

## परिशिष्ट-1

### कृषि/उद्यान विभाग/पशुपालन विभागों हेतु समेकित (समूह 'ग') परीक्षा-2023 हेतु परीक्षा योजना

#### लिखित परीक्षा (वस्तुनिष्ठ प्रकार)

क्र० सं०	प्रश्नपत्र	विषय	प्रश्नों की संख्या	अधिकतम अंक	समय अवधि
1	प्रश्नपत्र-I	सामान्य ज्ञान, सामान्य अध्ययन और सामान्य हिन्दी (विषय कोड-91)	100	100	02 घण्टे
2	प्रश्नपत्र-II	वैकल्पिक विषय 1. कृषि (विषय कोड-92) 2. जीव विज्ञान (विषय कोड-93) 3. उद्यान (विषय कोड-94)	200	200	03 घण्टे
कुल अंक			300 अंक		

नोट:-1. प्रश्नपत्र-1 सभी अभ्यर्थियों के लिए अनिवार्य है।

2. अभ्यर्थी प्रश्नपत्र-2 में दिये गये विषयों यथा कृषि, जीवविज्ञान एवं उद्यान में से धारित शैक्षिक अर्हता के अनुसार किसी एक विषय का चयन कर सकते हैं।

3. उक्त वस्तुनिष्ठ प्रकृति की परीक्षाओं में ऋणात्मक मूल्यांकन (Negative marking) पद्धति अपनाई जायेगी। अभ्यर्थी द्वारा प्रत्येक प्रश्न के लिए दिये गये गलत उत्तर के लिए या अभ्यर्थी द्वारा एक ही प्रश्न के एक से अधिक उत्तर देने के लिए (चाहे दिये गये उत्तर में से एक सही ही क्यों न हो), उस प्रश्न के लिए निर्धारित अंकों का एक चौथाई अंक दण्ड के रूप में काटा जायेगा।

## परिशिष्ट-02

कृषि/उद्यान विभाग/पशुपालन विभागों हेतु समेकित (समूह 'ग')

परीक्षा-2023 हेतु पाठ्यक्रम

### प्रश्नपत्र-I

विषय :: सामान्य ज्ञान, सामान्य अध्ययन और सामान्य हिन्दी (वस्तुनिष्ठ प्रकार)

(सभी अभ्यर्थियों के लिए अनिवार्य)

प्रश्नों की संख्या: 100

अधिकतम अंक: 100

समयावधि: 2 घण्टे

### सामान्य ज्ञान, सामान्य अध्ययन

प्रश्न की संख्या-80

अधिकतम अंक-80

- 1 सामान्य विज्ञान एवं कंप्यूटर से संबंधित जानकारी : सामान्य विज्ञान एवं कंप्यूटर संचालन की आधारभूत जानकारी में प्रश्न विज्ञान एवं कंप्यूटर की सामान्य समझ एवं दैनिक जीवन में इनके अनुप्रयोग पर आधारित होंगे।
- 2 भारत का इतिहास तथा भारतीय राष्ट्रीय आन्दोलन : भारत का इतिहास तथा भारतीय राष्ट्रीय आन्दोलन के अन्तर्गत प्रश्न; प्राचीन, मध्यकालीन एवं आधुनिक भारतीय इतिहास की सामान्य जानकारी तथा भारत के स्वतंत्रता आन्दोलन पर आधारित होंगे।
- 3 भारतीय राज्य व्यवस्था : भारतीय राज्य व्यवस्था के अन्तर्गत प्रश्न; भारतीय राज्यव्यवस्था, संविधान एवं पंचायती राज पर आधारित होंगे।
- 4 भारत का भूगोल एवं जनांकिकी : इसके अन्तर्गत प्रश्न भारत के भौगोलिक, पारस्थितिकीय, सामाजिक-आर्थिक और जनांकिकीय पक्षों की सामान्य समझ पर आधारित होंगे।
- 5 सम-सामयिक घटनाएं : इसके अन्तर्गत प्रश्न उत्तराखण्ड राज्यीय तथा राष्ट्रीय महत्व की समसामयिक घटनाओं पर आधारित होंगे।
- 6 उत्तराखण्ड का इतिहास : उत्तराखण्ड की ऐतिहासिक पृष्ठभूमि: प्राचीनकाल (आरम्भ से 1200 ई0 तक): मध्यकाल (1200 से 1815 ई0 तक): प्रभावशाली राजवंश एवं उनकी उपलब्धियाँ, गोरखा आक्रमण एवं शासन, ब्रिटिश शासन, टिहरी रियासत एवं उसकी शासन व्यवस्था, स्वतंत्रता आन्दोलन में उत्तराखण्ड की भूमिका।
- 7 उत्तराखण्ड की संस्कृति : जातियां एवं जनजातियां, धर्म एवं लोक विश्वास, परम्पराएं एवं रीति-रिवाज, वेश-भूषा एवं आभूषण, मेले एवं त्यौहार, नृत्य, गायन एवं वाद्य यंत्र,

