

Syllabus for the written exam of [redacted] Lower Division Clerk

**General Awareness:** Questions will be designed to test the ability of the candidate's general awareness of the environment around him and its application to society. Questions will also be designed to test knowledge of current events and everyday observation. Questions will also be from the social and economic policies, Indian constitution, Geography, Science, New inventions, discoveries in medical, environment and engineering sectors, Cultural events, Sports, Awards and honours, Books and authors, Persons in news, Social welfare work and projects initiated by the government, National and International days, Eminent personalities, Historical events and Emperors, Forest and climate change, etc. (20 MCQ)

**General Intelligence and Reasoning:** It would include questions of non-verbal type. Test will include questions on similarities and differences, space visualization, problem solving, analysis, judgment, decision making, visual memory, discriminating observation, relationship concepts, figure classification, arithmetical number series, non-verbal series, etc. (20 MCQ)

**Numerical Aptitude:** Test will include questions on Number Systems, Decimals and Fractions, Fundamental Arithmetical Operations, Percentages, Ratio and Proportion, Averages, Interest, Profit and Loss, Discount, Use Of Tables and Graphs, Mensuration, Time and Distance, Ratio and Time, Time and Work, LCM, HCF , Arithmetical Computation, Analytical Functions etc. (20 MCQ)

**Questions from Subjects of 12th standard:** Test will include questions on various topics of 12th standard like Laws of motion, Work energy and power, Gravitation. Theory of gasses, Kinematics, Properties of bulk matters, chemical substances, Solutions, Electrochemistry, Chemical kinetics, Elements, Biomolecules, Polymers, World of living, Natural phenomenon, Plant cell culture, Basic forestry, Effects of current, Natural resources, Number system, Algebra, Trigonometry, Mensuration, Statistics, Probability, Geometry, Entrepreneurial opportunities, Resource mobilization, India and the contemporary world, Contemporary India, Democratic Politics, Economic development, Synonyms and Antonyms, Idioms, Judiciary, Human rights in India, Legal services, Arbitration, Tribunal Adjudication and the alternate dispute resolution. Physical fitness, Wellness and Lifestyle, Yoga, Climate vegetation and soil, Natural hazards and disasters, The Earth, Landforms, climate, Life on the Earth, Indian Society, Change and development in Indian Society, Basics in computer science, Programming, Network, Data management, Accountancy, Economics, Statistical tools, etc. (40 MCQ)

**Syllabus for Entry-Level post of  
Category-I: Technician (Maintenance, Workshop, General Services)  
Pay Level 2 of 7<sup>th</sup> CPC Pay Matrix**

The questions in parts A,B,C,D & E will be of a level commensurate with the essential qualification viz. 10<sup>th</sup> Standard for Technician (Maintenance, Workshop, General Services) Pay Level 2 of 7<sup>th</sup> CPC Pay Matrix.

**A. General Awareness (20 MCQ):**

Questions will be designed to test the ability of the candidate's general awareness of the environment around him and its application to society. Questions will also be designed to test knowledge of current events and of such matters of everyday observation and experience in their scientific aspects as may be expected of an educated person. The test will also include questions relating to India and its neighbouring countries especially pertaining to Sports, History, Culture, Geography, Economic scene, General Polity including Indian Constitution, and Scientific Research etc.

**B. Mental Ability and Reasoning (20 MCQ)**

It would include questions of non-verbal type. The test will include questions on similarities and differences, space visualization, problem solving, analysis, judgment, decision making, visual memory, discriminating observation, relationship concepts, figure classification, arithmetical number series, non-verbal series etc. The test will also include questions designed to test the candidate's abilities to deal with abstract ideas and symbols and their relationship, arithmetical computation and other analytical functions.

**C. General English (20 MCQ)**

Candidates' understanding of the Basics of English Language, its vocabulary, grammar, sentence structure, synonyms, antonyms and its correct usage, etc. and writing ability would be tested.

