Integrated Ph. D. Zoology Entrance Test Syllabus 2018

UNIT I: ANIMAL TAXONOMY AND BIOSYSTEMATICS

Terms and Definitions in Taxonomy; Taxonomic characters; Taxonomic keys: Kinds, Merits & Demerits. Taxonomic ranks and categories; ICZN, Homonymy, Synonymy and Law of Priority; Typification and different Zoological types; Intraspecific Categories and their taxonomic status; Species concept (Morphological and Biological) – their Merits & Demerits. Speciation: Allopatric, Sympatric and Parapatric with examples. Cytotaxonomy with special reference to chromosome evolution in Primates and Grasshoppers; Molecular taxonomy; Construction of Phylogenetic trees using mitochondrial DNA and other markers.

UNIT II: STRUCTURE AND FUNCTION OF INVERTEBRATES

Introduction to Protozoa; Flagellar and Ciliary movements in Protozoa; Colonial protozoans and theories of origin of Metazoa; Canal system, Skeleton and Reproduction in Porifera; Nematocysts, Polymorphism in Hydrozoa, Coral reefs; Origin & organization of Coelom; Adaptive radiation in Polychaetes; Trochophore larva and its evolutionary significance; Crustacean larvae and their significance, Importance of *Peripatus*; Respiration and Excretion in Arthropods; Respiration & Nervous system in Cephalopods; Modification of Foot and Economic importance of Molluscs. Echinodermata - Water vascular system; Larval forms and their significance. Salient features and affinities of Minor phyla: Mesozoa, Phoronida, Ctenophora, Endoprocta and Rotifera.

UNIT III: ANATOMY AND PHYSIOLOGY OF MAMMALS

Digestive system; Physiology of Digestion, Absorption, Energy balance, Basal Metabolic Rate (BMR). Respiratory system; Respiration in terrestrial and aquatic Mammals, Anatomical considerations, Transport and Exchange of gases, Waste elimination, Neural and Chemical regulation of Respiration. Anatomy of heart, Cardiac cycle, Heart as a pump, Blood pressure. Blood corpuscles, Haemopoiesis, Plasma function, Blood volume, Blood volume regulation, Human blood groups, Haemostasis. Comparative physiology of excretion, Urine formation, Urine concentration, Waste elimination, Micturition, Regulation of water balance. Neurons, Gross anatomy of Brain and Spinal cord, Peripheral and Autonomous nervous system, Nerve conduction. Sense organs: Vision and Hearing. Physiology of muscle contraction; Pectoral and Pelvic Girdles and Limbs; Endocrine glands and their functions; Neuro-endocrine regulation and hormonal disorders; Thermoregulation in Animals: Homeotherms, Poikilotherms; Aestivation and Hibernation.

UNIT IV: ETHOLOGY AND DEVELOPMENTAL BIOLOGY

Home range, Territoriality and Dispersal, Habitat and food selection, Optimal foraging theory; Genetic and environmental components in the development of behaviour; Social organization in Insects and Primates; Parental care and nesting habits in Amphibians and Birds; Courtship, Mating system and role of Pheromones in Behaviour; Parental investment and Reproductive strategies; Learning behaviour in Vertebrates; Migration in Insects, Fishes and Mammals; Gametogenesis; Process of Blastulation, Gastrulation and Fate map construction in Mammals; Implantation of blastocyst and formation of foetal membranes in humans; Role of hormones in Pregnancy and Parturition; Maternal-foetal interactions; Regeneration phenomenon in animals, Histomorphological changes in regeneration of Limbs in Amphibians and Tail in Lizards.

