

## **Syllabus for the post of Horticulture Supervisor**

### **Diversity in Living World**

**The Living World-** What is a living being? Biodiversity; Need for classification; three domains of life; taxonomy and systematics; concept of species and taxonomical hierarchy; binomial nomenclature; tools for study of taxonomy-museums, zoological parks, herbaria, botanical gardens.

**Biological Classification-** Five kingdom classification; Salient features and classification of Monera, Protista and Fungi into major groups: Lichens, Viruses and Viroids.

**Plant Kingdom-** Salient features and classification of plants into major groups - Algae, Bryophyta, Pteridophyta, Gymnospermae and Angiospermae; Angiosperms - classification upto class, characteristic features and examples.

### **Structural Organisation in Plants**

**Morphology of Flowering Plants** - Morphology and modifications: Tissues

**Anatomy of Flowering Plants** - Anatomy and functions of different parts of flowering plants: root, stem, leaf, inflorescence-cymose and racemose, flower, fruit and seed.

### **Cell: Structure and Function**

**Cell-The Unit of Life** - Cell theory and cell as the basic unit of life: Structure of prokaryotic and eukaryotic cells; Plant cell and animal cell; cell envelope; cell membrane, cell wall; cell organelles - structure and function; endomembrane system, endoplasmic reticulum, Golgi bodies, lysosomes, vacuoles; mitochondria, ribosomes, plastids, microbodies; cytoskeleton, cilia, flagella, centrioles (ultrastructure and function); nucleus, nuclear membrane, chromatin, nucleolus.

**Biomolecules** - Chemical constituents of living cells: biomolecules, structure and function of proteins, carbohydrates, lipids, nucleic acids, enzymes- types, properties, enzyme action.

**Cell Cycle and Cell Division** - Cell cycle, mitosis, meiosis and their significance.

### **Plant Physiology**

**Transport in Plants-** Movement of water, gases and nutrients; cell to cell transport, Diffusion, facilitated diffusion, active transport; plant-water relations, Imbibition, water potential, osmosis, plasmolysis; long distance transport of water - Absorption, apoplast, symplast, transpiration pull, root pressure and guttation; transpiration, opening and closing of stomata; Uptake and translocation of mineral nutrients - Transport of food, phloem transport, massflow hypothesis; diffusion of gases.

**Mineral Nutrition-** Essential minerals, macro- and micronutrients and their role; deficiency symptoms and diseases caused; mineral toxicity; elementary idea of hydroponics as a method to study mineral nutrition; nitrogen metabolism, nitrogen cycle, biological nitrogen fixation.

**Photosynthesis in Higher Plants-** Photosynthesis as a mean of autotrophic nutrition; site of photosynthesis, pigments involved in photosynthesis (elementary idea); photochemical and biosynthetic phases of photosynthesis; cyclic and non cyclic photophosphorylation; chemiosmotic hypothesis; photorespiration; C<sub>3</sub> and C<sub>4</sub> pathways; factors affecting photosynthesis.

**Respiration in Plants-** Exchange of gases; cellular respiration - glycolysis, fermentation (anaerobic), TCA cycle and electron transport system (aerobic); energy relations - number of ATP molecules generated; amphibolic pathways; respiratory quotient.

**Plant - Growth and Development -** Seed germination; phases of plant growth and plant growth rate; conditions of growth; differentiation, dedifferentiation and redifferentiation; sequence of developmental processes in a plant cell; growth regulators - auxin, gibberellin, cytokinin, ethylene, ABA; seed dormancy; vernalisation; photoperiodism.

## **Reproduction**

**Reproduction in Organisms-** Reproduction, a characteristic feature of all organisms for continuation of species; modes of reproduction - asexual and sexual reproduction; asexual reproduction - binary fission, sporulation, budding, gemmule formation, fragmentation; vegetative propagation in plants.

**Sexual Reproduction in Flowering Plants-** Flower structure; development of male and female gametophytes; pollination - types, agencies and examples; outbreeding devices; pollen-pistil interaction; double fertilization; post fertilization events - development of endosperm and embryo, development of seed and formation of fruit; special modes-apomixis, parthenocarpy, polyembryony; Significance of seed dispersal and fruit formation.

## **Genetics and Evolution**

**Principles of Inheritance and Variation** Heredity and variation: Mendelian inheritance; deviations from Mendelism - incomplete dominance, co-dominance, multiple alleles and inheritance of blood groups, pleiotropy; elementary idea of polygenic inheritance; chromosome theory of inheritance; chromosomes and genes; Sex determination - in humans, birds and honey bee; linkage and crossing over; sex linked inheritance - haemophilia, colour blindness; Mendelian disorders in humans - thalassemia; chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.

**Molecular Basis of Inheritance** Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; transcription,

genetic code, translation; gene expression and regulation - lac operon; genome and human and rice genome projects; DNA fingerprinting.

### **Biology and Human Welfare**

**Health and Diseases** - Pathogens; parasites causing human diseases (malaria, dengue, chickengunia, filariasis, ascariasis, typhoid, pneumonia, common cold, amoebiasis, ring worm) and their control; Basic concepts of immunology - vaccines; cancer, HIV and AIDS; Adolescence - drug and alcohol abuse.