**D. Arithmetic (20 MCQ)**

The questions will be designed to test the ability of appropriate use of numbers and number sense of the candidate. The part will include questions on problems relating to number system, computation of whole numbers, decimals and fractions, relationships between numbers, fundamental arithmetical operations, percentage, ratio and proportion, average, interest, profit and loss, discount, use of tables and graphs, menstruation time and distance ratio and time etc.

**E. Basic Science (20 MCQ):-**

Matter-its nature and behavior ( Nature of matter, Particle nature, Basic units, Structure of atoms), Organization in the Living world (Cell-basic unit of life, Tissues, Organs, Organ system, Organism, Biological diversity, Health and

Diseases), Motion, Force and Work (Motion, Force and Newton's Laws, Gravitation, Floatation, Work, Energy and Power, Sound), Our Environment (Physical resources, Bio-geo chemical cycles in nature), Food Production.

Chemical substances-Nature and behavior (Chemical reactions, Acids, Bases and Salts, Metals and Non-metals, Carbon compounds, Periodic classification of elements), World of living (Life processes, Control and co-ordination in animals and plants, Reproduction, Heredity and evolution), Natural phenomena (Laws of reflection, Laws of refraction, Functioning of human eye, Lens etc.), Effects of current (Electric current, Potential difference and electric current, Ohm's law, Resistance, Resistivity etc.), Magnetic effects of current (Magnetic field, field lines, Fleming's LHS, RHS etc.), Natural resources (Sources of energy, Our environment, Management of natural resources)

#### **Trade Test**

Over and above the written test based on the aforementioned syllabus, this category of candidate shall also have to undergo a trade test based on their respective trade as may be decided by the respective Directors of the Institute.



**General Syllabus for Entry-Level post of  
Category-II Technical Assistant pay level 5 of 7th CPC Pay Matrix**

To be used against General Awareness & Reasoning, General English & General Science and Arithmetic of framework elaborated at Para 2.2 of Appendix - XI of ICFRE TSR - 2013 for all functional Groups viz. Field/Lab Research, Maintenance, Workshop, General Service and Para Medical)

**A. General Awareness & Reasoning (20 MCQ):**

**i) General Awareness:-**

Questions in this component will be aimed at testing the candidate's general awareness of the environment around him and its application to society. Questions will also be designed to test knowledge of current events and of such matters of everyday observation and experience in their scientific aspects as may be expected from an educated person. The test will also include questions relating to India and its neighbouring countries especially pertaining to history, culture, geography, economic scene, general policy and scientific research etc. These questions will be such that they do not require a special study of any discipline.

**ii) Reasoning:-**

Questions of reasoning would include questions of both verbal and non-verbal type. This component will include questions of analogies, similarities and differences, spatial visualization, spatial orientation, problem solving, analysis, judgment, decision making, visual memory, discrimination, observation, relationship concepts, arithmetic reasoning, verbal and figure classification, arithmetical number series, non-verbal series, coding and decoding statement, conclusion, syllogistic reasoning etc.

**B. General English & General Science (20 MCQ)**

**i) General English:-**

Questions in this component will be designed to test the candidate's understanding and knowledge of English language and will be based on spot the error, fill in the blanks, synonyms, antonyms, spelling/detecting misspelled words, idioms & phrases, One word substitution, improvement of sentences, Active/Passive Voice of Verbs, conversion into direct/indirect narration, comprehension Passage etc.

**ii) General Science:-**

Basic understanding of science expected of a high school student

C. Arithmetic (20 MCQ)

The questions will be designed to test the ability of appropriate use of numbers and number sense of the candidate. The part will include questions on problems relating to number system, computation of whole numbers, decimals and fractions, relationships between numbers, fundamental arithmetical operations, percentage, ratio and proportion, average, interest, profit and loss, discount, use of tables and graphs, mensuration time and distance ratio and time etc.