खेलकूद, प्रतियोगिताएं एवं पुरस्कार पर आधारित होंगे।

- 8 **उत्तराखण्ड का भूगोल एवं जनांकिकी:** भौगोलिक स्थिति। उत्तराखण्ड में नदियां, पर्वत, जलवायु, वन संसाधन, मिट्टी एवं बागवानी, प्रमुख फसलें, सिंचाई के साधन, प्राकृतिक एवं मानव जनित आपदायें एवं आपदा प्रबन्धन, जल संकट और जलागम प्रबन्धन, पर्यावरण एवं पर्यावरणीय आन्दोलन, उत्तराखण्ड की जनसंख्या: वितरण, घनत्व, लिंगानुपात, साक्षरता एवं जनसंख्या पलायन।
- 9 **उत्तराखण्ड के आर्थिक एवं प्राकृतिक संसाधन—** प्रदेश की शिक्षा व्यवस्था एवं प्रमुख शिक्षण संस्थान, पर्यटन, खनिज तथा उद्योग, संसाधनों के उपयोग की वर्तमान स्थिति। उत्तराखण्ड में गरीबी व बेरोजगारी, उन्मूलन व आर्थिक विकास की दिशा में चलाई जा रही विभिन्न योजनाएँ।
- 10 **सामान्य बुद्धि परीक्षण ::** सामान्य बुद्धि परीक्षण के अन्तर्गत बोधगम्यता, तार्किक एवं गणितीय क्षमता इत्यादि का परीक्षण सम्मिलित है।

## **General Knowledge, General Studies**

No of Questions : 80

MM: 80

- 1 **General Science and Knowledge of Computer Operation:** Questions on General Science and Computer operation will cover general understating and application of science and Computers including matters of day to day observation.
- 2 **History of India and Indian National Movement:** Questions on history of India and Indian National Movement will be based on general understanding of ancient, mediaeval and modern India and India's freedom movement.
- 3 **Indian polity:** Questions on Indian polity will be based on Indian polity, Constitution and Panchayati raj.
- 4 **Geography and Demography of India:** Questions will be based on a general understanding of geographical, ecological, socio-economic aspects and demography of India.
- 5 **Current Events:** Questions will be based on important current events of Uttarakhand State and National.
- 6 **History of Uttarakhand:** Historical background of Uttarakhand: Ancient period (from earliest to 1200 AD) ; Mediaeval period (from 1200 to 1815 AD): Important dynasties and their achievements; Gorkha invasion and administration, British rule, Tehri State and its administration, role of Uttarakhand in the Freedom Movement of India.

- 7 **Culture of Uttarakhand:** Question will be based on Castes and tribes, religious and folk beliefs, traditions and customs, costumes and ornaments; Fairs and Festivals, dances, songs, musical instruments, sports, tournaments
- 8 **Geography and Demography of Uttarakhand:** Geographical Setup. Rivers, mountains, climate, soils, forest resources and horticulture and Major crops of Uttarakhand. Means of irrigation. Natural and man-made calamities and Disaster management. Water crises and watershed management, Environment and environmental movements. Population of Uttarakhand: Distribution, density, sex ratio, literacy and migration.
- 9 **Economic and natural resources :** Education system of the State and important educational institutes; tourism, minerals and industries. the position of utilization of resources. Various schemes being implemented in Uttarakhand for the eradication of poverty and unemployment.
- 10 **General intelligence test ::** In General Mental Ability, questions will includes test comprehension, reasoning and numerical ability.

## सामान्य हिन्दी

प्रश्नों की संख्या: 20

अधिकतम अंक: 20

स्वर एवं व्यंजन, स्वर और व्यंजन वर्णों का वर्गीकरण, संज्ञा, सर्वनाम—व्याकरण विचार, तत्सम, तद्भव, प्रत्यय, उपसर्ग, समास, संधि पर्यायवाची, विलोम शब्द, वाक्यांश के लिए एक शब्द, मुहावरे एवं लोकोक्ति, विराम चिह्न।

## प्रश्नपत्र-II

### वैकल्पिक विषय

(अभ्यर्थी धारित शैक्षिक अर्हता के अनुसार दिये गये निम्न विषयों यथा कृषि, जीवविज्ञान एवं उद्यान में से किसी एक विषय का चयन कर सकते हैं)

प्रश्नों की संख्या: 200

अधिकतम अंक: 200

समयावधि: 3 घण्टे

## **1. Agriculture**

### **UNIT-1**

Definition and scope of Agronomy, Classification of field Crops, general principles of Crop production: Climate, soil, soil preparation, seed and sowing, tillage, water management, nutrient management, plant protection management, harvesting, threshing and storage, mixed and inter-cropping, manure and fertilizers, cultivation of common crops -Cereal Crops: Wheat, Barley, Oat: oilseed Crops: Rapeseed and mustard, Linseed, Sunflower; Pulse crops: Chick pea, field pea, Lentil, Rajmah, Fodder Crops: Oat, Berseem, Lucerne; Cash Crops: Potato, sugarcane, recommended varieties, seed rate, time and method of sowing, irrigation, manure and fertilizer, weed controls, insect-pests and diseases, harvesting, processing and yield. Soils- origin and classification loam, silt, clay, sandy loam, physical and chemical properties of soil. Use of fertilizers, essential nutrients- nitrogen, phosphorus and potassium, organic and inorganic fertilizers and their effects on crops and soil, FYM and green manuring, water requirement of crops, measurement of water discharge, prevention of loss of water, different methods of irrigation - flooding, basin method, border /strip method, sprinkler and drip irrigation. Disadvantage of excess moisture, prevention of formation of acidic and alkaline soils and their management.

