

RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

SYLLABUS FOR EXAMINATION FOR THE POST OF LECTURER (SCHOOL EDUCATION) CHEMISTRY

PAPER - II

Part – I Senior Secondary Level

1. **Atomic Structure:**

Fundamental Particles, Modern concept of atomic structure, Quantum numbers, Aufbau principle, Pauli's exclusion principle, Hund's Rules. Electronic configuration of elements, Classification of elements and periodicity in properties, s, p, d and f Block elements.

2. **p- Block Elements:**

General introduction, Electronic configuration, Occurrence, Oxidation states, Trends in physical and chemical properties.

3. **Transition Elements:**

Transition elements, Electronic configuration, Oxidation states, Absorption spectra including charge transfer spectra and magnetic properties, Co-ordination compounds (Werner's theory). Nomenclature (IUPAC), Isomerism.

Lanthanides and Actinides: Electronic configuration, Oxidation states, Chemical reactivity, Lanthanide contraction and its consequences.

4. **Solid State & Surface Chemistry:**

Classification of solids, Calculation of density of unit cell, Packing in solid, Point defects, Band theory of metals, Physical and chemical adsorption, Colloids and emulsions.

5. **Solutions:**

Types of solutions, Solubility and concentrations, Ideal and non-ideal solutions, Colligative properties and calculations of molar mass, Abnormal molecular mass, Vant Hoff factor.

6. **Thermodynamics:**

Laws of thermodynamics, Zeroth and first law and their applications, Concept of work and heat, Gibb's energy.

7. **Alkanes, Alkenes, Alkynes and Halo-alkanes:**

Methods of preparations and chemical reactions of alkanes, alkenes, alkynes and haloalkanes.

8. Alcohols, Aldehydes, Ketones, Carboxylic Acids and their derivatives:

Classification, nomenclature, methods of preparation, Chemical reactions of alcohols aldehydes, ketones, carboxylic acids and their derivatives.

9. Aromaticity and Arenes:

Aromaticity, Benzene, Alkyl-arenes, Structure of benzene, Electrophilic substitution reactions, orientation of functional groups.

10. Bio-molecules:

Elementary treatment of carbohydrates, proteins, enzymes, vitamins & nucleic acids.

Part – II Graduation Level

1. Chemical Bonding:

Theories of chemical bonding, VB and MO theories of Diatomic molecules, VSEPR theory, Hydrogen bonding, Quantum mechanics, Schrodinger's wave equation for one electron system.

2. Co-ordination Complexes:

Details of Crystal field theory for weak and strong field complexes. Comparison of VB and CFT theories. Factors affecting $10 Dq$. Thermodynamic aspects of Crystal fields, John-Teller effect.

3. Co-ordination Chemistry of Lanthanides and Actinides:

Co-ordination behaviour of Lanthanides and Actinide complexes. Magnetic and spectroscopic properties.

4. Chemical Dynamics:

Rate of reaction, factors affecting rate of reactions. Zero, first and second order reactions. Collision and Transition state theories and their comparison.

5. Electrochemistry:

Electrochemical and Galvanic cells, Theory of strong electrolytes. Debye and Huckel theory of activity coefficient, Nernst equation, Ionic equilibria. Fuel cells, Corrosion.

6. Enthalpy and Entropy:

Enthalpy and its changes at constant pressure and temperature. Entropy as a function of temperature and volume. Hess's Law of constant heat summation, Gibbs and Helmholtz functions.

7. Conformations and Configuration:

Conformation of alkanes (ethane, butane). R/S nomenclature, Configuration of alkenes (E/Z) nomenclature. Conformations of cyclo-hexane.

8. **Reactions Intermediates:**

Free radicals, carbocations, carbanions, carbenes, benzyne, nitrene.

Name Reactions: Nucleophilic Addition reactions and mechanism of Aldol, Cannizzaro, Perkin, Stobbe, Benzoin, Reformatsky, Knoevenagel, Baeyer–Villiger, Wittig and Mannich reactions.

9. **Halo, Nitro, Amino-Arenes and Diazonium Salts:**

Preparations, Chemical properties of Halo, Nitro, Amino-Arenes and diazonium salts, elimination and addition mechanism and synthetic applications of diazonium salts.

10. **Polymers and Drugs:**

Polymers, Types of polymerization, Natural and synthetic polymers. Drugs (antacids, anti-histamines, analgesics, antipyretics, antibiotics and antifertility).

Part – III Post Graduation Level

1. **Molecular Orbital Theory:**

M.O. Theory of polyatomic molecules (AX₂, AX₃ and AX₄).

2. **Organometallic Compounds:**

Organometallic compounds of Li, Mg, Sn and Fe. Structure, bonding and applications.

2. **Kinetics and Catalysis:**

Kinetics of photo-chemical reactions, Acid-Base and Enzyme catalysis.

3. **Electrochemistry:**

Measurement of E.M.F., Kohlrausch's Law and its applications, Membrane equilibria.

4. **Thermodynamics:**

Third Law of Thermodynamics and Joule-Thompson's experiment.

5. **Substitutions and Elimination Reactions:**

SN¹, SN², SNⁱ, E¹ and E² reactions of haloalkanes, Preparation and Chemical reactions of phenols, ethers and epoxides.

6. **Pericyclic Reactions:**

Electrocyclic, Cyclo-addition and Sigmatropic rearrangement, Photo-organic chemistry of alkenes.

7. **Environmental Pollution:**

Ozone depletion, Green house effect, Global warming.

8. **Spectroscopy:**

Elementary idea of IR, UV and NMR techniques.

Part – IV (Educational Psychology, Pedagogy, Teaching Learning Material, Use of Computers and Information Technology in Teaching Learning)

I. Educational Psychology

- Concept, scope and functions of educational psychology.
- Physical, cognitive, social, emotional and moral developmental characteristics of adolescent learner and its implication for teaching-learning.
- Behavioural, cognitive and constructivist principles of learning and its implication for senior secondary students.
- Concept of mental health & adjustment and adjustment mechanism.
- Emotional intelligence and its implication in teaching learning.

II Pedagogy and Teaching Learning Material (Instructional Strategies for Adolescent Learner)

- Communication skills and its use.
- Teaching models- advance organizer, concept attainment, information processing, inquiry training.
- Preparation and use of teaching-learning material during teaching.
- Cooperative learning.

III Use of Computers and Information Technology in Teaching Learning

- Concept of ICT, hardware and software.
- System approach.
- Computer assisted learning, computer aided instruction

For the competitive examination for the post of School Lecturer:-

1. The question paper will carry maximum 300 marks.
2. Duration of question paper will be **Three Hours**.
3. The question paper will carry 150 questions of multiple choices.
4. Negative marking shall be applicable in the evaluation of answers. For every wrong answer one third of the marks prescribed for that particular question shall be deducted.
5. Paper shall include following subjects :-
 - (i) Knowledge of Subject Concerned: Senior Secondary Level
 - (ii) Knowledge of Subject Concerned: Graduation Level.
 - (iii) Knowledge of Subject Concerned: Post Graduation Level.
 - (iv) Educational Psychology, Pedagogy, Teaching Learning Material, Use of Computers and Information Technology in Teaching Learning.
