

J&K SAINIK SCHOOL MANASBAL

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Syllabus for Written Test for the Post of TGT Biology

Botany

Viruses: Structure with special reference to TMV, T-2 Phage, Lytic and Lysogenic cycles, economic importance; Mycoplasma-General account ; virioids and prions.

Bacteria and Cyanobacteria; Bacteria-Overview of structure, gram positive and gram negative bacteria. General characters of cyanobacteria with special reference to nostoc.

Fungi: General characteristics, classification proposed by Alexopoulos and Mims(1973). Structure and life cycle of representative types shown against each group.

Oomycetes	Phytophthora
Ascomycetes	Morchella
Basidiomycetes	Agaricus
Deuteromycetes	Alternaria

Plant Pathology: Symptoms, etiology and management of black stem rust of wheat powdery mildew of apple.

Lichens: General characters and types.

Algae: General characteristics ; criteria for Algal classification; round's (1965) system of classification; structure and life cycle of representative types shown each group;

Chlorophyceae	volvox
Xanthophyceae	vaucheria
Rhodophyceae	batrachospermum
Phaeophyceae	ectocarpus

Economic importance of Algae

Bryophytes: General characteristics: proskauer's (1957) system of classification.

Structure and life cycle of representative types shown against each group (anatomy and development excluded)

Hepaticopsida	Marchantia
Anthocerotopsida	anthoceros
Bryopsida	polytrichum

Evolution of sporophyte: Apogamy and apospory; alternation of generation. Economic importance of bryophytes.

Pteridophytes: General characteristics , classification of pteridophytes(smith et al-2006) structure and life cycle of representative types shown against each group. (anatomy and development excluded)

Psilopsida	psilotum
Sphenopsida	equisetum
Lycopsida	lycopodium
Filicopsida	dryopteris

Heterospory and origin of seed habit: stellar evolution in pteridophytes

Gymnosperms: General characters, sporne's (1965) system of classification

General characters of cycadales, ginkgoales, welwitschiales, genetales, ephedrales, pinales, araucariales, cupressales
Morphology, Anatomy and reproduction in cycas, pinus and ephedra.

Fossil gymnosperms: caytonia, williamsonia,

Angiosperm taxonomy: Scope of taxonomy. Fundamental component of taxonomy

Angiosperm : Evolution and classification : Diversity and phylogeny of angiosperms: Salient features of classification systems proposed by Bentham and Hooker, Takhtajan, and Angiosperm phylogeny group (APG)

Botanical Nomenclature: Principles of international code of botanical nomenclature (ICBN); taxonomic hierarchy; type concept

Plant identification: Methods of plant identification, types of identification keys; contribution of morphology, anatomy and embryology in plant taxonomy (with suitable examples in all)

Textonomic institutions: Methods of Herbaria ; role of botanical gardens.

Diversity of Angiosperms: Morphology and economic importance of families-Brassicaceae, fabaceae, Apiaceae; Rosaceae, Asteraceae, Solanaceae, Lamiaceae, liliaceae and poaceae

The Root System: Organization of the root Apical meristem; Differentiation of primary and secondary tissues and their roles; Structural modifications for storage, support, respiration and reproduction; root-microbe interaction with special reference to mycorrhiza.

The shoot system: The shoot apical meristem and its histological organization : vascularization of primary shoot in monocotyledons and dicotyledons; cambium and its functions; formation of secondary xylem; general account of wood structure; formation of growth rings, sapwood and heartwood; secondary phloem, structure and function, periderm; anomalous. Secondary growth in dracaena

Leaf: Origin, anatomy of monocotyledon (wheat, maize) and dicotyledon (water lily and sun flower) leaf.

Leaf appendages: structure and function of hairs, trichomes, thorns etc

Stomata: Types and their characteristics.

Vegetative reproduction: vegetative propagules and vegetative propagation by different methods; economic aspects

Flower: Flower as a modified shoot, structure of typical flower. Functions and structure of anther and pistil, development of the male and female gametophytes. Types of pollination, attractants and rewards for pollinators. Pollen pistil interaction. Self incompatibility; double fertilization . formation of seed, development of embryo and endosperm (In capsella and Poa). Fruit development.

Seed: Seed appendages and dispersal strategies.

Cell Architecture: Prokaryotic and Eukaryotic cells.

The Cell envelop: Plant cell wall-ultrastructure and function. Plasma membrane . fluid mosaic organization (Model) and functions.

Non-Membrane organelle: Structure and function of Ribosomes.

Single membrane organelles: Structure and function of endoplasmic reticulum and golgi bodies.

Double membrane organelles: mitochondria and plastids

Nucleus: Ultra structure , nuclear envelope , nucleolus , functions

Cell cycle: Mitosis and Meiosis, mechanism and significance

Mendelism: Symbols and terminology, Mendel's laws of inheritance, monohybrid, dihybrid and test crosses (suitable examples)

Modifications of Mendelian ratios (Allelic and Non-allelic interactions)-incomplete dominance, co-dominance, epistasis, complementary genes , duplicate genes and multiple alleles (with suitable examples in all)

Linkage and crossing over: coupling repulsion hypothesis , chromosome theory of linkage, mechanism of crossing over.

