**Integrated Ph. D. Zoology Entrance Test Syllabus 2021**

**UNIT I: ANIMAL TAXONOMY AND BIOSYSTEMATICS**

Terms and definitions in animal taxonomy; Taxonomic characters: definition and kinds-morphological, physiological, molecular, ecological, behavioral and geographical. Taxonomic keys: definition and kinds- bracket key, indented key and pictorial key. ICZN: Historical background, overview of terms, principles and articles. Homonymy, synonymy and law of priority. Typification: Definitions, kinds and significance. Intraspecific categories and their taxonomic status. Species concepts: morphological, biological and phylogenetic. Mechanisms of speciation: allopatric, sympatric, peripatric and parapatric. Cytotaxonomy: back ground, chromosome evolution with specific reference to primates and grasshoppers. Molecular taxonomy: Concept of phylogenetic systematics & phylogenetic tree reconstruction. Origin of life on earth, Special creation theory, abiogenesis and biogenesis. Modern synthetic theory of organic evolution, Genetic variations, Natural Selection, Isolation. Convergent and divergent evolution. Speciation: isolating mechanisms - geographical isolation & reproductive isolation.

**UNIT II: STRUCTURE AND FUNCTION OF INVERTEBRATES**

Classification of protozoa, porifera, cnidaria, annelida, arthropoda, mollusca and echinodermata upto order level. Nutrition, locomotion, reproduction and economic importance of protozoa. Canal system and skeleton in porifera. Polymorphism in cnidaria, corals and coral reefs. Larval forms of cestodes and trematodes. Nervous system, adaptive radiation in polychaetes. Economic importance of annelida; vermiculture and vermicompost. Respiration in arthropods (aquatic and terrestrial), crustacean larvae and their phylogenetic significance. Respiration in molluscs, nervous system in cephalopods. Colouration, ink, foot and its modifications, shell structure and composition in molluscans. Torsion in gastropods. Echinodermata: Autotomy & regeneration, water vascular system; larval forms and their significance

**UNIT III: ANATOMY AND PHYSIOLOGY OF MAMMALS**

Structure of digestive system & associated glands. Physiology of digestion, absorption & assimilation. Structure of lungs. Transport & exchange of respiratory gases & regulation of respiration.Glycolysis, TCA Cycle & ETC. Structure and function of heart & blood. Ultra-structure of kidney. Physiology of excretion-urine formation, micturition, regulation of water balance. Central nervous system: brain and spinal cord. Peripheral nervous system: cranial and spinal nerves. Endocrine glands and their functions. Neuro-endocrine regulation and hormonal-disorders. Eye and physiology of vision. Ear and physiology of hearing. Gustatory and olfactory receptors with their physiology**.**

**UNIT IV: ETHOLOGY AND DEVELOPMENTAL BIOLOGY**

Home range, territoriality, dispersal and habitat selection. Food selection and optimal foraging theory. Genetic and environmental components in the development of behaviour. Neural basis of behaviour: stimulus filtering, biological rhythms. Social organization in insects and primates. Parental care and nesting habits in birds. Behavioural adaptations in mammals and birds. Communication in animals: auditory, visual, chemical and tactile. Courtship and mating systems. Parental investment and reproductive strategies. Learning behaviour in vertebrates. Migration in insects and fishes. Gametogenesis, fertilization and cleavage. Blastulation and implantation of blastocyst (Mammals). Extra embryonic membranes– formation, structure and function. Natural and artificial parthenogenesis; significance of parthenogenesis.

**UNIT V: MOLECULAR BIOLOGY AND GENETICS**

DNA structure and replication in prokaryotes and eukaryotes. DNA damage and repair. Transcription in prokaryotes and eukaryotes . Protein synthesis and post translational modifications in eukaryotes. Mendelian and Non-Mendelian inheritance; non-allelic gene interactions . Mechanisms of sex determination and dosage compensation. Molecular mechanism of crossing over; transposable elements and their evolutionary significance. Gene expression in prokaryotes and eukaryotes. Cell signalling: signalling molecules and modes of cell-cell signalling; cell surface receptors . Signal transduction pathways: MAP kinase and JAK/STAT pathways. Apoptosis and cell renewal. Cancer biology: cancer and its types, transforming agents, cellular and viral oncogenes. Concept of genomics and human genome project. Gene mapping: linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids. Human genetics: Pedigree analysis, Lod score for linkage testing, karyotypes, genetic disorders.

**UNIT VI: BIOSTATISTICS & BIOTECHNIQUES**

Methods of sampling; diagrammatic and graphic representation of data. Measures of central tendency: mean, median and mode; measures of dispersion: standard deviation and standard error. Probability and probability distribution: binomial, poisson and normal distributions. Tests of significance: Chi square test, students T test and ANOVA (one-way analysis). Techniques for the preparation of fixatives & preservatives. Light microscopy. Electron Microscopy: SEM & TEM. Micromorphometry. Centrifugation and its applications. Electrophoresis, Blotting techniques and PCR with their applications. Cytogenetic techniques. Ion exchange chromatography. Gel-filtration chromatography. HPLC and GC. Immunoassays: ELIZA, radioimmunoassay & immunofluorescence.

