

TAMIL NADU PUBLIC SERVICE COMMISSION
SYLLABUS
BIO-TECHNOLOGY (PG DEGREE STANDARD)
For the post of Scientist 'C' Grade in Forest Department
in the Tamil Nadu Forest Service

Code: 471

UNIT I: BASIC ZOOLOGY AND WILDLIFE BIOLOGY

Non-chordate, chordate, classification and relationship of various phyla up to subclasses, symmetry, parasitic adaptation, metamorphosis in insect and its hormonal regulation, mollusc, pisces, amphibian, reptilian, aves, mammalian, ecology, biosphere, concept of ecosystem, population characteristics, population dynamics, ethology, social organization in insects, evolution, theories of origin of life, physiology with special reference to mammals.

Scope and importance of wildlife of India, forestry, silviculture, forest entomology, behaviour of wildlife, wildlife management techniques, wildlife census techniques, human wildlife conflicts, health care of wildlife, conservation of wildlife, modern concepts in wildlife conservation, wildlife administration and legislation, ecology, environment and conservation biology.

UNIT II: MICROBIOLOGY

History and microbial taxonomy, major discoveries related to the field of microbiology, microbial growth and metabolism, nutritional requirements for growth, identification of bacteria microbial growth control, epidemiology of microbes, microbial diseases, agricultural microbiology, environmental microbiology, biogeochemical cycles, and biotechnological application of extremophiles.

UNIT III: CELL & MOLECULAR BIOLOGY

Introduction to cell biology, basic properties of cells, cellular dimension, cell origin and evolution, microscopy, flow cytometry, organelles of the eukaryotic cell and its functions, bio membranes, structural organization, transport across membrane, cell adhesion, cell junctions, structure of nucleic acids, genome organization in prokaryotes and eukaryotes, DNA replication, transcription, translation, site of synthesis of organelle, membrane proteins, nucleus.

Genes, chromosomes, co-linearity of genes, proteins, genetic code, identification of DNA as the genetic material, the complexity of eukaryotic genome, DNA markers, SNP and their detection techniques, gene expression and regulation in prokaryotes and eukaryotes, mutations, chromosomal abnormalities, genetic diseases, techniques in the study of chromosomes, recombination, DNA damage and repair, allele frequencies and genotype frequencies, Hardy-Weinberg principle, genetics and evolution, random genetic drift, karyotyping, chromosome mapping, biology of plasmids, Human Genome Project, Genomics and Modern methodologies in understanding genome.

Definition and scope of developmental biology, gametogenesis, fertilization, mechanism of fertilization in mammal & sea urchin, types of fertilization, fate maps, vertebrate development.

UNIT IV: ENZYMOLOGY & IMMUNOLOGY

Introduction to enzymes, classification, nomenclature, general properties, extraction, kinetics of enzyme catalysis, kinetic constants, inhibition of enzyme activity, enzyme catalysis, enzyme specificity, catalysis, coenzyme action, enzyme regulation, enzyme engineering.

History and overview of the immune system, types of immunity, physiology of immune response, immune system, biology of antigens, immunoglobulin, monoclonal antibody transplantation, immunotechniques and its applications.

UNIT V: GENETIC ENGINEERING, PLANT & ANIMAL BIOTECHNOLOGY, MARINE & ENVIRONMENTAL BIOTECHNOLOGY

Gene cloning, genetic engineering tools, rDNA technology, gene libraries, vectors, cloning, nucleic acid hybridization techniques, molecular probes, DNA fingerprinting; DNA sequencing, site directed mutagenesis; DNA microarray; chromosome walking and jumping, gene therapy, transgenic animals and plants, modern concepts in genetic analysis.

Introduction of plant tissue culture, composition of media, micropropagation, organogenesis, plant transformation, animal health disease diagnosis, hybridoma technique, prophylaxis, cryopreservation, animal cell culture, cell line, cloning micromanipulation, transgenic animals.

Aquaculture, culture of sea weeds, marine micro algae, marine hydrocolloids, marine enzymes, marine lipids, marine flavourants, aquaculture biotechnology, production of transgenic fishes, pharmaceuticals from marine realms, biofouling, marine bioremediation, marine flora, marine fauna, marine resources assessment, population study, marine environment protection, oceanography, marine microbes, biology of microorganisms used in genetic engineering, microbial assessment, role of microbes in marine environment, microbial, microbial interaction, culture systems, hatchery techniques, aquafarms, marine pharmacology, microbial techniques, disease diagnosis, environment interaction, marine pollution, wastewater bio-treatment, bioaugmentation.

Concept of environment, environmental pollution, biofilm kinetics, waste water management, toxicity, biosensors, biomonitoring, biomagnification, biomining, biofuels, bioremediation; xenobiotics, solid waste, bioethics, need for bioethics, biosafety, IPR, patenting, copyright, industrial designs, trademarks, geographical indications, layout, registration, bioprospecting, biopiracy.

UNIT VI: BIOINFORMATICS, PROTEOMICS & GENOMICS

Database concepts, internet and its application, introduction to bioinformatics, protein and nucleotide databases, information retrieval from biological databases, sequence alignment, artificial intelligence, database searching, bioinformatics for genome sequencing, genome maps, markers, genome variation, protein structure, molecular visualization tools, medical application of Bioinformatics.

Whole genome analysis, foundations of genomics, mapping of genome, genome library construction, genome sequencing, annotation of genome, genomics versus proteomics.

UNIT VII: TISSUE ENGINEERING & STEM CELL BIOLOGY

Basic biology of tissue engineering, tissue development, 3D cell culture, biomaterials in tissue engineering, structural tissue engineering, periodontal applications.

Stem cells, pluripotency, self-renewal and differentiation, types of stem cells, stem cell isolation and culture techniques, stem cell cycle, ethics in human stem cell research.

UNIT VIII: NANOBIO TECHNOLOGY

Introduction to nanotechnology, preparation of nanomaterials, DNA based nanostructures, protein-based nanostructures, magnetic nanoparticles for imaging, hyperthermia, nanotoxicology, risk assessment and safety regulation of nanoparticles.

UNIT IX: BIOINSTRUMENTATION

Microscopic techniques, its principles and applications, centrifugation, chromatography techniques, electrophoretic techniques, ELISA, RIA, blotting, electro blotting, PCR, RT-PCR, microarray (DNA, Proteins), spectroscopic techniques, radio-isotopic techniques.

UNIT X: RESEARCH METHODOLOGY & BIostatISTICS

Research methodology, review of literature, writing the research report, standard deviation, spreadsheet tool, web search.

Statistics, sampling method, sample estimates, measures of central tendency, measures of dispersion, correlation, regression, probability, probability distribution, normal distribution, Inference, sampling distribution, correlation coefficient, tests of significance, spreadsheets, statistical packages.