Chromosome alternations; origin and meiotic behavior of deletions , duplications, translocations and inversions; variations in chromosome number, aneuploidy and polyploidy (types , origin and significance)

Chromosome organization : Nucleosome organization , Morphology of chromosome , chemical composition , characteristics and role of centomere and telomere

Genetic material: Structure of DNA (Watson and Crick Model), DNA replication (semi conservative) , DNA as genetic material (Experimental proof)

RNA: Structure, types and properties of RNA (mRNA, tRNA, rRNA), properties of genetic code , mechanism of transcription and translation (prokaryotes)

Regulation of gene expression in prokaryotes(Lac Operon)

Gene Mutations: Concept and type of point mutations, frame shift mutations-concept and significance.

Plant water relations: Importance of water to plant life, physical properties of water, diffusion, bulkflow, osmosis; transport and transpiration; physiology of stomata.

Mineral nutrition: Essential macro- and micro-nutrient elements and their role; ion uptake; mineral deficiency and toxicity symptoms.

Transport of organic substances: Evidences and mechanism of phloem transport; source-sink relationship.

Proteins: Classification of proteins based on structure and solubility.

Basis of enzymology: Discovery and nomenclature; characteristics of enzymes; concept of holoenzyme, apoenzyme, coenzyme and cofactors; mechanism of enzyme action.

Lipids: Biological functions of triacylglycerols.

Nitrogen metabolism: Biology of nitrogen fixation; ammonium assimilation.

Photosynthesis: Photosynthetic pigments; absorption & action spectra, enhancement effect; concept of two photosystems; Z-scheme; photophosphorylation; C3, C4 and CAM pathways; photorespiration.

Respiration: ATP- the biological energy currency; aerobic and anaerobic respiration; Glycolysis, Krebs cycle; electron transport system, oxidative phosphorylation (chemi-osmotic mechanism).

Growth and Development: Differentiation and morphogenesis (elementary idea); phases of growth, concept of phasic development; kinetics of growth.

Seed dormancy: Physiology of dormancy; seed germination and factors regulating seed germination.

Physiology of flowering: Photoperiodism; vernalization.

Plant movements: Tropic and nastic movements.

Plant hormones: History of discovery and physiological effects of auxins, gibberellins, cytokinins, abscisic acid and ethylene.

Plants and environment: Atmosphere (gaseous composition and layering of atmosphere); water (properties, reservoirs and water cycle); soil (development, soil profile, physico-chemical properties (texture and pH); basic concept of climate change and its impact on plants.

Ecological adaptations: Morphological, anatomical and physiological adaptation of plants to water (hydrophytes and xerophytes); chilling and light.

Forest types of India: Characteristics of various types as per Champion and Seth's Classification (1968).

Population ecology: Primary and secondary characters of population; outline of intra- and interspecific population interactions with emphasis on intra- and inter-specific competition.

Community ecology: General characteristics of community; community development through ecological succession (Hydrosere and Xerosere).

Ecosystems: Structure, abiotic and biotic components, food chains, food webs, ecological pyramids, energy flow, biogeochemical cycles of carbon, nitrogen and sulphur.

Archaeobotany and Ethnobotany: Plant use through ages; ethnobotany and its scope.

Food Plants: Morphology, cultivation and economic importance of Rice and Potato.

Fibres: Morphology, cultivation, extraction and economic importance of jute.

Vegetables oils: Fixed and volatile oils; morphology, cultivation, extraction and economic importance of mustard.

Wood: General account of hard and soft woods.

Spices and Condiments: Source, part used and uses with particular reference to spices and condiments in Kashmir.

Medicinal and Aromatic Plants (MAPs): Morphology and uses of *Podophyllum hexandrum* and *Lavendula officinalis*.

Beverages: Morphology, cultivation, and processing of tea.

Tissue culture: Basic aspects of plant tissue culture, cellular totipotency, differentiation and morphogenesis, applications of plant tissue culture (conservation, agriculture, industry).

Genetic Engineering: Tools and techniques of recombinant DNA technology; cloning vectors (plasmids); construction of recombinant DNA, applications of genetic engineering.

Polymerase chain reaction: Principle and applications; transgenic – concept and applications.

ZOOLOGY

Life and Diversity of Animals- I

Protozoa: General characters: Classification upto orders: Morphology, Life Cycle and Pathogenicity of *Plasmodium*, *Leishmania* and *Giardia*.

Porifera: General characters, Classification upto orders: Type study: *Leucosolenia*; Canal systems; Skeletal elements

Coelenterata: General characters, Classification upto orders: Type study: *belia*; Corals and Coral reefs; Polymorphism.

Helminths: General characters, Classification upto orders: Morphology, Life Cycle and Pathogenicity of *Fasciola hepatica*, *Taenia saginata* and *Wuchereria bancrofti*.

