U.P.EducationServiceSelection Commission, Prayagraj

Syllabus

Subject- Science (TrainedGraduate)

(A) Physics

GeneralPhysics(Mechanics)

Units and Dimensions, Vector and Scalar quantities, Product (Scalar and Vector products),Gradient,DivergenceandCurl,Gauss,StokesTheoremandapplications.Motion,ForceandAcceleration,EquationsofMotion,KineticandPotentialEnergy,Linear and Angular momentum.Conservation of Energy and Momentum, Conservative and Non-conservative forces, Rotational motion, Centrifugal and Centripetal force, Gravitational force, Central force, Kepler's laws of planetary motion, Geostationary satellites, Gravitational acceleration, Escape velocity, Simple and Compound pendulum, Moment of Inertia, Parallel and Perpendicularaxestheorem,MomentofInertiaofsphere,ring,discandcylinder,Angular momentum and torque.Streamlinedandturbulentflow,Criticalvelocity,StokesandPoiseuille'sformulas, Bernoulli's theorem and applications.Surfacetension,Excesspressureinsidecurvedsurfacesofliquids,Surfaceenergy,Flow of liquid in a capillary.Elasticity:Elasticconstants,mutualrelationsbetweenthem,Bendingmoment,Cantilever.TheoryofRelativity,changeinlength,timeandmass,Mass-Energyequivalence.

Heat

Concept of heat and temperature, Various temperature measuring scales, Absolute temperature,Thermalexpansionofsolids,gasesandliquids,ConductorsandInsulators, Radiation of heat, Black body radiation, Rayleigh-Jeans and Wien's laws, Planck's radiation formula, Newton's law of cooling, Stefan's law, Internal energy, Isothermal and Adiabatic changes, First and Second laws of thermodynamics, Carnot engine, Entropy, Maxwell'sthermodynamicrelations,Joule-Thomsoneffect,Clausius-Clapeyronequation.

WavesandOscillations

Simpleharmonicmotion,ProgressiveandStationarywaves,PhaseandGroupvelocity, Damped harmonic motion, Forced oscillations and resonance, Resonance sharpness

Superpositionofwaves,BeatsandLissajousfigures,Dopplereffect.

Optics

Spherical mirrors and lenses, Refractive index, Formulas for focal lengths, Coaxial system, Combination of thin lenses, Eyepieces, Ramsden and Huygens eyepieces, Chromaticaberrationoflenses,Humaneye,Long-sightedness,Short-sightedness,Basic concepts of Interference, Diffraction and Polarization, Biprism, Newton's rings,Fresnel-Fraunhofer diffraction, Rayleigh criterion, Resolving power, Zone plate and workingprinciplesofgratings,Doublerefraction,Plane,circularandellipticalpolarization, Quarter and Half-wave plates, General concept of Laser, Ruby and Helium-Neon lasers.

ElectricityandMagnetism

Primary and Secondary cells, Internal resistance, Electromotive force, Laws of combination of resistances and capacitors, Current, Drift velocity and Conductivity, Galvanometer,AmmeterandVoltmeter,Wheatstonebridgeandits applications, Electric Filed, Electric Potential, Gauss Law,Biot-Savart law, Ampere's circuital law, Electromagnetic induction, Faraday's and Lenz's laws.Self-inductionandMutualinduction,Alternatingcurrent,SeriesandParallel(LCR)circuits, Introductory knowledge of dia-, para- and ferro-magnetism, Electromagnetic Maxwell's equations, Displacement current, Electromagnetic waves.

ModernPhysics

Structureofatom,VectorandBohr'smodelofatom,Pauli'sExclusionPrinciple, OpticalandX-ray Spectra, Photoelectriceffect,Comptoneffect,Zeeman,Paschen-BackandRaman effect, de- Broglie Waves, Uncertaintyprinciple, Schrödinger equation, Radioactivity, Metals, Semiconductors and Insulators, P-N Junction,Zener Diode, Transistor and their uses.Logicgates,Truthtables,Boolean algebra.

Uttar Pradesh Education Service Selection Commission, Prayagraj

Syllabus

Science (Chemistry) Trained Graduate (Secondary Education)
(Subject Code-05)

(4) Chemistry

Matter – Nature and behaviour, types of matter, elements and their classification (metals and non-metals), compounds and their mixtures.

Laws of Chemical Combinations-Laws of constant proportions, multiple proportions and reciprocal proportions, Gay-Lussac's law of gaseous volumes, Mitscherlich's law of isomorphism.

Structure of Matter-Dalton's atomic theory, atoms, molecules and their characteristics.

Atomic structure—Discovery of the electron, proton, and neutron. Rutherford's alpha-ray scattering experiment and discovery of the nucleus.

Atomic models of Rutherford, Bohr and Sommerfield. Quantum numbers, modern atomic theory.

de Broglie equation, Heisenberg Uncertainty principle, shape of s,p and d orbitals, Electronic configuration based on Aufbau principle, Hund's rule and Pauli's exclusion principle.

Radioactivity - Discovery of radioactivity, radioactive rays and their characteristics, half life and average life, laws of radioactive decay, nuclear fission and fusion, artificial radioactivity. Isotopes, Isobars and isoelectronics.

Chemical bonding - Fundamental concepts of valency, electronic theory, octet rule, exceptions to octet rule, electrovalent, covalent and coordinate bonds. Characteristics of ionic, covalent and coordinate compounds. Polarization and Fajans' rule. Inert pair effect, valence bond theory of covalency (for hydrogen molecule), hybridization and shapes of sp, sp^2 and sp^3 hybrid orbitals.

Chemical reactions—Symbols, ions, and formulas, presentation of chemical reactions by chemical equations. Physical and chemical changes and their differences.

Types of chemical reactions – Displacement, addition, dissociation, decomposition, double decomposition, slow, fast, exothermic, endothermic and cataylsed reactions.

Electrochemical cells-Voltaic cell and its mechanism of working. Dry cell, lead storage battery, reversible cell, electrode potential, Nernst equation and its applications.

Periodic Classification of Elements - Mendeleeff's periodic classification and its basis,

Merits and demerits of the Mendleeff's periodic table, modified form of the periodic table and its important features, periodic properties of elements (atomic and ionic radii, ionization potential, electron affinity and electronegativity), variation of periodic properties in groups and periods. General properties of s and p block elements. Discussion of the properties of first row transition elements (3d block elements) with reference to their electronic configuration, oxidation state, colour, magnetic properties and complex compounds formation

General Organic Chemistry – Inductive, electromeric and mesomeric effects, Hyperconjugation, resonance.and their applications, electrophilic and nucleophilic reagents, free radicals, carbocations and coboanions. Hydrogen bonding and its effects. Classification and nomenclature of organic compounds.

Isomerism-Structural and stereoisomerism, concept of mechanism of organic reactions, mechanism of simple substitution, addition and neutralization reactions.

Methods of preparation of the following Organic compounds and their properties: alkanes, alkenes, alkynes, alkyl halides, ketones, acids and their derivatives. Benzene, its preparation, properties and structure.