Current general Knowledge and Current Scientific Advancement with these topics.

### **UNIT-II**

Study of horticultural crops including recommended varieties and their main features, suitability for different regions, time and method of sowing, manure and fertilizer, irrigation, diseases and pests and their control. major vegetables like Potato, Brinjal, chillies, tomato, Cauliflower, Cabbage, knol khol, Onion, Watermelon, Okra, Radish, Carrot and Pea, cucurbits, bittergourd, bottlegourd, muskmelon, ridge gourd, root crops-carrot, radish sweet potato, turnip, fruits vegetables-tomato, brinjal, botanical Classification of vegetables and fruits, pruning and training of fruit plants, Unfruitfulness, Fruit drop, Polyembryony, Parthenocarpy and incompatibility. Practices involved in the production of fruits:

Mango, Guava, Kagzi lime, Banana, Grape, Litchi, Papaya, Loquat, Aonla, Ber, Jack Fruit, Apple, Pear and Peach, Production techniques of plantation crops: Coconut, Cashew nut, Tea Coffee and coca.

Current general Knowledge and Current Scientific Advancement with these topics.

### **UNIT-III**

Type of iron and steel, wood, plastic and tin used in agricultural implements and their forms & properties. Study of different types of ploughs- indigenous, chisel, rotary and disc plough. their management & cost, selection of prime movers, water lifting devices; discharge, command area, cost of different system; soil preparation, methods of ploughing, need for tillage, kinds of tillage, mechanical Power transmission through belts, pulleys and gears, EC engine and its components. Classification of tractors, Elementary knowledge about main components of tractor and their functions such as steering, clutches, transmission gears, differential and final drive, Introductory agricultural economics-meaning and scope, Production-meaning, factors of production such as land, labour, capital and management, properties of factor of production; law of returns; intensive and extensive agriculture, law of demand, relative prices and standard of living; Cooperation-meaning, principles of cooperation, land development banks. Agriculture- place in Five Year Plans; Extension Education, Extension Teaching and Learning. Extension and Rural Development Programmes: Including T and V system, National Demonstration, IRDP, Jawahar Rojgar Yozana.

Current general Knowledge and Current Scientific Advancement with these topics.

### **UNIT-IV**

Study of major breeds of cow, buffalo, goat, sheep, poultry and Pig; Physiology and anatomy of cow and buffalo; characteristics of good milch cow and buffalo, bulls and bullocks. Care and management of pregnant cow, poultry management. Principles of feeding of various classes of livestock and poultry. Clean milk production and maintenance of hygiene. Common medicines and vaccines used in treatment/prevention and control of animal diseases; handling of animals for treatment; castration. Operation flood, Milk and Milk products, Identification of Adult rated milk. Importance of farm's livestock and poultry in agriculture and Indian economy, Pathogenic disease and vaccination. The antigens, antibiotics, antiseptics, disinfectants, The milk and its synthesis in mammary glands. Composition of milk of different species and colostrum. Details composition and physio-chemical properties of cow and buffalo's milk. Factors affecting quantity and chemical composition of milk. Chemistry of milk constituents viz. lactose, fat,

protein, enzymes and vitamins. preservatives and adulterants of milk. Chemical changes occurring during storage of milk. Classification of common feeds and fodders, low-cost balanced feeds. Evaluation of energy and protein value of feed. Processing methods of animal feed stuffs. Processing of milk for filtration, clarification, bactofugation, standardization, homogenization, cream separation-centrifugation. Indigenous milk products- paneer, chhana, ghee, khoa, dahi. Other milk products- cream, butter, ice-cream, condensed milk, milk powder, cheese, dairy by products.

Current general Knowledge and Current Scientific Advancement with these topics.

#### **UNIT-V**

Mendel's Law's of heredity, Chromosomal theory of inheritance, meiosis and mitosis, Linkage and crossing over-types, mechanism and significance, Nucleic acid as genetic material- structure, replication, genetic code and translation, Mutation-spontaneous and induced, Sex chromosomes and its determination in man and drosophila, sex linked characters. Mean as measures of central tendency-Mean, Median, Mode, Geometric Mean, Harmonic Mean, Weighted Range, Quartile Deviation, Variance, Standard Deviation and Coefficient of variation. Chemistry of Carbohydrates- Glucose, fructose, Galactose, Sucrose, Lactose, Maltose, Starch, Cellulose. Ammo acids, Lipids and fatty acids. Vitamin A, D, E, K, Thiamine, Riboflavin and Nicotinic acid, Plant growth substances, photoperiodism and vernalization, Insect Anatomy: Digestive, Excretory, Reproductive, Circulatory, Respiratory and Nervous systems of grasshopper, General introduction to Phylum Arthropoda, class Insecta, Mode of reproduction in crop plants in relation to breeding techniques. Genetic consequences of self and cross pollinated crops, Plant Introduction and exploration, Breeding self pollinated crops, population's improvement, Mass selection, recurrent selection. Breeding cross pollinated crops mass selection, pedigree, bulk and back cross methods. Classification of plant diseases according to cause and occurrence. Plant Pathogens: Fungi (Albugo. Erysiphe, Ustilago, Claviceps and Puccinia. Diagnostisic characters of the following genera: Phytophthora, Peronospora, Sclerospora, Ustilago, Sphacelotheca, Tolyposporium, Melampsora, Alternaria, Cercospora, Fusarium, Helminthosporium, pyricularia, Rhizoctonia and Colletotrichum Preliminary knowledge of hazards related to pesticide use, MRL, ADI, Mammalian Safety Ratio Basic concept of Integrated Pest Management.

