthropods (Scorpion, bees and tarantulas) . Major insect pests of domestic animals: general account.

Preservation and Processing of Fishes. Fish Products and by-products. Artificial food and feeding. Prawn fishery - general account. Pearl culture-culture methods and uses.

Animal breeding - Inbreeding and Outbreeding; artificial breeding; Modern methods of breeding for improvement of sheep and cattle. Types, action and uses of different animal venoms with reference to snakes. Classification, action and uses of animal poisons. Vermicompost and vermiculture.

Prof.Ulfat Jan
(Head of the Department)