



Shri Sangameshwar Education Society, Solapur

Kannada Linguistic Minority Institute

Sangameshwar College, Solapur

(Autonomous)

The Written Test – the First Phase of the Selection Process
for the Post(s) of Assistant Professor

Syllabus

Subject: Zoology

Unit 1: Cell biology and Biochemistry:

prokaryotic and eukaryotic cell organization; plasma membrane, membrane models, transport and cell junctions, Structure and functions of mitochondria, endoplasmic reticulum, Golgi complex, lysosomes, peroxisomes, ribosomes, cytoskeleton and nucleus; structure of chromatin and chromosomes, heterochromatin, euchromatin, Cell cycle, mitosis, meiosis, cell differentiation, apoptosis, necrosis, autophagy. and cell signalling-Cell signaling Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways.

Carbohydrates, lipids, amino acids, proteins and nucleic acids: classification, structure and biological significance. Stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.) Principles of biophysical chemistry (pH, buffer, thermodynamics). Enzymes: classification, cofactors, mechanism of action, factors affecting activity, inhibition and isoenzymes.

Unit 2: Comparative anatomy and developmental biology:

Comparative integumentary, skeletal, digestive, respiratory, circulatory, urinogenital and nervous systems of vertebrates.

Gametogenesis: spermatogenesis, oogenesis, structure of gametes, vitellogenesis; fertilization- mechanisms of external and internal fertilization and early embryonic development. Cleavage, blastulation, gastrulation, fate maps, implantation and placenta. Embryonic cell movements, metamorphosis.

Unit 3: Animal physiology and endocrinology:

Blood and circulation- Blood corpuscles, haemopoiesis and plasma function, blood groups, haemoglobin, haemostasis. Cardiovascular System: anatomy of heart structure, myogenic heart, specialized tissue, ECG – its principle and significance,

cardiac cycle, heart as a pump, blood pressure, neural and chemical regulation of all above. Respiratory system – Comparison of respiration in different species, anatomical considerations, transport of gases, exchange of gases, Respiratory pigments- Hemoglobin, hemocyanin, chlorocruorin, haemoerythrin, neural and chemical regulation of respiration. Excretory system – kidney, urine formation, urine concentration, waste elimination, regulation of water balance, electrolyte balance, acid-base balance. Endocrinology -Endocrine glands, basic mechanism of hormone action, hormones and diseases

Unit 4: Molecular biology and methods in biology:

DNA and RNA structure, Different types of DNA and RNA. DNA replication, DNA damage and repair mechanisms, Transcription in prokaryotes and eukaryotes; RNA polymerases in prokaryotes and eukaryotes, Transcription factors, Genetic code; Properties of genetic code, Translation in prokaryotes and eukaryotes, RNA processing (Post Transcriptional Modifications), Control of gene expression at transcription and translation level (regulating the expression of phages, viruses, prokaryotic and eukaryotic genes, role of chromatin in gene expression and gene silencing).

Generation of genomic and cDNA libraries in Cloning vectors: Plasmids, Cosmids, Phagemids, Lambda Bacteriophage, BAC, YAC, MAC, Southern, Northern and Western blotting, Polymerase Chain Reaction, DNA Finger Printing, Molecular analysis using UV/visible spectroscopy, Isolation and purification of RNA, DNA and proteins, different separation methods.

Unit 5: Genetics and evolutionary biology:

Mendelian principles: Dominance, segregation, independent assortment. Concept of gene: Allele, multiple alleles, Extensions of Mendelian principles: Codominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, linkage and crossing over, sex linkage, sex limited and sex influenced characters. Extra chromosomal inheritance: Inheritance of Mitochondrial, maternal inheritance. Microbial genetics: Methods of genetic transfers – transformation, conjugation, transduction, Human genetics: Pedigree analysis, karyotypes, genetic disorders. Mutation: Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal versus somatic mutants, insertional mutagenesis. Structural and numerical alterations of chromosomes: Deletion, duplication, inversion, translocation, ploidy and their genetic implications. Origin of life, chemical evolution, Lamarckism, Darwinism, natural selection, mutation theory, population genetics, Hardy-Weinberg equilibrium, genetic drift, gene flow, fossils, speciation, adaptive radiation and human/molecular evolution.

Unit 6: Animal diversity and systematics:

Protista/Protozoa: general characters, classification, locomotory organelles and locomotion; Porifera: characters, classification and canal system of Sycon; Cnidaria: characters, classification and polymorphism in Hydrozoa. Platyhelminthes and Nematelminthes: classification, Taenia solium and Ascaris lumbricoides life

histories, parasitic adaptations. Annelida and Arthropoda: classification, metamerism, insect metamorphosis, economic importance of earthworms, leeches and insects. Mollusca and Echinodermata: classification, pearl formation and water vascular system. Chordata: protochordates, Agnatha, Pisces, Amphibia, Reptilia, Aves and Mammalia; phylogeny, parental care, bird migration, venomous/non-venomous snakes and economic importance of fishes.

Unit 7: Ecology and animal behaviour:

Organism and environment- Abiotic/biotic factors, Population Ecology: Characteristics of a population; population growth curves; population regulation. Community Ecology-Community structure - Food webs, trophic levels, keystone species; Species interactions -Competition, predation, mutualism, parasitism; Succession- Primary and secondary succession, community stability. Ecosystem Ecology: Ecosystem structure; ecosystem function; energy flow and mineral cycling (C, N, P); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, eustarine). Biogeographical zones of India.

Animal behaviour: instinct, learning, habituation, imprinting, conditioning, orientation, aggression, territoriality, reproductive/social behaviour, honeybee communication, altruism, sexual selection and mate choice. Chronobiology: biological rhythms, circadian, tidal and lunar rhythms, photoperiodism and melatonin.

Unit 8: Applied zoology and wild life conservation:

Fisheries: Inland/marine fisheries, capture and culture fisheries, fishing crafts and gears, fish culture, Indian/exotic carps, breeding, feeding, farm management, diseases, preservation and fish by-products. Apiculture: honeybee species, life cycle, Primitive and Modern hives and equipment, honey bee products, pests and diseases. Sericulture: silkworm species, host plants, Bombyx mori life cycle, silk gland, rearing appliances, pests and diseases; Animal husbandry and poultry-breeds, feeding, breeding, housing and diseases.

Biodiversity: levels, hotspots, threats, conservation, protected areas, in-situ and ex-situ conservation, wildlife management, human-wildlife conflict and climate change.

Unit 9: Teaching Methodology and NAAC