Technical Assistant (Category-II) Cat-II

Syllabus

CHEMISTRY

INORGANIC

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

ORGANIC

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

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

PHYSICAL

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

NOVEL INORGANIC SOLIDS

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

POLYMER CHEMISTRY

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

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

RESEARCH METHODOLOGY FOR CHEMISTRY

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

GREEN CHEMISTRY

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

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

INDUSTRIAL CHEMICALS AND ENVIRONMENT

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

QUANTUM CHEMISTRY, SPECTROSCOPY & PHOTOCHEMISTRY

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

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

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

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

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

MOLECULES OF LIFE

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

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Technical Assistant (Category-II)
Syllabus

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 BIOCHEMISTY, 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 sulpher cycles; Nitrogen fixation, assimilation of ammonia; synthesis of DNA, RNA and proteins; Secondary metabolites-structure, function and metabolism. Pre-mendelian and post-mendelian concepts of heredity, mendelian principles of heredity, probability and chi-square, Cell and animal cell, chromosome structure. Cell division mitosis, meiosis, variation in chromosomes polytene chromosome, Lampbrush chromosomes.

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

MICROBIOLOGY

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

ENTOMOLOGY

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

PLANT PATHOLOGY

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

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 & viriods. Nomenclature and criteria of identification, multiplication, transmission and infective nature. General morphological characters, life cycle, reproduction of nematodes behaviour in soil and nematodes as vertors 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 herbicids: 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 &

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

FUNDAMENTALS OF EXTENSION EDUCATION

Meaning, concept and process of extension education. Objective, principles and philosophy of extension. Education - formula and non-formal. Components of behavious-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.

Syllabus for the Post of Forest Guard

A. General Awareness (30 MCQ):

Questions are designed to test the candidate's general awareness of the environment around him and its application to society. Questions are also designed to test knowledge of current event and of such matters of everyday observation and experience in their scientific aspect as may be expected of an educated person. The test will also include questions relating to India and its neighbouring countries especially pertaining to History, Culture, Geography, Economics, General Policy and science.

B. Arithmetic & Mental Ability and Reasoning (30 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.
It would include questions of both verbal and non-verbal type. The test will include questions on Semantic analogy, Symbolic operations, Symbolic/Number analogy, Trends, Figural analogy, Space orientation, Semantic classification, Venn diagrams, Symbolic/ Number classification, Drawing inferences, Figural classification, Punched hole / Pattern-folding and unfolding, Semantic series, Figural pattern-folding and Completion, number services, Embedded figures, Figural series, Critical thinking, Problem solving, Emotional intelligence, Word building, Social intelligence, Coding and decoding, other sub-topics, if any numerical operations.

C. General English (10 MCQ)

Spot the error, Fill in the blanks, Synonyms/Homonyms, Antonyms, Spellings/Detecting mis-spelt words, Idioms & phrases, One word substitution, Improvement of sentences, Active/Passive voice of verbs, Conversion into Direct/Indirect narration, Shuffling of Sentence parts, Shuffling of Sentences in a passage, Cloze Passage, Comprehension Passage.

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D. Science of Intermediate level(30 MCQ):-

Chemistry

Some basic concepts of Chemistry, Structure of atom, Classification of elements and Periodicity in properties, Chemical bonding and Molecular structure, States of matter: Gases and Liquids, Thermodynamics, Equilibrium, Redox reactions, Hydrogen, s-Block elements (Alkali and Alkaline earth metals), Group 13 and 14 p-Block elements, Organic chemistry-some basic principles and techniques, Hydrocarbons, Environmental Chemistry.

Solid state, Solutions, Electrochemistry, Chemical kinetics, Surface chemistry, General principles and processes of isolation of elements, Group 15,16, 17 & 18 p-Block elements, d and f Block elements, Coordination compounds, Haloalkanes and Haloarenes, Alcohols, Phenols and Ethers, Aldehydes, Ketones and Carboxylic acids, Organic compounds containing Nitrogen, Biomolecules (Carbohydrates, Proteins, Hormones, Vitamins, Nucleic acids), Polymers, Chemistry in everyday life (Chemicals in medicines, Chemicals in food, Cleansing agents).

Physics

Physical world and measurement, Kinematics, Laws of motion, Work, Energy and Power, Motion of system of particles and rigid body, Gravitation, Properties of bulk matter, Thermodynamics, Behaviour of perfect gas and Kinetic theory, Oscillations and Waves

Electrostatics, Current electricity, Magnetic effect of current & magnetism, Electromagnetic induction and alternating current, Electromagnetic waves, Optics, Dual nature of matter and radiation, Atoms & nuclei, Electronic devices, Communication systems.

Biology

Diversity in living world, Structural organisations in Animals and Plants, Cell structure and function, Plant physiology (Transport in plants, Mineral nutrition, Photosynthesis, Respiration, Plant growth and development), Human physiology (Digestion and absorption, Breathing and Respiration, Body fluids and circulation, Excretory products and their elimination, Locomotion and Movement, Neural control and coordination, Chemical coordination and regulation).

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ANNEXURE – I

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

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

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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.