Current general Knowledge and Current Scientific Advancement with these topics.

## 2. Biology

### (i) BOTANY

#### **UNIT 1-CYTOLOGY**

Prokaryote and Eukaryote cell, Cell Cycle, Mitosis and Meiosis, structure and function of all cytoplasmic organelles, nucleus, chromosomes, Lampbrush and Polytene chromosomes, DNA structure and replication, RNA structure and type, Modern concept of genes.

Current general Knowledge and Current Scientific Advancement with these topics.

#### **UNIT II- MICROBIOLOGY**

Viruses- Structure, transmission, multiplication, bacteriophages and economics importance.

Bacteria Structure, Classification, Gram Negative and Gram Positive Bacteria, Staining techniques, Vegetative, Asexual and Sexual reproduction, Genetic recombination and economic importance of Bacteria.

Current general Knowledge and Current Scientific Advancement with these topics.

#### **UNIT III-FUNGI AND PLANT PATHOLOGY**

Salient features of fungi. Broad classification of Fungi (Alexopoulos) upto class Level, nutrition of Fungi. Reproduction in Fungi- asexual reproduction, sexual reproduction. Heterothallism, heterokaryosis and parasexual cycle, Economic Importance of Fungi, Life history of *Mucor*. Penicillium, Yeast, Puccinia, Agaricus, Morchella, Alternaria. An introduction to Mushroom cultivation

Pathology of fungal plant diseases- A brief idea about diseases symptom. Establishment of diseases, categories of plant diseases on the basis of their occurrence. Control of plant diseases- brief idea about exclusion, eradication, protection by fungicides and by developing resistance.

Current general Knowledge and Current Scientific Advancement with these topics.

#### **UNIT IV- ALGAE, LICHENS AND BRYOPHYTA**

Algae-Introduction and salient features, Classification of algae upto class Level, range of vegetative structure, cell structure of prokaryotic and eukaryotic Algae. Reproduction, types of Life cycles (Haplontic, Diplontic, Diplohaplontic,



Haplobiontic and Diplobiontic) and Alternation of generations in Algae, ecology of algae, Life cycle of Nostoc, Chlamydomonas, Oedogonium, Vaucheria, Ectocarpus. Polysiphonia, Diatoms, Economic importance of Algae.

Lichens- Characteristics, General Structure, Symbiotic relationship, reproduction and economic importance.

Bryophyta- Salient features of Bryophytes, Habitats, Distribution and economic importance of Bryophyta, Classification of Bryophyta, a brief account of Alternation of generations, Life history of Marchantia, Anthoceros and Funaria.

Current general Knowledge and Current Scientific Advancement with these topics.

### **UNIT-V PTERIDOPHYTA AND GYMNOSPERMS**

**Pteridophyta** - Salient features of Pteridophytes, Habitats, Distribution, Classification and Economic importance of Pteridophytes, Alternation of generation in pteridophytes, Telome Theory, steler system, Apogamy, Agamospory, Apospory, Heterospory and seed habit, Life History of Rhynia, Selaginella, Equisetum, Pteris

**Gymnosperms-** General Charactersitics, classification (upto family Level) of Gymnosperms, Ecological and economic importance of gymnosperms. morphology, Anatomy and reproduction of **Cycas**, Pinus and Ephedra, Types of Fossils and their types, process of fossilization, living fossils.

Current general Knowledge and Current Scientific Advancement with these topics.

### **UNIT VI-TAXONOMY OF ANGIOSPERMS**

A general account of origin and evolution of angiosperms, Basic principles and broad outline of the classification proposed by Bentham Hooker and Hutchinsion. International code of Botanical nomenclature, Botanical gardens and herbaria, Botanical Survey of India.

Distinguishing features and economic importance of the families- Ranunculaceae, Caryophyllaceae, Malvaceae, Rutaceae, Fabaceae, Rosaceae, Cucurbitaceae, Apiaceae, Rubiaceae, Solanaceae. Acanthaceae, Lamiaceae, Apocynaceae, Euphorbiaceae, Polygonaceae, Orchidaceae, Liliaceae, Poaceae

Current general Knowledge and Current Scientific Advancement with these topics.

