



वर्षा वन अनुसंधान संस्थान
भारतीय वानिकी अनुसंधान एवं शिक्षा परिषद्
(पर्यावरण एवं वन मंत्रालय, भारत सरकार के अधीन एक स्वायत्त परिषद्)
पोस्ट बॉक्स नं. 136, जोरहाट - 785001, असम।

RAIN FOREST RESEARCH INSTITUTE
Indian Council of Forestry Research & Education
(An Autonomous body of Ministry of Environment & Forests, Govt. of India)
Post Box No. 136, Jorhat- 785001, Assam

No.3/213/2015-Estt./Vol.V/

Dated :29/10/2019

CORRIGENDUM

With reference to this office recruitment Notice No: RFRI/3/213/2006-Estt./Vol.VIII dated: 21.10.2019 vacancy to the post of Technical Assistant in the Pay Level-5 Rs.29,200-92,300/- may be read as below:

Sl No	Name of Posts	Pay Scale	No. of Posts	UR	SC	ST	OBC	EWS	Remarks
1	Technical Assistant	Pay Scale: Level-5; Rs.29,200- 92,300/-	2 (Chemistry) 1 (Botany) 1 (Zoology) 2 (Agriculture) 2 (Forestry)	4	1	0	2	1	Total=8

Syllabus of above disciplines is also attached herewith.


Director,
RFRI, Jorhat.

Syllabus of Forestry

SILVICULTURE

General Silvicultural Principles -Ecological and physiological factors influencing vegetation, natural and artificial regeneration of forests; methods of propagation, grafting techniques; site factors; nursery and planting techniques nursery beds, containers and maintenance, grading and hardening of seedlings; establishment and tending. Silviculture of some of the economically important species in India. Silviculture systems (Clear felling, uniform shelter wood selection, coppice and conversion systems), Management of silviculture systems of temperate, subtropical, humid tropical, dry tropical and coastal tropical forests; Thinning.

AGROFORESTRY

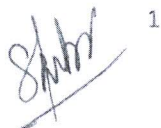
Agroforestry- Scope and necessity; Agro forestry systems under different agroecological zones; selection of species and role of multipurpose trees and NTFPs, techniques, food, fodder and fuel security. Social/Urban Forestry: Objectives, scope and necessity. JFM-Principles, objectives, Methodology, scope and benefits, National agroforestry policy.

FOREST SOILS AND WATERSHED MANAGEMENT

Forests Soils: Classification, factors affecting soil formation; physical, chemical and biological properties. Soil conservation-definition, causes for erosion; types-wind and water erosion; conservation and management of eroded soils/areas, wind breaks, shelter belts; sand dunes; water logged and other waste lands. Role of forests in conserving soils. Role of micro-organisms in ameliorating soils; N and C cycles. Watershed Management-Concepts of water shed; forest hydrology, landslide controls, rehabilitation of degraded areas; water harvesting and conservation;ground water recharge and watershed management.

ENVIRONMENTAL CONSERVATION AND BIODIVERSITY

Environment- Components and importance, principles of conservation, impact of deforestation; forest fires and various human activities like mining, construction and developmental projects, population growth on environment. Pollution-Types, Global warming, green house effects, ozone layer depletion, acid rain, impact and control measures, environmental monitoring; concept of sustainable development. Control and prevention of air, water and noise pollution. Environmental impact Assessment.



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TREE IMPROVEMENT

General concept of tree improvement, methods and techniques, variation and its use, provenance, seed source, exotics; quantitative aspects of forest tree improvement, seed production and seed orchards, progeny tests, use of tree improvement in natural forest and stand improvement, forest genetic resources and gene conservation in situ and ex-situ, application of DNA technology in forestry.

FOREST MANAGEMENT AND MENSURATION

Objective and principles; techniques; stand structure and dynamics, sustained yield relation; rotation, normal forest, growing stock; regulation of yield; management of forest plantations, commercial forests, forest cover monitoring. Forest Divisional Working plans. Methods of measuring -diameter, girth, height and volume of trees; form-factor; volume estimation of stand, current annual increment; mean annual increment, Sampling methods and sample plots. Yield calculation; yield and stand tables, forest cover monitoring through remote sensing; Geographic information Systems for management and modeling. Forest Surveying different methods of surveying.

