

RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER
SYLLABUS FOR EXAMINATION FOR THE POST OF
LECTURER - CHEMISTRY
(SCHOOL EDUCATION)
PAPER – II

Part – I (Senior Secondary Standard)

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 Transition Elements

Transition elements, electronic configuration, absorption spectra including charge transfer spectra and magnetic properties, co-ordination compounds (Werner's theory). Nomenclature (IUPAC) Isomerism, Elementary M.O. approach for metallic bond and bond order. Conductors, insulators, semiconductors and super conductors.

3 Lanthanides and Actinides

Electronic configuration, oxidation states, Lanthanide and Actinide contraction, principles of isolation and application.

4 Chemical Kinetics & Surface Chemistry

Rate of chemical reaction, order of reaction, factors affecting rate of reactions, Physical adsorption and chemisorption, colloids and emulsions.

5 Solutions

Types of solutions, solubility and concentrations, vapour pressure, Ideal and real solutions, properties and calculations of molar mass.

6 Thermodynamics

Laws of thermodynamics, zeroth and first law and their applications, concept of work and heat, Gibb's energy, enthalpy and entropy.

7 Alkanes, Alkenes, Dienes and Halo-alkanes

Classification, nomenclature (R,S), methods of preparations and chemical reactions of alkanes, alkenes, alkadienes and haloalkanes.

8 Aldehydes, Ketones, Carboxylic Acids and their derivatives

Classification, nomenclature, methods of preparation, chemical reactions of 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 Standard)

1 **Chemical Bonding**

Theories of chemical bonding, VB and MO theories of Diatomic molecules, VSEPR theory, 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 :**

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.

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). Configuration of alkenes (E/Z) nomenclature. Conformations of cyclo-hexane.

8 **Name Reactions**

Nucleophilic Addition reactions and mechanism of Aldol, Cannizzaro, Perkin, Stobbe, Benzoin, Reformatsky, Knoevengel, Baeyer–Villiger, Wittig and Mannich reactions.

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

Preparations, Chemical properties, 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 Standard)

1 **Molecular Orbital Theory**

M.O. Theory of polyatomic molecules (AX_2 , AX_3 and AX_4)

- 2 **Organometallic Compounds**
Organometallic compounds of Li, Mg, Sn and Fe. Structure, bonding and Applications.
- 3 **Super Heavy Elements**
Super heavy elements, electronic configuration and their positions in the periodic table.
- 4 **Kinetics and Catalysis**
Kinetics of photo-chemical reactions, Acid-Base and Enzyme catalysis.
- 5 **Electrochemistry**
Measurement of E.M.F., Kohlrausch's Law and its applications, Membrane equilibria.
- 6 **Thermodynamics**
Third Law of Thermodynamics and Joule-Thompson's experiment.
- 7 **Substitutions and Elimination Reactions**
 S_N^1 , S_N^2 , S_N^i , E_1 and E_2 reactions of haloalkanes, Preparation and Chemical reactions of phenols, ethers and epoxides.
- 8 **α,β - Unsaturated Aldehydes and Ketones**
Reactions of α,β - Unsaturated Aldehydes and Ketones, Michael addition, Favorskii rearrangement.
- 9 **Pericyclic Reactions**
Electrocyclic, Cyclo-addition and Sigmatropic rearrangement, Photo-organic chemistry of alkenes.
- 10 **Environmental Pollution and Spectroscopy**
Ozone depletion, Green house effect, Global warming. 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)

1. Importance of Psychology in Teaching-Learning :
 - Learner,
 - Teacher,
 - Teaching-learning process,
 - School effectiveness.
2. Development of Learner :
 - Cognitive, Physical, Social, Emotional and Moral development patterns and characteristics among adolescent learner.
3. Teaching – Learning :
 - Concept, Behavioural, Cognitive and constructivist principles of learning and its implication for senior secondary students.
 - Learning characteristics of adolescent and its implication for teaching.

4. Managing Adolescent Learner :

- Concept of mental health and adjustment problems.
- Emotional Intelligence and its implication for mental health of adolescent.
- Use of guidance techniques for nurturing mental health of adolescent.

5. Instructional Strategies for Adolescent Learner :

- Communication skills and its use.
 - Preparation and use of teaching-learning material during teaching.
 - Different teaching approaches:
 - Teaching models- Advance organizer, Scientific enquiry, Information, processing, cooperative learning.
 - Constructivist principles based Teaching.

6. ICT Pedagogy Integration :

- Concept of ICT.
- Concept of hardware and software.
- System approach to instruction.
- Computer assisted learning.
- Computer aided instruction.
- Factors facilitating ICT pedagogy integration.

Scheme of Examination

Subject Concerned

S. No.	Subject	No. of Questions	Total Marks
1	Knowledge of Subject Concerned : Senior Secondary Level	55	110
2	Knowledge of Subject Concerned : Graduation Level	55	110
3	Knowledge of Subject Concerned : Post Graduation Level	10	20
4	Educational Psychology, Pedagogy, Teaching Learning Material, Use of Computers and Information Technology in Teaching Learning	30	60
Total		150	300

Note : 1 All the question in the Paper shall be Multiple Choice Type Question.

2 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.

Explanation : Wrong answer shall mean an incorrect answer or multiple answer.

3 Duration of the paper shall be 3 Hours.

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