**Strategies for Enhancement in Food Production** - Improvement in food production: Plant breeding, tissue culture, single cell protein and Apiculture.

**Microbes in Human Welfare** In household food processing, industrial production, sewage treatment, energy generation and microbes as biocontrol agents and biofertilizers. Antibiotics; production and judicious use.

### **Biotechnology and Its Applications**

**Biotechnology** - Principles and processes; Genetic Engineering (Recombinant DNA Technology).

**Application of biotechnology in health and agriculture:** Human insulin and vaccine production, stem cell technology, gene therapy; genetically modified organisms - Bt crops; transgenic animals; biosafety issues, bio piracy and patents.

### **Ecology and Environment**

**Organisms and environment:** Habitat and niche, population and ecological adaptations; population interactions - mutualism, competition, predation, parasitism; population attributes - growth, birth rate and death rate, age distribution.

**Ecosystems:** Patterns, components; Food chain and Food web, productivity and decomposition; energy flow; Ecological pyramids, energy and energy flow; nutrient cycles (carbon, nitrogen, oxygen, sulphur and phosphorous); ecological succession; ecological services - carbon fixation, pollination, seed dispersal, oxygen release

**Biodiversity and its Conservation** - Concept of biodiversity; patterns of biodiversity; importance of biodiversity; loss of biodiversity; biodiversity conservation; hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, national parks, sanctuaries and Ramsar sites.

**Environmental Issues** - Air pollution and its control; water pollution and its control; agrochemicals and their effects; solid waste management; radioactive waste management; diffusion of gases.

greenhouse effect and climate change; ozone layer depletion; deforestation; any one case study as success story addressing environmental issue(s).

**Crop rotation and types of farming:** Classification of crops, Crop rotation, Dryland farming, Organic Farming, Mixed Farming and intercropping

**Crop Production:** Cereal crops- Paddy, maize, Millets, Wheat, Barley; Pulse crops- Pigeon Pea, Urd, Gahat, Soy bean, Pea; Oil seed crop- Til, Sunflower, Mustard; Vegetable crops- Potato, Tomato, Brinjal, Cauliflower, Capsicum, Frenchbean; Cash crop- Sugarcane ; Fodder crops- Barseem, Sorghum

**Horticulture:** Importance of Horticulture; Soil selection in relation to horticulture crops; Preparation of soil; Methods of Orchard establishment ; Kitchen garden and plant propagation

**Pomology:** Principles of Fruit preservation, economics and importance.

**Floriculture:** Need and Importance of floriculture in Uttarakhand; Floriculture in Uttarakhand of Gladiolus, Dahalia, Rose, Marigold.

**Animal Husbandry And Dairying:** Importance of Animal husbandary and Dairying; General care of animals and their management, common diseases of Cow, Buffalo, Goat and Sheep and their management and improved breeds of Cow, Buffalo, Goat and Sheep; Basis of Dairying, Clean and safe milking techniques and different techniques of milking.

**CLIMATOLOGY:** Weather and Seasons in Uttarakhand.; Effects of adverse climate on crop plants; Changes in seasonal rainfall and distribution on agriculture.

**SOIL:** Soil formation, composition of soil and Physical properties of the soil; Introduction to main soils of India; Sources of soil and their distribution and conservations; Soil erosion, types and losses; General Methods to check Soil erosion.

**Irrigation Methods:** Irrigation, Necessity and significance and different irrigation sources; Water requirements and factor effecting the Plants; Importance of soil Moisture and its conservation; Water drainage, necessity and methods; Importance of water to the plants; The suitable sources and methods of irrigation for Uttarakhand.

**Manures and Fertilizers:** Maures, their importance and classification; The importance of important Nutrients and their effects on the growth of plants; Organic manure, compost, vermi-compost and green manure; Abiotic (Inorganic) manure, their classification and types; The effect of abiotic manures on soil and crops. Different methods to use organic and inorganic manure.

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**Modification of Agricultural lands:** Land modification, aims, importance and types; Ploughing methods and modern concepts for modification of agricultural land; Different agricultural implements used in Uttarakhand their structure and functions.

**Microorganisms:** Virus- Structure, transmission, Multiplication and Bacteriophage; Bacteria- structure and reproduction; Fungi- Characters, classification, Nutrition and reproduction; Homothallism, heterothallism, Economics importance; Pathology of fungal plant diseases- disease symptoms, classification of plant diseases on the basis of their occurrence, important plant diseases and insect pests of cereals, pulses, oil-seeds, fruits, vegetables and ornamental plants and their management, principles of plant diseases management.

**Cultivation of important medicinal and aromatic plants:** In special reference to Uttarakhand state

**Weeds:** Important weeds of Agricultural and Horticultural crops and their managements.

**Bio-geographical regions of India:** Vegetation types of India.

**Statistics:** Definition, scope and importance of statistics, representation of statistical data; Measures of central tendency-mean, median and mode; Measures of dispersion- range, standard deviation, standard error, Mean deviation; Coefficient of correlation.

**Bio-fertilizers and Bio pesticides**