FOREST ECOLOGY

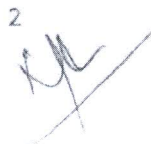
Biotic and abiotic components, forest eco-systems; forest community concepts; vegetation concepts, ecological succession and climax, primary productivity, nutrient cycling and water relations. Forest types in India, identification of species, composition and associations; dendrology, taxonomic classification, principles and establishment of herbaria and arboreta conservation of forest ecosystems.

FOREST RESOURCES AND UTILIZATION

Logging and extraction techniques and principles, transportation systems, storage and sale of Timber; Non-Timber Forest Products (NTFPs)- definition and scope; gums, resins, oleoresins, fibres, oil seeds nuts, rubbers, canes, bamboos, medicinal plants, charcoal, lac and shellac, katha and Bidi leaves, need and importance of wood seasoning and preservation general principles of seasoning, air and kiln seasoning, composite wood; plywood, fibre boards, particle boards, wood substitution.

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FOREST PROTECTION & WILDLIFE

Injuries to forest, insect-pests and disease, General forest protection against fire, equipment and methods, controlled use of fire. Rotational and controlled grazing, different methods of control against grazing and browsing animals; effect of wild animals on forest regeneration; encroachment, poaching, shifting cultivation and control.

FOREST ECONOMICS AND LEGISLATION

Fundamental principles, cost-benefit analyses; estimation of demand and supply: Socioeconomic analysis of forest productivity and attitudes; valuation of forest goods and service. National Forest Policy, Forest laws, necessity; general principles, Indian Forest Act 1927, Forest Conservation Act, 1980, Wildlife Protection Act 1972 and their amendments.

FORESTS AND PEOPLE

Forests and its importance, forest societies, interactions with people, social and cultural factors, afforestation programmes, forest conflicts, wildlife and human conflicts, important forest movements, gender dimension, tribal economy, pastoralists, management of commons and Common Property Resources (CRPS) and open access resources, sustainable livelihood, food security, eco-tourism, land use change. Forest rights, customary rights of people, community participation, biodiversity and ethnobotany, global environmental change and land use, resettlement, poverty alleviation and forests, role of NGOs and other CBOs community based organizations.

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Syllabus of Agriculture

AGROMETEOROLOGY

Elements of Weather-rainfall, temperature, precipitation, humidity, wind velocity, Sunshine weather forecasting, climate change in relation to crop production.

AGRONOMY

Agronomy as a science and its scope, plant growth and development, environmental effects on crop growth, ideal plant type, tillage seed quality, sowing, crop density and spatial arrangement, crop nutrition, organic manures and fertilizers, irrigation and drainage, weed management, distribution of crops, cropping system, selection of crops and varieties for multiple cropping, crop yield contributing character; Organic farming concept, practices and scope in India; Crop production in dry lands, salt affected, acidic, flood affected, waterlogged and eroded areas.

CROP PHYSIOLOGY

Plant cell-an introduction, laws of thermodynamics, diffusion and osmosis, the concept of water potential, cell water relations, absorption of water, transpiration, stomatal physiology, ascent of sap, ion uptake and metabolic utilization of mineral ions, deficiencies of mineral ions in plants, photosynthesis, respiration, fat metabolism, physiology of growth and development, growth regulators, physiological parameter influencing the productivity of major cereal, pulse and oilseed crops.

ELEMENTARY BIOCHEMISTRY, GENETICS AND PLANT BREEDING

Cell, Biomolecules, water, pH and buffer; cellular constituents: Structure and function- amino acids and protein, carbohydrates, lipids and biomembrances and nucleic acids; Enzymes- function, properties and mechanism, metabolism of cellular constituents: Central Metabolic Pathways: Derivative path ways- glycolysis, hexose mono phosphate pathways, degradation of starch, sucrose, other sugars, fatty acids and acylglycerols, proteins and amino acids; Biosynthetic path ways, photosynthesis, formation of sucrose and starch, Kreb's cycle and electron transport chain; Nitrogen and sulphur cycles; Nitrogen fixation, assimilation of ammonia; synthesis of DNA, RNA and proteins; Secondary metabolites-structure, function and metabolism. Pre-mendelian and post-mendelian concepts of heredity, mendelian principles of heredity, probability and chi-square, Cell and animal cell, chromosome structure. Cell division mitosis, meiosis, variation in chromosomes polytene chromosome, Lampbrush chromosomes.