### **UNIT VII- ANATOMY**

Meristems- Characteristics and functions, Primary and secondary meristems, Apical cell theory, Histozen theory, Tunica carpus theory, Tissue and Tissue System in Plants.

A brief account of root, shoot and leaf anatomy, Root-stem transition. Secondary growth in Root and Stem, Annual ring, sapwood, heartwood, periderm and anomalous secondary growth in Dicot, Monocot stem and roots.

Current general Knowledge and Current Scientific Advancement with these topics.

### **UNIT VIII-PLANT PHYSIOLOGY**

Diffusion, Osmosis, Plasmolysis and Imbibition. Absorption of water (Active and Passive Absorption), Factor effecting of water absorption, Mineral Nutrition, Macro and Micro Nutrients, Plant Ash, Mineral deficiency symptoms, Theories of Mineral Absorption.

Transpiration, Theories of Transpiration, Structure of stomata, opening and closing of stomata, factors effecting and significance of transpiration. Translocation of Solutes, Theories of translocation of food, Mechanism of phloem transport and factor effecting translocation.

Respiration (Aerobic and Anaerobic), glycolysis, Krebs Cycle, ETS, Redox potential, pentose phosphate pathway, ATP. Oxidative phosphorylation, factors effecting the rate of respiration.

Photosynthesis-Historical background, Concept of photo system I and II, Z-scheme, Structure of Chloroplast, Pigments, Photophosphorylation, Calvin cycle, Hatch-slack cycle, CAM Plants. Factor effecting the rate of Photosynthesis.

Current general Knowledge and Current Scientific Advancement with these topics.

### **UNIT IX- EMBRYOLOGY AND MORPHOGENESIS**

Structure of Anther, Ovule, Types of Ovule, Micro and Megasporogenesis and development of Male and Female gametophyte respectively, Pollination, Fertilization, Endosperm, Development of Embryo, polyembryony, apomixis.

General concept of Morphogenesis, seed germination and dormancy, Plant movements, Plant growth regulators, Photoperiodism and vernalization.

Current general Knowledge and Current Scientific Advancement with these topics.

## **UNIT X-ECOLOGY**

Definition and scope of ecology and its relationships, The environment and its factors, Primary and Secondary productivity biosphere (Hydrosphere, Lithosphere and stratosphere)

Concept of ecosystem, Types of ecosystem, Biotic and Abiotic components, energy flow, Trophic level, Food Chains, Food web, Ecological Pyramids, Community (Characters, Life forms and Biological spectrum) Ecological Succession.

Biogeochemical cycles (Carbon, Nitrogen and Phosphorous cycle). Biogeographical regions of India, Vegetation types of India, Population (Characters, Biotic potential, density, Natality, Mortality, Growth curve, eco types and ecads). Pollution (Air, Water, Soil, Noise and radioactive)

Introduction of Toxicology, Principles and History of environmental toxicology, Types and Source of Toxic Agents.

Concept of Biodiversity, Conservation and management, Concept of Protected areas, Ex-situ and In-situ conservation, India's Wild life habitats, Distribution, conservation status and efforts.

Current general Knowledge and Current Scientific Advancement with these topics.

## **UNIT XI-ECONOMIC BOTANY**

Cereals and Millets, Food Plants (Potato, Sweet-Potato, Sugarcane), Fruits (Mango, Apple, Banana, Citrus, Litchi), Fibres (Cotton, Hemp and Coir), Vegetables (Root, Stem, Leaf and Fruit Vegetables), Timbers (Teek, Saal, Chir, Deodar, Shisham and Oak), Medicinal Plants related with Uttarakhand, Oils (Linseed, Mustard and Groundnut Oil).

Current general Knowledge and Current Scientific Advancement with these topics.

## **UNIT XII- GENETICS**

Mendel's experiments, Mendelian Law's, Abberations of mendelian Law's, Sex Determination, Sex Linked inheritance, Cytoplasmic inheritance, Linkage and Crossing Over, Mutations, Genetic code, Protein Synthesis, Gene expression, Gene Bank, Nif and Nod genes, C-DNA and Gene Library.

Current general Knowledge and Current Scientific Advancement with these topics.

## **UNIT XIII-PLANT BREEDING**

Aims and Objectives of Plant breeding, Basic techniques used in Plant breeding, Selection, Plant introduction, Acclimatization, Hybridization, Hybrid Vigour, Mutational breeding.

Current general Knowledge and Current Scientific Advancement with these topics

## (ii) ZOOLOGY

**UNIT I. ORIGIN OF LIFE AND EVOLUTION:** Theories of origin of life and organic evolution. (Modern synthetic theory of evolution). Fossils and fossilization. Evolution of life through ages (Geological time scale). Evolution of man. Speciation Hardy- Weinberg equilibrium, Genetic drift. Gene pool.

Current general Knowledge and Current Scientific Advancement with these topics

**UNIT II. DIVERSITY OF LIVING ORGANISMS:** Kingdom system of classification. Protostomia and Deuterostomia. Acoelomara and Coelomat, Major groups of Non-Chordata and Chordata and their classification up to classes. Taxonomy and systematics. Rules of Nomenclature. Linnean hierarchy. Biological concept of species and types of species

Current general Knowledge and Current Scientific Advancement with these topics

**UNIT III. ANIMAL TISSUE SYSTEMS:** Epithelial tissue, connective tissue (Fluid tissue, muscles, bone and cartilage), Nervous tissue.

