

RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

SYLLABUS FOR SCREENING TEST FOR THE POST OF CHEMIST (CHEMISTRY) (AYURVEDA DEPARTMENT)

1. **Atomic Structure:-** Quantum numbers, Aufbau principle, Pauli's exclusion principle, Hund's multiplicity rule and its applications, Postulates of quantum mechanics.

2. **Periodic table and Periodicity:-** Long form of periodic table, division of elements into s, p, d and f blocks, atomic and ionic radii, Ionization energy, Electron affinity, Electronegativity and their applications.

3. **Chemical bonding:-** Ionic, covalent, coordinate bond, valence bond theory, concept of resonance and hybridization, shapes of simple inorganic molecules and ions, VSEPR theory, Geometry of some molecules and ions (BeF_2 , BF_3 , CH_4 , PF_5 , CO_3^{2-} , NO_3^- , SO_4^{2-} etc.), Molecular Orbital Theory of Homonuclear and Heteronuclear diatomic molecules, LCAO Concept, Comparison between VBT and MOT, Weak intermolecular forces.

4. **Chemistry of transition and inner transition elements:-** Electronic configuration, Oxidation States, magnetic properties, complexation, charge transfer spectra, coordination compounds, their naming and isomerism, EAN concept, CFT and LFT, Lanthanides and Actinides, Super heavy elements.

5. **Reaction mechanism:-** Electronic effects viz., inductive, electromeric, mesomeric, resonance and their applications, Types of reagents and reaction intermediates, free radicals, nucleophiles, electrophiles, carbonium ions, carbanions, nitrine, carbene, benzyne, substitution, addition, elimination and rearrangement reactions, Aromaticity.

6. **Stereochemistry:-** Stereochemistry and conformational analysis of organic compounds, D-L notation, R-S notation, E-Z system of nomenclature, Conformations of alkanes and cycloalkanes, optical activity, Racemisation, Resolution, retention of configuration, walden inversion stereospecific and stereoselective synthesis, asymmetric synthesis.

7. **Name reactions and reagents of synthetic importance:-**

(i) Reactions:- Aldol condensation, Baeyer – Villiger, oxidation, Birch reduction, Diels – Alder reaction, Friedel-crafts reaction, Haloform reaction, Claisen-Schmidt reaction, HVZ reaction, Hofmann elimination, Mannich reaction, MPV reduction, Oppenauer oxidation, Pinacol-Pinacolone rearrangement, Reformatsky reaction, Reimer-Tiemann reaction, Wittig reaction.

(ii) Reagents:- N-bromosuccinimide, Wilkinson catalyst, Ziegler-Natta catalyst, Lithium aluminium hydride, Raney Ni.

8. **Spectroscopy:-** Principles and applications of UV, IR, NMR and Mass spectroscopy in structure elucidation of organic compounds.

9. **Synthesis and Uses of Some Organic Compounds:-**

(i) Polynuclear hydrocarbons-Naphthalene.

(ii) Chloroform and Iodoform.

(iii) Ethyl alcohol

(iv) Glycerol

(v) Crown ethers

(vi) Tartaric acid

(vii) Citric acid

(viii) Urea

(ix) Acetoacetic ester

(x) Nitroanilines

(xi) Saccharin

(xii) Menthol

10. **Biomolecules:-** Molecules of biological importance such as Carbohydrates, Amino-acids, Proteins, Enzymes, Nucleic acids, Oils, Fats, Steroids, Hormones and Vitamins.

11. **Life Saving Drugs and their Action:-** Chemotherapeutic agents in prevention and treatment of diseases, natural and synthetic drugs, classification of synthetic drugs.

(i) Bactericidal- Sulphadruugs and their mode of action.

(ii) Antibiotics- Penicillin, Amphotericin and their mode of action.

(iii) Antimalarials- Chloroquine, Primaquine and their mode of action.

(iv) Antipyretics and analgesics- Aspirin, Paracetamol and their mode of action.

(v) Antiseptics and disinfectants- Iodol, Dettol, Tincture of Iodine.

12. **Colloids:-** Classification, preparation, purification and properties of colloids and their applications.

13. **Chemical Kinetics:-** Rate of reaction, Order and Molecularity, collision and transition state theory of reactions, parallel, consecutive, side reactions and their kinetics, kinetics of H_2-Br_2 , H_2-Cl_2 photochemical reactions.

14. **Thermodynamics:-** First, second and third law of thermodynamics, concept of entropy, Gibbs free energy.

15. **Electrochemistry:-** Theory of weak and strong electrolytes, Debye-Huckel Onsager equation, Concentration cells, Fuel cells, Faraday's law of electrolysis.

16. **Solutions:-** Concentration terms (Molarity, Normality, Molality, Mole fraction, Percentage concentration), Types of solutions, Colligative properties, van't Hoff factor and abnormal molar mass.

17. **Analytical techniques:-**

(i) volumetric titrimetry (redox and complexometric titrations).

(ii) Chromatography- Gas, Ion-exchange, Thin layer, HPLC.

(iii) Instrumental techniques of analysis of heavy metals in aqueous systems, pesticides as water pollutants,

(iv) Purification and treatment of water- water quality standards and their analysis- hardness, alkalinity, turbidity, TDS, P^H.

(v) Evaluation of analytical data- Significant figures, Precision, Accuracy, Errors, Mean, Mode, Median.

(vi) Principle and process of solvent extraction, the distribution law and the partition coefficient, batch extraction.

18. **Introduction to computers and computing:-** Basic knowledge of hardware and software, input-output devices, Introduction of computer languages and operating system with DOS as an example.

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Pattern of Question Papers:

1. Objective Type Paper
2. Maximum Marks : 100
3. Number of Questions : 100
4. Duration of Paper : Two Hours
5. All Questions carry equal marks
6. There will be Negative Marking

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