Dominance relationship, gene interaction. Multiple alleles, pleiotropism and pseudoalles. Sex determination, sex linkage, sex limited and sex influenced traits. Linkage, crossing over mechanism, chromosomes mapping, structural change in chromosoces: Deletion and Duplication, Translocation and inversion, "Numerercal change in chromosomes, chemical basis of heredity" Gene concept , mode of replication of genetic material, transcript and translation genetic material. Gene regulation and operon concept. Mutation- Chemical and physical mutagens, mode of action of mutagens. Extra nucear inheritance. Polygene and quantitative inheritance. Plant tissue culture, principal and application.

MICROBIOLOGY

Microbial cell structure, Micro-organisms- Algae, Bacteria, Fungi, Actinomycetes, Protozoa and Viruses. Role of micro-organisms in respiration, fermentation organic matter decomposition

ENTOMOLOGY

Introduction and scope of Entomology, brief history of entomology in India, Insects as Arthropods and its relationship with phylum Annelida and other classes of Arthropoda, origin of insects, major points related to dominance of insects in Animal Kingdom. External morphology and antomy of grasshopper; body segmentation, integument, thorex and abdomen, antennae, legs and wings and their modifications, generalized mouth parts and their modification, Alimentary, Circulatory, Excretory, Respiratory, Reproductive and nervous system, major sensory organs like simple and compound eyes, chemoreceptors, endocrine glands; basic embryology and post embryonic development basic groups of present day insects with special emphasis to order and families of agricultural importance

PLANT PATHOLOGY

Importance of plant disease, scope and objectives of plant pathology. Concept of plant diseases inanimate cause and plant virus. Classification of plant disease. Definition and terms, parasites, pathogens, biotrophs and hemibotrophs, necrotrophs, pathogenecity, pathogenesis, virulence, infection, primary infection, innoculum, invasion and colonisation, inoculum potential, symptoms, incubation period, disease cycle, disease syndrome, single cycle disease, multiple cycle disease, alternate host, collateral host, predisposition, biotype, symbiosis, mutualism, antagonism. Pathogenesis & parasitism, Koch's postulate. Effect of pathogenesis on the plants, morphological changes, physiological changes. Development of epidemics. Principles

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and methods of plant disease management. Basic concepts; avoidance, eradication, protection, disease resistance and therapy. General Morphology, characteristics of fungi and somatic structure, reproduction of various structure. Basic and different methods of classification of fungi, taxonomy and nomenclature. General morphological and cultural characters of prokaryotes (Bacteria, basic methods of classification, taxonomy and nomenclature. Nutrition and effects of physiochemical factors on growth. Reproduction and life cycle. Genetics and variability, importance and general characters of mycoplasma, spiroplasma & Fastidious bacteria, reproduction, nomenclature and classification. Physical architecture and chemical composition of virus & virioids. Nomenclature and criteria of identification, multiplication, transmission and infective nature. General morphological characters, life cycle, reproduction of nematodes behaviour in soil and nematodes as vectors for other plant pathogens. Classification and general identifying characters of phanerogames plant parasites, reproduction and life cycle.

LIVESTOCK PRODUCTION SCOPE AND IMPORTANCE

(a) Importance of live stock in agriculture and industry, White revolution in India. (b) Important breeds Indian and exotic, distribution of cows, buffaloes and poultry in India. Care and management: (a) Systems of cattle and poultry housing (b) Principles of feeding, feeding practices. (c) Balanced ration-definition and ingredients. (d) Management of calves, bullocks, pregnant and milch animals as well as chicks crockrels and layers, poultry. (e) Signs of sick animals, symptoms of common diseases in cattle and poultry, Rinderpest, black quarter, foot and mouth, mastitis and haemorrhagic septicaemia coccidiosis, Fowl pox and Ranikhet disease, their prevention and control. Artificial Insemination: Reproductive organs, collection, dilution and preservation of semen and artificial insemination, role of artificial insemination in cattle improvement. Livestock Products: Processing and marketing of milk and Milk products.