Current general Knowledge and Current Scientific Advancement with these topics.

### **UNIT IV. PROTOZOA TO ECHINODERMATA:**

Nutrition, locomotion and reproduction in Protozoa.

Canal system and skeleton in Porifera.

Nematocysts, polymorphism, Corals and coral reefs and metagenesis in Coelenterata.

Metamerism, nephridial system and locomotory organs in Annelida.

Significance of Peripatus.

Types of mouth parts, Tracheal system and metamorphosis in Insecta. Booklungs. Larval forms in Crustacea.

Torsion and Detorsion in Gastropoda. Foot and gills in Mollusca.

Water-vascular system (Asterias) and larval forms in Echinodermata.

Current general Knowledge and Current Scientific Advancement with these topics.

#### **UNIT V. COMPARATIVE ANATOMY OF CHORDATA:**

Endostyle and protonephridia in Protochordata. Affinities of Hemichordata,

Organs of neural complex and tadpole larva in Herdmania. wheel organ in Branchiostoma.

Differences between Petromyzon and Myxine.

Scales, types of tail in fishes. Lung fishes. Latimeria. Electric organs in fishes.

Limbless Amphibia. Neoteny in Amphibia.

Chelonia, Rhynchocephalia, Crocodilia and Dinosaurs. Distinction between poisonous and non-poisonous snakes. Biting mechanism in snakes. Venom and anti-venom

Structure of a typical feather Types of feather. Flightless birds. Aerial adaptations in birds.

Prototheria, Metatheria. Flying mammals Cetacea and Sirenia. Dentition in Mammals. Eye and ear of mammals.

**General comparative anatomy of vertebrates:** Integument. Gills of Cyclostomata and Pisces, Air bladder Lungs and air-sacs, Alimentary canal, liver and pancreas. Types of hearts. Types of Kidneys. Cranial nerves and spinal cord.

Current general Knowledge and Current Scientific Advancement with these topics.

**UNIT VI. BIOCHEMISTRY:** Balanced Diet, Nutrient substances (Structure and classification of Protein, Carbohydrates and Lipids), Nutrient elements Vitamins Enzymes and Enzyme action. Metabolism of Proteins, Carbohydrates and Lipids.

Current general Knowledge and Current Scientific Advancement with these topics.

**UNIT VII. PHYSIOLOGY:** Homeostasis. Intra-cellular and Extra-cellular digestion. Digestion and absorption of Protein. Carbohydrates and Lipids. Respiratory pigments and physiology of respiration. Hemopoiesis, composition of blood, blood groups and blood coagulation. Cardiac Cycle. Nitrogenous excretion. urine formation in mammals Mechanism of muscle contraction. Conduction and

transmission of nerve impulse. Endocrine system and mechanism of hormone action with special reference to Thyroid, Parathyroid, Pituitary and Adrenal glands; Gonads and Gastro-intestinal tract Bioluminescence.

Current general Knowledge and Current Scientific Advancement with these topics

**UNIT VIII. DEVELOPMENTAL BIOLOGY:** Gametes and gametogenesis. Mechanism of fertilization. Types of eggs. Patterns of cleavage. Embryonic induction and primary organizer. Fate maps. Blastulation and types of blastula. Gastrulation (frog and chick.). Foetal membranes of chick Placentation in mammals. Regeneration. Parthenogenesis.

Current general Knowledge and Current Scientific Advancement with these topics.

**UNIT IX. ANIMAL BEHAVIOUR (ETHOLOGY):** Stereotyped and innate patterns of behaviour. Innate releasing mechanism (IRM). Taxes, kinesis and reflexes, Fixed and modifiable action patterns Learned behaviour. Imprinting. Migration in fishes and birds. Parental care in Amphibia and Pisces. Biological clock

Current general Knowledge and Current Scientific Advancement with these topics.

**UNIT X. ECONOMIC ZOOLOGY:** Beneficial and harmful protozoa. Life-cycles and pathogenesis of *Entamoeba histolytica*, *Trypanosoma gambiense*. *Plasmodium vivax*, *Fasciola hepatica*, *Taenia solium*, *Ascaris lumbricoides* and *Encyclostoma deudenale*. Life-cycles and pathogenesis of Mosquito spp. (*Anopheles*, *Culex* and *Aedes*), House-fly: health and hygiene. Sponge industry, vermiculture. Insects pests of crops, fruits and vegetables. Integrated pest management (IPM). Sericulture Apiculture. Lac-culture. Pearl industry. Aquaculture and Pisciculture. Animal husbandry and Dairy technology. Poultry and piggery

Current general Knowledge and Current Scientific Advancement with these topics.

**UNIT XI. BIostatistics:** Statistics and Biological researches. Data. Types of data, data collection, classification and presentation (tabulation and graphics etc.). Measures of central tendency-mean, mode, median. Measures of Dispersion-Range, Standard deviation and standard error. Coefficient of correlation. Tests of Significance- Chi-square and T-test.