Life and Diversity of Animals –II

Annelida: General characters, Classification upto orders: Economic importance: Type study *Pheritima*, Metamerism

Arthropoda: General characters, Classification upto orders: Type study: Prawn

Mollusca: General characters, Classification upto orders: Economic importance and Shell in Molluscs

Echinodermata: General characters; Classification upto orders. Type study: Star fish Echinoderm larvae.

Developmental Biology

Gametogenesis and Fertilization

Types and patterns of cleavage

Process of Blastulation and Gastrulation in frog and chick

Regeneration, primary organizer and elementary knowledge of extra embryonic Membranes

Concept of competence, Determination and Differentiation.

Evolution and Wildlife management

Concept of Species and Speciation

Modern concept of organic evolution

Phylogeny of horse

Wildlife management, conservation and control with reference to wildlife of J &K

Wildlife protection Act. Endangered species of India & status of mammals.

Economic Zoology

Aquaculture: Trout culture methods

Sericulture: Rearing & diseases of silkworm.

Apiculture: Bee-keeping-methods & diseases.

Agriculturally & Medically important insects.

Economic importance of helminthes with special reference to roundworms

Animal Diversity

1) Origin of Chordates

2) General characters and classification up to order level of following:

I. Protochordates : (urochordates and cephalochordates)

II. Pisces III. Amphibia IV. Reptiles V. Aves VI. Mammals

Comparative Anatomy of vertebrates:

1) Integumentary system : Integument & its derivatives: (Scales, feathers, hair, beaks and glands)

- 2) Digestive System :Comparative account of alimentary canals of vertebrates. Dentition in Mammals.
- 3) Respiratory system : Aquatic and Terrestrial respiration. Air sacs in birds.
- 4) Circulatory System :Evolution of heart & Aortic Arches.
- 5) Nervous System :Comparative account of brain.
- 6) Urinogenital System :Comparative account of kidneys and their ducts. Gonads and their ducts.
- 7) Endocrine system :Comparative account of vertebrate endocrine glands (Elementary Idea)

Physiology:

- 1) Digestion :Physiology of digestion. Types of digestion with special reference to ruminants.
- 2) Respiration :Types of respiratory pigments and oxygen dissociation curves.
- 3) Excretion :Formation and excretion of nitrogenous wastes.
- 4) Reproduction :Reproductive cycles in mammals.
- 5) Physiology of muscle contraction with special reference to skeletal muscle.
- 6) Physiology of vision and hearing.
- 7) Chemical nature of hormones and their modes of action (pituitary, thyroid, adrenalin).

Genetics:

- 1. Mendelian and Post Mendelian inheritance
- 2. Linkage, Crossing over, Linkage maps.
- 3. Mutation: Chromosomal aberrations, point mutations.
- 4. Molecular genetics: Organization of genetic material, Structure of DNA, Replication in prokaryotes and eukaryotes, Transcription and post transcriptional modification, Translation.
- 5. Human genetics: Chromosomal and single gene disorders with special reference to sickle cell anemia, hemophilia and phenylketonuria .
- 6. Population genetics : Hardy Weinberg's law, factors affecting Hardy Weinberg's law, Human genetics

Animal Behavior:

- 1) Social organizations
- 2) Animal communications.
- 3) Parental care in amphibians.
- 4) Migration in fishes and birds.
- 5) Biological clocks.

Immunology:

- i.Cells and tissues of immune system, Lymphatic system.
- ii.Innate immunity and Acquired immunity.
- iii.Immunoglobulins, formation of antibodies.
- iv.Antigen antibody reactions.
- v.Autoimmune diseases.
- vi. Practical aspects of immunology (vaccines)
- vii.MHC genes.

Biotechnology:

- i. Microbial culture (techniques and management).
- ii. Recombinant DNA technology and its applications.
- iii. Vectors and their role.
- iv. Gene libraries (C-DNA & genomic libraries)
- v. PCR, S-blotting, N-blotting, W-blotting.
- vi. Somatic cell hybridization.

Cell Biology:

- i. Energy transduction, role of mitochondria and chloroplast.
- ii. Cell junctions, cell adhesions and extracellular matrix.
- iii. Ionic basis of membrane excitability.
- iv. Protein sorting.
- v. Cell signaling.
- vi. Vesicular traffic in Secretory and endocytic pathway.

Biostatistics and Ecology:

- i. Population characteristics.
- ii. Competition- inter & intra specific
- iii. Measurement of central tendencies. (Mean, Mode, Median)
- iv. Mean deviation, standard deviation, variation.
- v. Probability test, Student T-test, Chi-square test.

Biochemistry:**i. Carbohydrates:**

- Aerobic and anaerobic metabolisms.
- Pyruvate formation.
- TCA cycle and electron transport system.

ii. Proteins:

- Degradation of amino acids.
- Deamination and transamination.
- Ornithine cycle and its relation with Krebs's cycle.

iii. Lipids:

- Hydrolysis of lipids.
- Oxidation of fatty acids with special reference to α , β , ω Ketosis.