UNIT V: CELL AND MOLECULAR BIOLOGY

Cellular diversity: Structural features of Prokaryotic & Eukaryotic cells. Membrane Structure and Function: Structure of model membranes, Active transport, Ion pumps, Mechanism of sorting and regulation of intracellular transport. Cytoskeleton: Microtubules, Microtubular organelles and Microfilaments. Cell division & cell cycle: Mitosis and Meiosis, their regulation & control. Cell signalling: Signalling molecules and Modes of cell-cell signalling. Cell surface receptors: G-protein coupled receptors, Receptor protein-tyrosine kinases, Cytokine-receptors and non-receptor protein tyrosine kinases. Signal transduction pathways: MAP kinase and JAK/STAT pathways. Cell transduction and cytoskeleton: Integrins and signal transduction, regulation of the actin cytoskeleton. Mechanism of DNA biosynthesis in prokaryotes; DNA damage and repair; Structure & types of RNA, Mechanism of RNA synthesis in prokaryotes; Protein synthesis and processing.

UNIT VI: GENETICS AND EVOLUTION

Mendelian principles: Dominance, Segregation and Independent assortment. Deviation from Mendelian inheritance: Codominance, Incomplete dominance; Complementary and Supplementary ratios; Pleiotropy. Concept of gene: Allele, Multiple alleles, Pseudoallele, Complementation tests. Extra chromosomal inheritance: Inheritance of mitochondrial and chloroplast genes, Maternal inheritance. Genomics, Proteomics and Human Genome Pedigree analysis, Lod score for linkage testing, Karyotypes, Genetic disorders and Genetically inherited diseases. Linkage maps, Tetrad analysis, Mapping with molecular markers, Mapping by using somatic cell hybrids. Gene manipulation: An overview of DNA cloning, Transgenic animals. Recombinant DNA technology: Basics and Applications. Origin of life on Earth; Modern synthetic theory of organic evolution; Convergent and Divergent evolution; Speciation: Isolating mechanisms.

UNIT VII: ECOLOGY

Ecosystem: Structure and function; Energy flow and Mineral cycling (CNP); Structure and function of Terrestrial (forest) and Aquatic (fresh water) ecosystems. Concept of Habitat and Niche; Niche width and overlap; Fundamental and realized niche. Species interactions: Types of interactions, Interspecific competition, Herbivory, Carnivory, Symbiosis. Ecological succession: Types & Mechanisms, changes involved in succession, concept of climax. 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. Nature of communities; Community structure and attributes. Major biomes and biological communities. Environmental pollution; Global environmental change. Bioaccumulation, Bioremediation and Biomagnifications.

UNIT VIII: BIOLOGICAL TECHNIQUES AND IMMUNOLOGY

Electron Microscopy: SEM & TEM; Histological Techniques; Microtomy and Micrometry; Principles and uses of pH meter and Spectrophotometer; Electrophoresis. Sub-cellular fractionation and centrifugation. PCR, Blotting techniques; Cytogenetic techniques: FISH & GISH. Chromatography. Tumour immunology: Introduction to tumours and their immune surveillance; Host immune response to tumours; Tumor escape mechanisms. Tumor immune therapy: Non-Specific and antigen Specific treatment.

UNIT IX: APPLIED ZOOLOGY

Protozoan diseases in man and domestic animals; Major helminth diseases in man & domestic animals. Beneficial insects; Medicinal uses of insects, Biological control agents of insect pests and role of insects in forensic sciences. Lac culture: Life history of *Laccifer lacca*; Lac culture methods. Major insect pests of apple in Kashmir: nature and extent of damage and control measures. General account of major insect pests of domestic animals. Carp and Trout culture; Artificial food and feeding; Preservation and Processing of Fishes; Fish Products and by products; General account of Prawn fishery; Pearl culture. Animal breeding: Inbreeding, Outbreeding and Artificial breeding. Types, action and uses of different animal venoms with reference to snakes. Classification, action and uses of animal poisons. Vermicompost and vermiculture.

UNIT X: BIOSTATISTICAL ANALYSIS

Variability and its measures: Mean, Standard Deviation, Coefficient of variation. Probability distribution: Binomial, Poisson and Normal. Hypothesis testing: Test of significance based on t, z & f tests and analysis of Variance - One way and two way ANOVA. Non-Parametric tests: Kruskal Wallis test and Mann Whiteny U test.

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