Current general Knowledge and Current Scientific Advancement with these topics.

**UNIT XII. MOLECULAR BIOLOGY AND BIOTECHNOLOGY:** Genetic material of prokaryotes and eukaryotes. Types of DNA and RNA. DNA replication. Genetic code. Central dogma of protein synthesis. DNA Fingerprinting and PCR technology,

Biotechnology- a double edged sword. Gene cloning, Gene transfer technology. Gene bank and cryopreservation. Transgenesis. Genetically modified animals and plants. Totipotency. Tissue culture. Biopesticides. Biofertilizers. Single cell protein (SCP) and their importance.

Current general Knowledge and Current Scientific Advancement with these topics.

**UNIT XIII. BIOINFORMATICS:** Basic knowledge of computer and its components. Input and output devices RAM and ROM. Software and Hardware.

Current general Knowledge and Current Scientific Advancement with these topics.

### **3.Horticulture**

#### **UNIT-I**

Agricultural and horticultural zones, Classification and distribution of field crops, multiple cropping, mixed cropping, intercropping, relay and alley cropping, cultural practices for major field crops cereals, pulses, oil seeds and fodder crops; Green manuring: Crop rotation; Physical and chemical properties of soil, soil classification: Manure and fertilizers; Different methods of irrigation; Weed Management;

Measures of central tendency: mean, mode, median, geometric mean, harmonic mean, percentiles and quartile for raw and grouped data, dispersion: range, standard deviation, variance, coefficient of variation for raw and grouped data, correlation: scatter diagram, correlation coefficient and its properties, regression: Water relations in plants, study of stomata, guttation, transpiration, mechanism of stress tolerance, photosynthesis, photorespiration, respiration, phytohormones, physiological role in controlling plant process, unfruitfulness, physiology of training and pruning; Importance of microbes in horticulture.

Classifications of carbohydrates, fats, proteins, vitamins and minerals; Mendelian genetics-Mendel's principles of heredity, Chromosome theory of inheritance, gene interaction, cytoplasmic inheritance and maternal effects, chemical basis of heredity, structure and component of nucleic acids, replication, transcription and translation, physical basis of heredity, cell reproduction, mitosis, meiosis and its significance, gametogenesis and syngamy in plants, mutations.

Orchard Management system; Organic Farming Introductory economics-meaning and scope, factors of production, law of returns and law of demand; Extension and rural development programmes in India, Agroforestry system, subsystem and practice: agri-silviculture, silvipastoral, horti-silviculture. hortisilvipastoral, shifting cultivation, teungya, home gardens, alley cropping, intercropping, wind breaks, shelterbelts and energy plantations; Mushroom Cultivation; Current general Knowledge and Current Scientific Advancement with these topics.

## UNIT-II

**Fruit Crops:** Horticultural classification of fruits including genome classification, importance of fruit crops in nutrition and national economy, detailed study of area, production and export potential, varieties, climate and soil requirements, propagation techniques, planting density and systems, after care, training and pruning, water, nutrient and weeds management, use of plant growth regulators, physiological disorders, important insect-pests and diseases and their control measures, post-harvest technology. harvest indices, harvesting methods, grading, packaging and storage of the following crops viz, mango, banana, bael, grapes, citrus, papaya, sapota, guava, pineapple, jackfruit, avocado, Pomegranate, fig. litchi, ber, aonla, annona, jamun, carissa, date palm, phalsa, apple, pear, peach, apricot, cherry, strawberry. kiwi, almond, walnut, pecan nut, hazel nut and chestnut.

**Vegetable Crops:** Horticultural classification of vegetables including genome classification, importance of cool season vegetable crops in nutrition and national economy, detailed study of area, production and export potential, varieties, climate and soil requirements, seed rate, preparation of field, nursery practices; transplanting of vegetable crops and planting for directly sown/transplanted vegetable crops, spacing, planting systems, water and weed management, nutrient management and deficiencies, use of chemicals and growth regulators, cropping systems, harvest, yield and seed production, important insect -pests and diseases and their control measures, post-harvest technology, harvest indices, harvesting methods, grading, packaging, storage and marketing of temperate, tropical and subtropical vegetable crops viz cabbage, cauliflower, knol-khol, broccoli, Brussels sprout, lettuce, palak, Chinese cabbage, spinach, fenugreek, garlic, onion, leek, radish, carrot, turnip, beet root, peas, French bean, broad beans, rhubarb, asparagus, globe artichoke, tomato, brinjal, chillies, okra, amaranthus, cluster beans, cowpea, lab-lab, snap bean, cucurbits, moringa, curry



leaf, potato, tapioca, sweet potato, arrow root, cassava, colocasia, xanthosoma, amorphophallus, dioscorea, jerusalem artichoke, horse radish.

