Syllabus for Bihar Agriculture Service Category-3 (Chemistry)
Paper 2

Soil as a source of plant nutrients. Essential and beneficial elements, criteria of essentiality, forms of nutrients in soil, mechanisms of nutrient transport of plants, factor affecting nutrient availability to plants. Measures to overcome deficiencies and toxicities. Fertilizer and insecticides and their effect on soil water and air. Soil testing – Chemical methods, critical levels of different nutrients in soil. Plant analysis – DRIS methods, critical levels in plants. Rapid tissue tests. Indicator plants. Thermodynamics of nutrient transformations in soils. Cationic and anionic exchange and their models, molecular interaction.

Microbiology and biochemistry of root soil interface, soil enzymes, Origin, activities and importance; soil characteristics influencing growth and activity of microflora. Biochemical composition and biodegradation of soil organic matter and crop residues, humus formation.

Manures: Preparation of vermicompost, and enriched Farm Yard Manure, recycling of organic residues, biofertilizers, Green manures, Mechanical compost plants, Oil cakes, Sewage and sludge –Biogas plant slurry, Plant and animal refuges. Fertilizers – classification, Manufacturing processes and properties of major nitrogenous, phosphatic , potassic and complex fertilizers, their fate and reactions in the soil, Biological method of soil fertility evaluation. Soil fertility – Different approaches for soil fertility evaluation. Methods, Soil test based fertilizer recommendations to crops.

Laws of thermodynamics, concepts of free energy, entropy and partial molar free energy, Criteria for Reversible and Irreversible Processes, The Gibbs Helmholtz equation, Clapeyron - clausius equation.

Chemical Kinetics-order and molecularity, derivation of first and second order equations. Effect of temperature of rate of reaction, energy of activation and Arrhenius equation, theories of reaction rates: collision theory, transition state theory, theory of unimolecular reactions-Lindemnn's theory.

Carbohydrates, Proteins & Lipids: Definitions, Classification & Properties

Amino acids: Classification and General Properties of Amino acids; Peptide bond; Structure of peptides. Nomenclature and classification of enzymes, catalysis, chemical kinetics of enzymatic, catalysed reaction, enzyme inhibition.

Theory of electrolytic dissociation, ostwald's dilution law, Debye Huckel theory of strong electrolytes, Ionic strength. Basic principle of electrolytic conductance, specific and equivalent conductance, Kohlrausch's law, Electrode potential, Nernst equation, Relation between free energy change and Electrical energy, Thermodynamics of a Reversible Cell, Reference electrode, Liquid junction potential, Polarographic analysis.

Chemical Bonding, variable electrovalence, variable covalence, hybridization, Valence bond theory, molecular orbital theory, crystal field theory, ligand field theory, Double salts and complex compounds, Werner theory, coordination number, ligands and their classification.

Fundamental principles of visible, ultraviolet and infrared spectrophotometry, atomic absorption, flame photometry. Beer's law of dilute solutions and its derivation causes for deviation from Beer's law, factors affecting intensity of absorption peak. Introduction, classification, Basic principle of chromatographic techniques: Qualitative determination of acid and basic radicals of inorganic salts and elements as well as functional groups of organic compounds, Estimation of sugars and amino acids, Estimation of proteins by Lowry's method.

Syllabus for Bihar Agriculture Service Category-3 (Chemistry)
Paper I

Origin of the earth, Earth's crust; composition: Rocks and minerals, Soil formation factors and processes, Component of Soil, Soil profile, Soil physical properties, Soil texture, Textural classes, Bulk density and particle density of soils & porosity, Soil water, Retention and potentials, moisture constants, Soil temperature, Influence of soil temperature and air on plant growth.

Radioisotopes properties and decay principles; interaction of nuclear radiations with matter' half life & decay constant principles and use of radiation monitoring instruments –proportional, Geiger Muller counter, solid and liquid scintillation counters, neutron moisture meter.

Water-Temporary and permanent hardness, disadvantage of hard water, Determination of hardness of water. Dissociation of water, ionic product of water, concept of pH and buffer solutions, hydrolysis of salt; Henderson-Hasselbalch equation. Estimation of acidity, alkalinity, dissolved oxygen and carbon dioxide, dissolved and suspended solids, chemical oxygen demand (COD) biological oxygen demand (BOD) spectroscopic method of determination of phosphorus nitrate and nitrite in water.

Catalysis, adsorption, types of adsorption, Freundlich's adsorption isotherm, Langmuir adsorption isotherm and its limitation. Colloids: introduction, types of colloidal system, classification, properties- optical & electrical properties electrophoresis, coagulation, Dialysis, gold number.

Weather and climate, weather elements, Earth's atmosphere: composition and structure, solar radiation, global warming & green house effect. Temperature measurement and instruments, periodic horizontal and vertical temperature variations, relationship between temperature and humidity, humidity measurement and instruments. Atmospheric pressure laws of gases, pressure units and pressure instruments.

Basic elements of crop production, factors affecting crop production, history of agriculture development, surface, sprinkler and drip irrigation, irrigation efficiency and water use efficiency, Irrigation water- quality of irrigation water and its appraisal. Indian standards of water quality. Use of saline water for agriculture. Determination of soil moisture content by gravimetric method, tensiometer, electrical resistance and neutron moisture meter. Toxic elements- classification, formulation and toxicity of herbicides & insecticides. Sources of toxic elements, behavior in soils, effect on nutrients availability, effect on plant and animal health, green house effect.

Classification and nomenclature of Organic compounds, Isomerism: definitions & classification of structural isomerism and stereoisomerism. Types of organic reactions: Aliphatic free radical addition: Anti-Markovnikov's addition of bromine radical to propene. Nucleophilic substitution reactions. Elimination reactions: Electrophilic and nucleophilic addition reactions, Markovnikov's ionic addition, Electrophilic Aromatic substitution.

10/10/2014