ANNEXURE-II

Subject Wise Syllabus for Entry-Level post of  
Category - II (Technical Assistant - Field/Lab Research)  
pay level 5 of 7th CPC Pay Matrix

To be used against 'Relevant Subject (40 MCQ)' of framework elaborated at Para 2.2 of Appendix - XI of ICFRE TSR - 2013 for both sub-functional Groups viz. Life Sciences and Physical Sciences

The questions in part D will be of a level commensurate with the essential qualification viz. Graduation Standard for Category-II Technical Assistant (Field/Lab Research) pay level 5 of 7<sup>th</sup> CPC Pay Matrix

1. *The subject shall be dependent on the relevant field / trade in which the recruitment is intended to be made.*
2. *The Functional Group (Field/Lab Research) in this Category shall broadly have two sub-functional Groups viz. Life Sciences and Physical Sciences. The Director of the institute may choose to include one or more of the following subjects in above functional groups as per requirement of respective institute.*
  - *Physics*
  - *Chemistry*
  - *Botany*
  - *Zoology and*
  - *Mathematics*
3. *Syllabus of the above subjects is hereunder.*
4. *Director of the Institute may also include any additional subject apart from above. The syllabus may accordingly be proposed by the Director.*

## 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 Nemathelminthes, 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, Siphunculata as disease vectors, hemiptera, as disease vectors

## SYLLABUS FOR BIOTECHNOLOGY

**Biodiversity and Taxonomy:** Principles of taxonomy and classification of plant kingdom; structural, biochemical and molecular systematic; biodiversity and plant genetic resources; germplasm exploration, collection, regeneration and evaluation; principles and methods of germplasm conservation; conservation of plant biodiversity; tools to assess molecular diversity, germplasm exchange and plant quarantine; ecology and biodiversity.

**Cell structure and Function:** Basics of Cell Biology in prokaryotes and eukaryotes; cell wall and cell membranes; structural organization and functions of cell organelles; intracellular transport; biosynthesis and degradation of cellular components; cell division and cell cycle; intracellular and extra-cellular control of cell division; programmed cell death.

**Biomolecules and Metabolism:** Classification, structure and function of carbohydrates, lipids, proteins, nucleic acids, hormones and vitamins; metabolism of carbohydrates (glycolysis, citric acid cycle, glycogenesis, glycogenolysis, pentose-phosphate pathway); metabolism of lipids (oxidation of saturated and unsaturated fatty acids, oxidation of odd chain fatty acids, energy yield, ketone bodies); metabolism of amino acids (biosynthesis and breakdown of amino acids) and metabolism of nucleic acids (biosynthesis and degradation of purine & pyrimidine); photosynthesis (oxidative phosphorylation and photophosphorylation); respiration (photorespiration).

**Genetics and molecular Biology:** Mendelism & chromosome theory, basic principles of inheritance; linkage & crossing over; allelic variation & gene function, co-dominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting; linkage disequilibrium; sex-linked inheritance; quantitative genetics and polygenic inheritance; population genetics and hardy-weinberg equilibrium; extra chromosomal inheritance; gene concept; mutations; transposable genetic elements; structural and numerical alterations of chromosomes; basics of cyto-genetics, karyotyping, chromosome banding and mapping; formulation and testing of genetic hypothesis; DNA as the genetic material; DNA and the molecular structure of chromosomes; Organization and structure of prokaryotic and eukaryotic of genomes; DNA replication in prokaryotes and eukaryotes; transcription and RNA processing in prokaryotes and eukaryotes; translation and the genetic code; regulation of gene expression in prokaryotes and eukaryotes; mutation, DNA repair, and recombination.

**Microbiology:** History and development of microbiology; classification of microbes; concepts and methods of sterilization; microscopy and staining; microbial culture techniques; concepts of microbial species and strains; growth curves, various forms of microbes; pathogenic microorganisms (bacteria, fungal, viral and protozoan); microbes in extreme environment (photosynthetic bacteria; Cyanobacteria; thermophilic, methanogenic and halophilic archaea); basic concepts of virology.

**Tissue culture:** Basic principles of plant tissue culture, totipotency, establishment of aseptic culture, callusing, regeneration and organogenesis, hardening; micro-propagation; somaclonal variations; endosperm and anther culture; embryo culture; somatic hybrids: synthesis of artificial seed; single cell and protoplast culture and

regeneration; cryopreservation and conservation of plant genetic resources; production of secondary metabolites, hairy roots and bioreactor technology.