CROP PRODUCTION

(a) Targets and achievements in food grain production in India since independence and its future projections, sustainable crop production, commercialization of agriculture and its scope in India. (b) Classification of field crops based on their utility-cereals, pulses, oils seeds, fibre, sugar and forage crops.



SOIL, SOIL FERTILITY AND WATER MANAGEMENT

Soil as a natural body and medium for plant growth; soil component and soil plant relationship; soil farming rocks and minerals; weathering and process of soil formation; physical properties of soils-texture, structure, density and porosity, soil colour consistence and plasticity, soil reaction pH and its measurement, soil acidity and alkalinity, buffering, effect of pH on nutrient availability, soil colloids-inorganic and organic; silicate clays: constitution and properties; humic substances nature and properties; ion exchange, cation exchange capacity, base saturation; soil organic matter: composition, properties and influence on soil properties, transformation of organic and inorganic wastes in soil- Urban and Industrial wastes. Soil water retention, dynamics and availability; soil air composition and dynamic; source, amount and flow of heat in soils; soil temperature and plant growth; soil survey and classification, soil of India; soil pollution behavior of pesticides and inorganic contaminants, prevention and mitigation of soil pollution, methods of irrigation and drainage.

WEED CONTROL

Introduction: definition, costs to society from weeds, classification of weed, Ecology of weeds: Reproduction (Seed production, seed dissemination, seed germination, vegetative reproduction), geographical distribution, factor influencing weed distribution, weed succession on uncultivated sites, competition between crops and weeds. Concepts of prevention, eradication and control of weeds. Weed control methods: Physical, cultural, biological, chemical and integrated weed management, Introduction to herbicides: basic concepts, polar vs. Non polar, Esters, Salts, acids etc, surfactant Chemistry. Factors affecting foliage active herbicides: reaching the target plants, spray retention, absorption into leaf, translocation, and factors influencing soil applied herbicides: microbiological effect, soil absorption, photo decomposition and volatilization, spray of herbicides.

HORTICULTURE

Definition and its branches; importance and scope; horticultural and botanical classification; climate, soil and distribution of fruit crops; propagation and nursery raising; principles of orchard establishment and management; flower bud differentiation and propagation; causes of unfruitfulness; pollinizers and pollinators; environmental and soil factors affecting vegetable production, kitchen gardening; types of gardens and their parts; care and maintenance of ornamental plants; lawn making; knowledge of landscaping of rural and urban area; exposure to important medicinal &

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aromatic plants, spices and condiments, use of plant bioregulator in Horticulture, post Harvest Technology-Principles and Practices.

FUNDAMENTALS OF EXTENSION EDUCATION

Meaning, concept and process of extension education. Objective, principles and philosophy of extension. Education - formula and non-formal. Components of behaviour-knowledge, attitude, skill and motivation. Principles and steps in teaching-learning process, learning situation. Implication of teaching. Concept, need and steps in programme planning. Principle of programme planning, Programme planning process.

AGRICULTURAL ECONOMICS

Nature and tools of Economic analysis, micro & macro economics , consumer behavior, demand and supply, production, costs, firm, price determination, markets, welfare economics, consumption, saving & investment, business cycle, inflation, income and interest, agriculture in economic development, agricultural policies, role of infrastructure and technological change, land reforms, agricultural finance, rural credit, financial and economic appraisal measures, fundamental accounting and book keeping, financial statements, agricultural marketing, market functions, marketing institutions, trade, role of economics in natural resource accounting, allocation of renewable and non-renewable resources, farm records, farm planning and budgeting, production functions, decision making under risk and uncertainties, farm efficiency measures, resource use efficiency, returns to scale, diversification and insurance.

