

SARVAJANIK UNIVERSITY

SURAT



SARVAJANIK
UNIVERSITY

INCLUSIVE | INTEGRATED | INNOVATIVE

Faculty of Science

[Applicable for Academic Session 2020-21]
[As per CBCS guidelines given by UGC]

Entrance Test Syllabus: Ph. D. in Chemistry

Physical Chemistry:

General Characteristics and Applications of Gas's Laws, Kinetic gas equation and Maxwell's law of distribution of molecular velocities, Liquid State: Constitutive Properties, Symmetry of a Crystal, X-Ray Crystallography, The Law of Chemical Equilibrium, Solubility and Solubility Product, Phase Equilibria: Diagram of various systems, Degree of hydrolysis and Hydrolysis Constants, Electrochemical cell: Electrode Potential: Nernst's equation and Potentiometric titrations, pH metric Titrations, Electrolytes - Kohlraush law of ionic conductance and its applications, Electrolytic Conductance - Conductometric titrations, Chemical kinetics: Rate, Order & Molecularity of Reaction, Theories of Reaction Rate, Kinetics of Complex and Chemical Reactions, Applications of Chemical Kinetics, Thermodynamics: Systems, Functions, Processes and Reactions, Laws of Thermodynamics, Free Energy and Functions, Van't Hoff Isotherm, Clapeyron Equation, Clapeyron-Clausius Equation, Distribution law, Catalysis: types and theories, Adsorption and Adsorption Isotherm, Colloids and Emulsions, Sol and Gel systems.

Instrumentation and Analytical Techniques:

Sampling techniques, Standard solutions, Volumetric titrations : Acid-Base(Neutralization), Precipitation, Complex and Redox titrations, Solvent Extraction & Gravimetric Methods, Statistical Analysis, Reliability of Analytical Data, Role of Instrumentation, Principle, Instrumentation and Applications of Visible Spectroscopy, Atomic Absorption Spectrometry, Optical Emission Spectrometry, NDIR, TOC, Elemental Analyzer, Gas Chromatography, High Performance Liquid Chromatography, Ion Exchange and Ion Exclusion, Chromatography, Chemical Sensors and Biosensors, Sampling techniques, Principle, Chemical Reaction and Analysis Methods to determine various quality parameters of soil and fertilizer, water-wastewater, industrial solid waste and stack gas, ore and alloy, polymer, petroleum and fuel, pharmaceutical and clinical analysis.

Industrial Processes, Waste Management & Quality Control:

Unit Processes and Chemical Reactions in Organic Chemistry, Unit Operations, Unit Operations, effluent treatment and principle of ETP, Solid & Hazardous Waste Management, Quality Control & Assurance in Chemical industry, Total Quality Management in Chemical Industry, Safety in Chemical Industries.

Forensic Science, Forensic Chemistry & Toxicology:

Laws and need of forensic science, types of forensic examinations, laboratories set up, crime and crime scene, police organizations, tools and techniques, modus operandi and physical evidence of case investigations.

Forensic chemistry and its scope, examination of petroleum products, fires and explosives, types of forensic toxicology, analysis, extraction, isolation and clean up procedures, forensic examination of metallic poison and various organic-toxic compounds.

Inorganic Chemistry

Atomic structure-Various theories viz., Dalton's atomic theory, Thomson's Atomic model, Rutherford's atomic model, Prout's hypothesis, Bohr's model. Quantum numbers, Pauling's Exclusion principle, Hund's principles of maximum multiplicity and Aufbau's principle

Chemical periodicity, VSEPR Theory. Main group elements and their compounds: Allotropy, synthesis, structure and bonding, industrial importance of the compounds. Transition elements and coordination compounds: structure, bonding theories, spectral and magnetic properties. Inner transition elements: spectral and magnetic properties, redox chemistry, analytical applications. Organometallic compounds: synthesis, bonding and structure, and reactivity. Understanding of Mole concept, Acid base theory, oxidation-reduction

Bioinorganic chemistry: Metal ions present in biological systems, Essential and trace elements, Toxicity of metal ions (Hg, Pb, Cd and As), Sodium / K-pump, Haemoglobin and myoglobin, Nitrogen fixation

Organic Chemistry

IUPAC nomenclature of organic molecules. Principles of stereochemistry: Organic reaction mechanisms involving addition, elimination, substitution reactions with electrophilic, nucleophilic or radical species. Determination of reaction pathways. Common named reactions and rearrangements – applications in organic synthesis.

Concepts in organic synthesis: Retrosynthesis, Pericyclic reactions - cycloaddition, sigmatropic rearrangements and other related concerted reactions.

Principles and applications of photochemical reactions in organic chemistry. Structure determination of organic compounds by IR, UV-Vis, NMR and Mass spectroscopic techniques.