**UNIT VII: ECOLOGY, LIMNOLOGY & BIODIVERSITY**

Ecosystem: Structure and function; energy flow and mineral cycling (CNP); structure and function of forest and fresh water ecosystems. Habitat and niche: Concept of habitat and niche; niche width and overlap; fundamental and realized niche. Ecological succession: types; mechanisms; changes involved in succession; concept of climax community. Concepts of bioremediation, biomagnification and biomonitoring. Attributes of population: natality, mortality, immigration, emigration, 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 factors. Physicochemical parameters of water bodies. Thermal stratification and its modification. Role of macro and micro-nutrients in water bodies. Eutrophication in lakes, its causes and consequences. Biodiversity: concept, levels and values. Biodiversity hotspots; loss of biodiversity. Convention on biological diversity (CBD): objectives, priorities and action plan. Biological diversity act, 2002: main provisions and rules.

**UNIT VIII: IMMUNOLOGY & APPLIED ZOOLOGY**

Innate immunity and acquired immunity. Complement system: classical & properdin pathways. Immuno-deficiency diseases: Stem cell, B & T-cell deficiency diseases. Tumour immunology with special emphasis on tumour immunotherapy. Concept of hypersensitivity, Classifications of hypersensitivity reactions. Mechanism of type I and type II hypersensitivity reactions. General account on autoimmune diseases with special emphasis on auto-immune anemia’s & rheumatoid arthritis. Transplantation immunology-Homograft rejection. Production & contribution of transgenic animals to human welfare (Poultry & Dairy) . Modern assisted reproductive techniques for the improvement of cattle. Application of biotechnology in – (a) sericulture, (b) apiculture. Recombinant DNA Technology for production of biomolecules. Cell culture media, cell culture types and techniques. Ex-vivo & in-vivo gene therapy.

**UNIT IX: PARASITOLOGY**

Concepts and definitions in animal associations. Origin, evolution and distribution of parasites in animal kingdom. Parasitic adaptations (morphological, physiological & behavioral) & Zoonosis. Host parasite relationships - general account. Protozoan parasites of man (luminal & blood). Detailed life cycle, pathogenicity and control of *Entamoeba & Leishmania.* Pathogenicity and control of falciparum malaria with special emphasis on immune-prophylaxis. Opportunistic parasites of man: *Pnemocystis carinii* & *Cryptosporidium parvum.* Host immune response to protozoans. Trematode parasites of man with life cycle, pathogenicity & control of *Shishtosoma .* Cestode parasites of man with life cycle, pathogenicity & control of *Taenia spp.* Nematode parasites of man with life cycle, pathogenicity & control of Ascaris & *Enterobius.* General account of antihelmintics and antihelmintic resistance.

**UNIT X: ICHTHYOLOGY**

Outline classification of fishes with distinguishing characters up to principal subdivisions with special emphasis on Berg’s Scheme of classification . General account on adaptive radiation in Elasmobranchii and Actinopterygii. Structure types and modification of scales and fins. Structure and function of gills , kidneys (Excretion and Osmoregulation) and endocrine organs. Sense organs and their functions. Reproductive organs in fishes (Teleost). Population estimation, structure and dynamics, Fecundity: absolute and relative. Age determination: Length frequency analysis, model progression methods, growth check, scale and otoliths. Adaptations in hill stream, deep sea and cave fishes. Fish migration and types of migration (European eel and Atlantic salmon). Aquaculture: Criteria and practices, applications of biotechnology in aquaculture. Trout and carp culture. Prawn and pearl culture. Integrated fish farming, composite/polyculture.

**UNIT XI: WILDLIFE**

Introduction and importance of wildlife. Wildlife habitat types and their significance. Major diseases of wild fauna (Viral and Bacterial). Human- wildlife conflict: causes, consequences and management. Principles of wildlife management. Wildlife management in India. Wildlife Protection Act of India (1972), its brief structure and recent amendments. National and international wildlife organizations: BNHS, WWF and IUCN . In situ and Ex situ conservation. Keystone species: concept and its relevance for conservation . Conservation status of markhor and tibetan antelope. Threatened fauna of Jammu and Kashmir. Wildlife conventions: Ramsar, Bonn, CITES. Conservation Projects: tiger, hangul, snow leopard and musk deer. Remote sensing and GIS: concept and applications in wildlife. Methods of studying wildlife census. Capture of wildlife: live trapping, mist netting, chemical captures (equipments & drugs). Bird ringing and banding, use of radio transmitters in wildlife study.

**UNIT XII : ENTOMOLOGY**

Insect morphology**:** Integument- structure and composition, head- structure and appendages, thorax- structure and appendages and abdomen- structure and its modifications. Metamorphosis in insects and its hormonal control. Larval and pupal forms in insects. Diapause- types, causes and control. Effects of temperature, humidity and light on the activities of insects. Insect-plant interaction. General account of insects as vectors of human diseases. General account of polyphagous insect pests. Insect pests of temperate fruits with emphasis on the occurrence, economic importance, life cycle and control of major pests. Chemical insecticides–organochlorines and organophosphates. Biological control with successful examples of parasites/parasitoids and predators. IPM: Concept, strategies and tools in pest management.

***Prof. Syed Tanveer***

Head of the Department