AGRICULTURAL ENGINEERING

Farm structures, farm house, dairy and poultry housing, farm site, food grain storage, elementary knowledge on engines/motors, common troubles and remedies, tractors and common farm equipments.

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CHEMISTRY

INORGANIC

Atomic structure (review of Bohr's theory and its limitations, dual behaviour of matter and radiation, de Broglie's relation, Heisenberg uncertainty principle, hydrogen atom spectra etc.), Chemical Bonding and Molecular Structure (Ionic bonding , Covalent bonding, Molecular Orbital (MO) Approach) , Transition Elements 3d series (General group trends with special reference to electronic configuration, variable valency colour, lanthanoids and actinoids etc.), Coordination Chemistry (Valence bond theory, drawbacks of VBT etc.), Crystal Field Theory

ORGANIC

Fundamentals of Organic Chemistry (Physical Effects, Electronic Displacements etc., Structure, Shape and Reactivity of Organic Molecules, Reactive Intermediates, Strength of Organic Acids and Bases etc.), Stereochemistry (conformation with respect to ethane, butane, cyclohexane, newmann, sawhorse and fischer representations, geometrical and optical isomerism, enantiomerism etc.), Aliphatic Hydrocarbons (preparation and reactions of Alkanes, Alkenes, Alkynes- upto 5 carbons), Reactions - Formation of metal acetylides, addition of bromine and alkaline KMnO4 ozonolysis and oxidation with hot alkaline KMnO4.

Functional group approach for the following reactions - preparation & reactions - Aromatic hydrocarbons (case benzene), Alkyl Halides (upto 5 carbons), Aryl Halides (preparation: from phenol, sandmeyer & gattermann reactions, Reactions-Chlorobenzene), Alcohols, Phenols and Ethers (Upto 5 Carbons), Aldehydes, Ketones and Carboxylic acids and their derivatives (aliphatic and aromatic), Carboxylic acid derivatives (aliphatic upto 5 carbons), Amines (Aliphatic and Aromatic upto 5 Carbons) and Diazonium Salts, Amino Acids, Peptides and Proteins, Carbohydrates

PHYSICAL

Chemical Energetics (review of thermodynamics and the laws of thermodynamics), Chemical Equilibrium, Ionic Equilibria, Solutions, Phase Equilibrium, Conductance, Electrochemistry, Kinetic Theory of Gases, Liquids, Solids, Chemical Kinetics

NOVEL INORGANIC SOLIDS

Synthesis and modification of inorganic solids, Inorganic solids of technological importance, Nanomaterials, Introduction to engineering materials for mechanical construction, Composite materials, Specialty polymers.

POLYMER CHEMISTRY

Introduction and history of polymeric materials, Functionality and its importance, Kinetics of polymerization, Crystallization and Crystallinity, nature and structure of polymers, Determination of molecular weight of polymers, Glass transition temperature (Tg) and determination of (Tg),

Polymer Solution, Properties of Polymers (Physical, thermal, flow & mechanical properties)

RESEARCH METHODOLOGY FOR CHEMISTRY

Literature Survey (Print, Digital, Information Technology and Library Resources, methods of Scientific Research and Writing Scientific Papers, Chemical Safety and Ethical Handling of Chemicals, Data Analysis, Electronics)

GREEN CHEMISTRY

Introduction to Green chemistry (What is Green Chemistry? Need for Green Chemistry, Goals of Green Chemistry, Limitations/Obstacles in the pursuit of the goals of Green Chemistry)

Principles of Green Chemistry and Designing a Chemical synthesis (Twelve principles of Green Chemistry with their explanations and examples), Examples of Green Synthesis/Reactions and some real world cases, Future Trends in Green Chemistry.