**Recombinant DNA Technology:** Basic principles of cloning, tools for cutting and joining DNA molecules, types of vectors and their properties, bacterial transformation and selection strategies; gene transfer to plants; transgenic technology; Intellectual Property Rights (IPR).

**Molecular tools and techniques:** Nucleic acids and protein isolation; molecular markers and their applications; polymerase chain reaction (PCR), RT-PCR; techniques for separation of nucleic acids and proteins; nucleic acid blotting; restriction digestion and ligation; restriction mapping; genetic mapping; preparation of genomic and cDNA libraries; molecular cloning; transformation and screening strategies; techniques for differential gene expression; transcriptomics; proteomics; metabolomics; synthesis and sequencing of oligo-nucleotides; genome sequencing; analysis and management of sequence data; bioinformatics; techniques for targeted mutagenesis; genome editing; techniques for gene transfer in plants.

**General Instrumentation:** Principles and applications of chromatography, agarose gel electrophoresis, PAGE, SDS PAGE, centrifugation, microscopy, X-ray crystallography, spectroscopy, spectrophotometer, autoradiography, preparation of microbial and tissue culture media, sterilization.

## 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

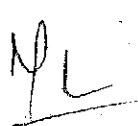
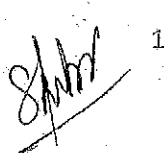

Agroforestry- Scope and necessity; Agro forestry systems under different agroecological zones; selection of species and role of multipurpose trees and NTFPs, techniques, food, fodder and fuel security. Social/Urban Forestry: Objectives, scope and necessity. JFM- Principles, objectives, Methodology, scope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



### 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.

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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 chromosomes: 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, inoculum, 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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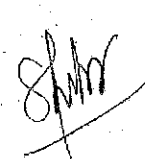
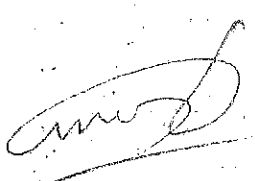


and methods of plant disease management. Basic concepts; avoidance, eradication, protection, disease resistance and therapy. General Morphology, characteristics of fungi and somatic structure, reproduction of various structure. Basic and different methods of classification of fungi, taxonomy and nomenclature. 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 vortors for other plant pathogens. Classification and general identifying characters of phenerogames 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 weds. 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 - formal 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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**General Awareness:** Questions will be designed to test the ability of the candidate's general awareness of the environment around him and its application to society. Questions will also be designed to test knowledge of current events and everyday observation. Questions will also be from the social and economic policies, Indian constitution, Geography, Science, New inventions, discoveries in medical, environment and engineering sectors, Cultural events, Sports, Awards and honours, Books and authors, Persons in news, Social welfare work and projects initiated by the government, National and International days, Eminent personalities, Historical events and Emperors, Forest and climate change  
(20 MCQ)

**General Intelligence and Reasoning:** It would include questions of non-verbal type. Test will include questions on similarities and differences, space visualization, problem solving, analysis, judgment, decision making, visual memory, discriminating observation, relationship concepts, figure classification, arithmetical number series, non-verbal series, coding-decoding, simplification, etc.  
(20 MCQ)

**Numerical Aptitude:** Test will include questions on Number Systems, Decimals and Fractions, Fundamental Arithmetical Operations, Percentages, Ratio and Proportion, Averages, Interest, Profit and Loss, Discount, Use of Tables and Graphs, Mensuration, Time and Distance, Ratio and Time, Time and Work, LCM, HCF, Arithmetical Computation, Analytical Functions etc.  
(20 MCQ)

**Questions from Subjects of 10th standard:** Test will include questions on various topics of 10th standard like chemical substances, world of living, Natural phenomenon, Effects of current, Natural resources, Number system, Algebra, Trigonometry, Mensuration, Statistics, Probability, Geometry, India and the contemporary world, Contemporary India, Democratic Politics, Economic development, Synonyms and Antonyms, Idioms, Human rights in India, Physical fitness, Wellness and Lifestyle, Yoga, Climate vegetation and soil, Natural hazards and disasters, The Earth, Life on the Earth, Basics in computer science, etc.  
(40 MCQ)