Walchand College of Arts and Science (Autonomous), Solapur
W.H.Marg, Ashok Chowk, Solapur

Broad Syllabus: For Recruitment Examination of Assistant Professor in Chemistry

Major Domain	Scope / Umbrella Terms
1. Inorganic Chemistry – Fundamentals	Periodicity; Chemical Bonding & Molecular Structure; VSEPR; Acids–Bases; HSAB Concept; Non-aqueous Solvents
2. Main Group & Transition Chemistry	Main Group Elements & Compounds; Allotropy; Transition Elements; Coordination Chemistry; Bonding Theories; Spectral, Magnetic & Redox Properties; Reaction Mechanisms
3. f-Block & Organometallic Chemistry	Inner Transition Elements; Lanthanides & Actinides; Spectral/Magnetic Properties; Redox & Analytical Applications; Organometallic Synthesis, Structure, Bonding & Reactivity; Homogeneous Catalysis; Cages & Metal Clusters
4. Analytical & Characterization Chemistry	Separation Techniques; Spectroscopic, Electroanalytical & Thermoanalytical Methods; IR, Raman, NMR, EPR, Mössbauer, UV-Vis, NQR, MS; Electron Spectroscopy & Microscopy
5. Bioinorganic & Nuclear Chemistry	Photosystems; Porphyrins; Metalloenzymes; Oxygen Transport; Electron Transfer; Nitrogen Fixation; Medicinal Metal Complexes; Nuclear Reactions; Fission & Fusion; Radioanalytical & Activation Analysis
6. Quantum & Mathematical Chemistry	Quantum Mechanics; Postulates & Operators; Particle-in-a-Box; Harmonic Oscillator; Hydrogen Atom; Angular Momentum; Tunnelling; Variational & Perturbation Methods; Atomic Structure; Many-Electron Systems
7. Chemical Bonding, Symmetry & Spectroscopy	MO/VB Theories; Diatomic Molecules; Hückel Theory; Group Theory & Point Groups; Character Tables; Selection Rules; Rotational, Vibrational & Electronic Spectroscopy; IR/Raman; Magnetic Resonance
8. Chemical Thermodynamics & Statistical Mechanics	Laws of Thermodynamics; State/Path Functions; Thermodynamic Processes; Maxwell Relations; Spontaneity & Equilibrium; Temperature/Pressure Effects; Phase Transitions & Phase Rule; Ideal/Non-ideal Systems; Boltzmann Distribution; Partition Functions & Statistical Thermodynamics
9. Electrochemistry & Ionic Equilibria	Electrochemical Cells; Redox Systems; Nernst Equation; Debye–Hückel Theory; Ionic Conductance & Kohlrausch Law; Ionic Equilibria; Conductometric & Potentiometric Methods
10. Chemical Kinetics, Catalysis & Surface Chemistry	Rate Laws; Temperature Dependence; Complex Reactions; Reaction Mechanisms; Steady-State Approximation; Collision & Transition-State Theories; Unimolecular Reactions; Enzyme Kinetics; Salt Effects; Homogeneous & Photochemical Catalysis; Colloids; Adsorption/Isotherms; Heterogeneous Catalysis
11. Solid State, Polymer & Data Chemistry	Crystal Structures; Bragg's Law; Solid-State Band Theory; Polymer Molar Mass & Polymerization Kinetics; Statistical/Data Analysis; Errors; Mean & Standard Deviation; Regression; Covariance & Correlation
12. Organic Chemistry – Structure & Stereochemistry	IUPAC Nomenclature; Structural & Stereoisomerism; Configuration & Conformation; Stereogenicity; Stereo-, Enantio-, Diastereo- & Regioselectivity; Asymmetric Induction; Aromaticity
13. Organic Reactive	Carbocations; Carbanions; Free Radicals; Carbenes; Benzynes; Nitrenes;

Intermediates & Mechanisms	Addition, Elimination & Substitution; Electrophilic/Nucleophilic/Radical Reactions; Mechanistic & Reaction-Pathway Analysis
14. Organic Reactions & Synthetic Chemistry	Named Reactions & Rearrangements; Functional Group Transformations; Oxidation–Reduction; Organic/Inorganic/Organometallic/Enzymatic Reagents; Chemo-, Regio- & Stereoselective Synthesis
15. Advanced Organic & Asymmetric Synthesis	Retrosynthesis; Disconnection & Synthons; Linear/Convergent Synthesis; Umpolung; Protecting Groups; Chiral Auxiliaries; Asymmetric Induction; Enantiomeric/Diastereomeric Excess; Resolution & Enantiodiscrimination
16. Pericyclic, Photochemical & Heterocyclic Chemistry	Electrocyclization; Cycloaddition; Sigmatropic Rearrangements; Concerted Reactions; Organic Photochemistry; Heterocyclic Compounds Containing O, N & S
17. Natural Products & Biomolecular Chemistry	Carbohydrates; Proteins & Peptides; Fatty Acids; Nucleic Acids; Terpenes; Steroids; Alkaloids; Biogenesis of Terpenoids & Alkaloids
18. Organic Structure Elucidation	IR; UV-Visible; ^{1}H NMR; ^{13}C NMR; Mass Spectrometry; Integrated Spectroscopic Structure Determination
19. Interdisciplinary & Emerging Chemistry	Nanoscience & Nanotechnology; Green Chemistry; Catalysis; Medicinal Chemistry; Supramolecular Chemistry; Environmental Chemistry
20. Fundamental concepts in Chemistry and its Applications	Acid–Base and Chemical Equilibrium Concepts, States and Properties of Matter, Chemistry in Biological, Environmental and Industrial Contexts.