INDUSTRIAL CHEMICALS AND ENVIRONMENT

Industrial Gases and Inorganic Chemicals, Industrial Metallurgy, General Principles of Metallurgy, Environment and its segments (Ecosystems, Biogeochemical cycles of carbon, nitrogen and sulphur, Air Pollution, Water pollution), Energy & Environment (Sources of energy:- coal, petrol and natural gas, Nuclear fusion/Fission, Solar Energy, Hydrogen, Geothermal, tidal and hydel etc., Nuclear pollution), Biocatalysis (Introduction to biocatalysis: Importance in " Green Chemistry and Chemical Industry)

QUANTUM CHEMISTRY, SPECTROSCOPY & PHOTOCHEMISTRY

Quantum Chemistry (Postulates of quantum mechanics, Schrodinger equation and its application to free particle, Heisenberg Uncertainty principle, wavefunctions etc., Angular Momentum, Chemical bonding etc.), Molecular Spectroscopy (Interaction of electromagnetic radiation with molecules and various types of spectra, Rotation spectroscopy, Vibrational Spectroscopy, Raman spectroscopy, Electronic Spectroscopy, Nuclear Magnetic Resonance (NMR) Spectroscopy, Electron spin Resonance (ESR) Spectroscopy), Photochemistry (Characteristics of electromagnetic radiation, Lambert-Beer's law and its limitations, laws of photochemistry, actinometry, photostationary states, chemiluminescence)

ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLYNUCLEAR HYDROCARBONS AND UV, IR SPECTROSCOPY

Inorganic Chemistry:- Chemistry of 3d metals, Organometallic Compounds, Bio-Inorganic Chemistry

Organic Chemistry:- Polynuclear and heteronuclear aromatic compounds (Properties of the following compounds with reference to electrophilic and nucleophilic substitution: Naphthalene, Anthracene, Furan, Pyrrole, thiophene, and Pyridine), Active methylene compounds (Preparation and

Reactions upto 6 carbon), application of spectroscopy to Simple Organic Molecules.

MOLECULES OF LIFE

Carbohydrates, Amino acids, Peptides and Proteins, Enzymes and correlation with drug action, Nucleic acids, Lipids, Concept of energy in biosystems.

BOTANY

BIODIVERSITY

Microbes, Algae, Fungi and introduction to Archegoniate, Bryophytes, pteridophytes, Gymnosperms

PLANT ECOLOGY AND TAXONOMY

Introduction, Ecological factors, Plant communities, Ecosystem, Phytogeography, Introduction to plant taxonomy, Identification, Taxonomic evidences from palynology, cytology, phytochemistry and molecular data, Taxonomic hierarchy, Botanical nomenclature, Classification, Biometrics, numerical taxonomy and cladistics

PLANT ANATOMY AND EMBRYOLOGY

Meristematic and permanent tissues, Organs, Secondary Growth, Adaptive and protective systems, Structural organization of flower, Pollination and fertilization, Embryo and endosperm, Apomixis and polyembryony

PLANT PHYSIOLOGY AND METABOLISM

Plant-water relations, Mineral nutrition, Translocation in phloem, Photosynthesis, Respiration, Enzymes, Nitrogen metabolism, Plant growth regulators, Plant response to light and temperature

CELL AND MOLECULAR BIOLOGY

Techniques in Biology (Principles of microscopy, Light Microscopy etc.), Cell as a unit of Life, Cell Organelles (Mitochondria, Chloroplast, ER, Golgi body & Lysosomes, Peroxisomes and Glyoxisomes, Nucleus), Cell Membrane and Cell Wall, Cell Cycle, Genetic Material (DNA, DNA replication (Prokaryotes and Eukaryotes), Transcription (Prokaryotes and Eukaryotes), Regulation of gene expression

ECONOMIC BOTANY AND BIOTECHNOLOGY

Origin of Cultivated Plants, Cereals, Legumes, Spices, Beverages, Oils and Fats, Fibre Yielding Plants, Introduction to Biotechnology, Plant tissue culture, Recombinant DNA Techniques

GENETICS AND PLANT BREEDING

Heredity (Brief life history of Mendel, terminologies, laws of inheritance etc.), Sex-determination and Sex-Linked Inheritance Linkage and Crossing over, Mutations and Chromosomal Aberrations, Plant Breeding, Methods of crop improvement, Quantitative inheritance, Inbreeding depression and heterosis, Crop improvement and breeding

ANALYTICAL TECHNIQUES IN PLANT SCIENCES

Imaging and related techniques (principles of microscopy, light microscopy, fluorescence microscopy etc.), Cell fractionation, Radioisotopes,