**Plantation Crops:** History and development, scope and importance, area and production, export and import potential, role in national and state economy, uses, industrial importance, by products utilization, soil and climate, varieties, propagation: principles and practices of seed, vegetative and micro- propagation, planting systems and method, gap filling, systems of cultivation, mulching, shade regulation, weed and water management, training, pruning and handling, nutrition, foliar feeding, role of growth regulators, soil management, liming practices, tipping practices, top working, physiological disorders, important insect-pests and diseases and their control measures, harvesting, post-harvest handling and processing, packaging and marketing, yield and economics of coconut, arecanut, oil palm, palmyrah palm, cacao, cashew nut, coffee, tea and rubber.

Current general Knowledge and Current Scientific Advancement with these topics.

### UNIT-III

**Medicinal and Aromatic Crops:** History, scope, importance, origin, distribution, production, climatic and soil requirements, propagation and nursery techniques, planting and aftercare, training and pruning, nutrient and water management, plant protection, harvesting, processing, therapeutic and pharmaceutical uses and economics of medicinal and aromatic plants viz. pepper, cardamom, clove, ginger, turmeric, betelvine, periwinkle, rauwolfia, dioscorea, isabgol, Ammi majus, belladonna, cinchona, pyrethrum, citronella grass, khus grass, sweet flag (bach), lavender, geranium, patchouli, bursera, mentha, muskdana (musk mallow) and ocimum.

**Spices and Condiments:** History, scope and importance, area and production, uses, export potential and role in national economy, classification, soil and climate, seed, vegetative and micro propagation systems and methods of planting, nutrient management, irrigation practices, weed control, mulching and cover cropping, training and pruning practices, role of growth regulators, shade crops and shade regulation, harvesting, post-harvest technology, packaging, storage, value added products, methods of extraction of essential oil and oleoresins, economics of crops viz. cardamom, pepper, ginger, turmeric, clove, nutmeg, cinnamon, all spice, curry leaf, coriander, fenugreek, fennel, cumin, dill, celery, bishops weed, saffron, vanilla, thyme and rosemary.

Current general Knowledge and Current Scientific Advancement with these topics.

## UNIT-IV

**Floriculture:** Scope and importance of floriculture industry, classification of flowers and ornamental plants, detailed study of area, production and export potential, varieties, climate and soil requirements, seed rate, preparation of field, nursery practices; transplanting of flower crops and planting for directly sown/transplanted flower crops, spacing, planting technique, water and weed management, nutrient management and deficiencies, use of chemicals and growth regulators, harvesting; yield and seed production, important insect pests and diseases and their control measures, post-harvest technology. harvesting stages, harvesting methods, grading, packaging, storage and marketing of flowering plants like rose, marigold, chrysanthemum, orchid, carnation, gladiolus, Jasmine, dahlia, tuberose, bird of paradise, china aster and gerbera (under open and protected conditions), dehydration technique for drying of flowers, production techniques for bulbous.

**Ornamental Gardening & Landscaping:** History, types and styles of gardens and gardens in India. landscaping, basic principles, garden components and adornments; identification and use of landscape drafting equipments; layout of different types of gardens, designing of water garden, terrace garden, roof garden, rock garden, bog garden, sunken garden, terrariums; bioaesthetic planning, town and country planning, urban planning: landscaping of parks and public areas, educational institutions, Industrial areas, railway stations, dam sites, hydroelectric stations, river banks; Use of ornamental trees, shrubs, climbers and creepers, indoor plants, herbaceous perennials, palms, ferns, grasses, cacti and succulents in landscaping: lawn making: Flower arrangement; Types and art of making bonsai.

Current general Knowledge and Current Scientific Advancement with these topics.

## UNIT-V

**Propagation, Nursery Management, Protected Cultivation:** Methods of propagation: advantages and disadvantages; Seed dormancy: scarification & stratification, internal and external factors; Nursery techniques, apomixes-mono-embryony, polyembryony, chimera & bud sport; Methods and techniques of cutting, layering, grafting and budding. Physiological and bio-chemical basis of rooting factors influencing rooting in cuttings and layering: Graft incompatibility, Anatomical studies of bud union, selection and maintenance of mother trees, collection of scion wood stick, scion-stock relationship and their influences; Bud wood certification; Techniques of propagation through specialized organs, corm, runners, suckers, rhizomes; Micrografting, hardening of plants in nurseries; Insect-pest and disease control in nursery, Nursery registration, methodology and certification; Designs of mist chamber, humidifiers, greenhouses, glasshouses,

cold frames, hot beds, shade nets, poly-houses, lath house, conservatories; Land preparation and soil treatment, fertigation and irrigation management and cost of production.

Current general Knowledge and Current Scientific Advancement with these topics.

#### **UNIT-VI**

**Post Harvest Management:** Principles and methods of post harvest management, pre-harvest factors, affecting quality, factors responsible for deterioration of horticultural produce, physiological and bio- chemical changes, different systems of storage, packaging methods and types of packages, classification of preservatives, food colours. Methods of preparation of juices, squashes, syrups, cordials and fermented beverages, jam, jelly, marmalade, pickles, chutneys and sauces, quality control of processed products, Govt policy on import and export of processed fruits, food laws; modes of transport; Food and its function, Balanced diet: RDA for various age groups: Materials, tools and implements used in horticulture.

Current general Knowledge and Current Scientific Advancement wit