

# RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

## SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF LECTURER IN CHEMISTRY FOR COLLEGE EDUCATION DEPARTMENT

### PAPER – II

- 1 **Lanthanides and actinides:** Electronic configuration, magnetic and spectral properties, lanthanide and actinide contraction, oxidation states, super heavy elements.
- 2 **Chemistry of non-transition elements:** Preparation, properties and bonding in diborane and higher boranes, polyhedral borane anions and carboranes, borazines, silicones and silicates (structure and applications in industry and technology), phosphonitrilic compounds, interhalogen compounds, compounds of xenon and their structures.
- 3 **Organometallic chemistry of transition elements:** Synthesis, structure and bonding, homogeneous catalytic reactions, hydrogenation, hydroformylation, isomerisation, polymerisation.
- 4 **Solid state:** Bragg's equation, determination of dimensions of a unit cell, number of atoms and molecules per unit cell, lattice energy of ionic crystals, Madelung constant, Born-Haber cycle, Schottky and Frenkel defects, line and plane defects, Band theory, electrical properties of solids, insulators and semiconductors.
- 5 **Organic transformations and reagents:** Functional group interconversions including oxidations and reductions. Common catalysts and reagents( organic, inorganic, organometallic and enzymatic).
- 6 **Synthetic uses of:** Acetoacetic and malonic esters, Grignard and organolithium reagents, their preparation, identification, estimation and important applications in organic synthesis.
- 7 **Pericyclic reactions:** Selection rules and stereochemistry of electrocyclic reactions, cycloaddition and sigmatropic shifts, Sommelet - Hauser, Cope and Claisen rearrangements.
- 8 **Organic photochemistry:** Jablonskii diagram, photochemistry of alkenes, carbonyl compounds and aromatic compounds, photodegradation of polymers, singlet molecular oxygen reactions. Paterno-Buchi reaction, Norrish Type I & II reactions and Barton reaction.
- 9 **Analytical chemistry:** Principles and applications of AAS, DTA, TGA, partition and adsorption chromatography.

- 10 **Quantum theory:** Schrodinger equation, particle in a box, hydrogen atom, hydrogen molecule ion, variation theorem, spin-spin orbital coupling scheme, term symbols and spectroscopic states.
- 11 **Statistical thermodynamics:** Boltzmann distribution, kinetic theory of gases, partition functions and their relations with thermodynamic quantities.
- 12 **Physical chemistry of polymers:** Number average and weight average molecular weights, end-group analysis, sedimentation, light scattering and viscosity methods for determination of molecular weights, stereochemistry and mechanism of polymerization.
- 13 **Symmetry and group theory:** Symmetry elements and symmetry operations, groups, classes, multiplication and character tables, applications of group theory in hybridisation and molecular vibrations.
- 14 **Chemistry of natural products:** Carbohydrates, proteins, nucleic acid, fatty acids, terpenes, steroids and alkaloids.
- 15 **Colloids and surface chemistry:** Stability and properties of colloids, Micelles, CMC, isotherms and surface area analysis.
- 16 **Bioinorganic chemistry:** Photosystem, porphyrins, metalloenzymes, oxygen transport, electron transfer reaction, nitrogen fixation, introductory supramolecular chemistry.

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Note :- **Pattern of Question Paper**

1. Objective type paper
2. Maximum Marks : 75
3. Number of Questions : 150
4. Duration of Paper : Three Hours
5. All questions carry equal marks.
6. There will be Negative Marking.