Spectrophotometry, Chromatography, Characterization of proteins and nucleic acids, Biostatistics

BIOINFORMATICS

Introduction to Bioinformatics, Databases in Bioinformatics, Biological Sequence Databases, Sequence Alignments, Molecular Phylogeny, Applications of Bioinformatics

RESEARCH METHODOLOGY

Basic concepts of research, General laboratory practices, Data collection and documentation of observations, Overview of biological problems, methods to study plant cell/tissue structure, plant microtechniques, the art of scientific writing and its presentation

ZOOLOGY

ANIMAL DIVERSITY

Kingdom Protista, Phylum Porifera, Phylum Cnidaria, Phylum Platyhelminthes, Phylum Nematelminthes, Phylum Annelida, Phylum Arthropoda, Phylum Mollusca, Phylum Echinodermata, Protochordates, Agnatha, Pisces, Amphibia, Reptiles, Aves, Mammals

COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF VERTEBRATES

Integumentary System (derivatives of integument w.r.t. glands and digital tips), Skeletal System (evolution of visceral arches), Digestive System (brief account of alimentary canal and digestive glands) , Respiratory System (gills, lungs, air sacs and swim bladder), Circulatory System (evolution of heart and aortic arches), Urinogenital System (Succession of kidney, Evolution of urinogenital ducts), Nervous System (comparative account of brain), Sense Organs (Types of receptors), Early Embryonic Development (Gametogenesis, fertilization etc), Late Embryonic Development (implantation of embryo in humans, formation of human placenta and functions etc), Control of Development (Fundamental processes in development- gene activation, determination etc.)

PHYSIOLOGY AND BIOCHEMISTRY

Nerve and muscle, Digestion, Respiration, Excretion, Cardiovascular system, Reproduction and Endocrine Glands, Carbohydrate Metabolism, Lipid Metabolism, Protein metabolism, enzymes

GENETICS AND EVOLUTIONARY BIOLOGY

Introduction to Genetics, Mendelian Genetics and its Extension, Linkage, Crossing over and Chromosomal Mapping, Mutations, Sex Determination, History of Life, Introduction to Evolutionary Theories, Direct Evidences of Evolution, Processes of Evolutionary Change, Species concept, Macro evolution, Extinction

ANIMAL BIOTECHNOLOGY

Introduction (concept and scope of biotechnology), Molecular Techniques in Gene manipulation (cloning vectors, restriction enzymes, transformation techniques etc.), Genetically Modified Organisms (production of cloned and transgenic animals, applications of transgenic animals, production of transgenic plants, applications of transgenic plants), Culture Techniques and Applications

APPLIED ZOOLOGY

Introduction to Host-Parasite Relationship, Epidemiology of Diseases, Rickettsiae and Spirochaetes, Parasitic Protozoa, Parasitic Helminthes,

Insects of Economic Importance, Insects of Medical Importance, Animal Husbandry, Poultry Farming, Fish Technology

AQUATIC BIOLOGY

Aquatic Biomes (brief introduction of the aquatic biomes etc.), Freshwater Biology (Lakes: origin and classification etc., Streams: Different stages of stream development etc.), Marine Biology (salinity and density of sea water etc.), management of Aquatic Resources (causes of pollution, Water quality assessment-BOD and COD etc.)

IMMUNOLOGY

Overview of the Immune System, Cells and Organs of the Immune System, Antigens, antibodies, Working of the immune system, Immune system in health and disease, vaccines.

REPRODUCTIVE BIOLOGY

Reproductive endocrinology (gonadal hormones and mechanism of hormone action, steroids etc.), Functional anatomy of male reproduction (outline and histological of male reproductive system in rat and human, testis, germcell etc.), Functional anatomy of female reproduction (outline and histological of female reproductive system in rat and human, ovary, ovulation etc.), Reproductive Health (Infertility in male and female, Assisted reproductive technology, etc.)

INSECT, VECTORS AND DISEASES

Introduction to Insects, concept of vectors, Insects as vectors, dipteran as disease vectors, siphonaptera as disease vectors, Siphuculata as disease vectors, hemiptera as disease vectors