

RMSA- Recruitment to Model Schools
Category of Post: PGT – Chemistry
Syllabus

Part – I

GENERAL KNOWLEDGE AND CURRENT AFFAIRS (Marks: 10)

Part – II

CHILD DEVELOPMENT AND PEDAGOGY (Marks: 10)

1. Development of Child

Development, Growth & Maturation – Concept & Nature, Principles of development, Factors influencing Development – Biological, Psychological, Sociological, Dimensions of Development and their interrelationships – Physical & Motor, Cognitive, Emotional, Social, Moral, Language relating to Infancy, early Childhood, late Child hood, Adolescence, Understanding Development – Piaget, Kohlberg, Chomsky, Carl Rogers, Individual differences – Intra & Inter Individual differences in the areas of Attitudes, Aptitude, Interest, Habits, Intelligence and their Assessment, Development of Personality – Concept, Factors and Assessment of Personality, Adjustment, Behavioural problems, Pro-social behaviour and Mental Health, Methods and Approaches of Child Development – Observation, Interview, Case study, Experimental, Cross sectional and Longitudinal, Developmental tasks and Hazards.

2. Understanding Learning

Concept, Nature of Learning – input – process – outcome, Factors of Learning – Personal and Environmental, Approaches to Learning and their applicability– Behaviourism (Skinner, Pavlov, Thorndike), Constructivism (Piaget, Vygotsky), Gestalt(Kohler, Koffka) and Observational (Bandura), Dimensions of Learning – Cognitive, Affective and Performance, Motivation and Sustenance –its role in learning, Memory & Forgetting, Transfer of Learning.

3. Pedagogical Concerns

Teaching and its relationship with learning and learner, Learners in Contexts: Situating learner in the socio-political and cultural context, Children from diverse contexts–Children With Special Needs (CWSN), Inclusive Education, Understanding of pedagogic methods – Enquiry based learning, Project based learning, Survey, Observation and Activity based learning, Individual and Group learning: Issues and concerns with respect to organizing learning in class room like Study habits, Self learning and Learning to learn skills, Organizing learning in heterogeneous class room groups – Socio-economic background, Abilities and Interest, Paradigms of organizing Learning-Teacher centric, Subject centric and Learner centric, Teaching as Planned activity – Elements of Planning, Phases of Teaching – Pre active, Interactive and Post active, General and Subject related skills, competencies required in teaching and attributes of good facilitator, Learning resources – Self, Home, School, Community, Technology, Class room Management: Role of student, teacher, Leadership style of teacher, Creation of non-threatening learning environment, Managing behaviour problems, Guidance & Counselling, Punishment and its legal implications, Rights of a child, Time Management, Distinction between Assessment for Learning & Assessment of Learning, School based Assessment, Continuous & Comprehensive Evaluation: Perspective & Practice Understanding teaching & learning in the context of NCF, 2005 & Right To Education Act, 2009.

Part - III

PERSPECTIVES IN EDUCATION (Marks: 10)

1. History of Education : Pre-Vedic and Post-Vedic period, Medieval Education, Recommendations of various committees during British period with special reference to Woods Despatch (1854), Hunter Commission (1882), Hartog Committee (1929), Sargent Committee (1944), Recommendations of various committees during post independent period with special reference to Mudaliar Commission (1952-53), Kothari Commission(1964-66), Ishwarbhai Patel committee (1977), NPE-1986, POA-1992
2. Teacher Empowerment: Meaning, interventions for empowerment, Professional code of conduct for teachers, Teacher motivation, Professional development of Teachers and Teacher organizations, National / State Level Organizations for Teacher Education, Maintenance of Records and Registers in Schools.
3. Educational Concerns in Contemporary India: Environmental Education, Meaning and scope of Environmental Education, Concept of sustainable development, Role of Teacher, School and NGOs in development and protection of environment, Democracy and Education, Equality, Equity, Quality in Education, Equality of Educational opportunities, Economics of Education, Meaning and scope, Education as Human Capital, Education and Human Resource Development, Literacy – Saakshar Bharat Mission, Population Education, Significance of Population Education, Population situation, policies and programmes in India, Approaches to Population Education and role of school and teacher, Themes of population Education, Family life Education, Sustainable development, Adolescence Education, Health Education, Gender – Equality, Equity and Empowerment of Women, Urbanization and migration, Life skills, Inclusive Education, Conceptual Clarification and Definition, Prevalence, Myths & Facts, Characteristics, Classification & Types, Importance of Early Identification and assessment, Planning Inclusive Education, Classroom Management in Inclusive Education, Evaluation, Documentation and Record Maintenance, Psycho-Social management, Awareness & Sensitization Strategies, Liberalization, Privatization and Globalization, Value Education, Sarva Siksha Abhiyan, National Programme for Education of Girls at Elementary Level (NPEGEL), Mid-day-meals, Rashtriya Madhyamika Siksha Abhiyan(RMSA), KGBVs and SUCCESS Schools.
4. Acts / Rights: Right of Children to Free and Compulsory Education Act, 2009 and Child Rights.
5. National Curriculum Framework, 2005: Perspective, Learning and Knowledge, Curricular Areas, School Stages and Assessment, School and Classroom Environment and Systemic Reforms.

Part - IV

LANGUAGE: ENGLISH (Marks: 10)

1. Poets, Essayists, Novelists, Dramatists and their works.
2. Forms of Language – Story, Essay, Letter writing, Editorial, Précis writing, note- making, autobiography and biography.
3. Pronunciation – Sounds – Use of dictionary
4. Parts of Speech
5. Tenses
6. Types of Sentences
7. Articles and Prepositions
8. Degrees of Comparison
9. Direct and Indirect – Speech

10. Clauses
11. Active and Passive Voice
12. Use of Phrases
13. Comprehension of a Prose passage / Poems
14. Vocabulary

Part - V

CONTENT (Marks: 48)

I. GENERAL CHEMISTRY:

Atomic Structure and elementary quantum mechanics: Blackbody radiation, Planck's radiation law, photoelectric effect, Compton Effect, de Broglie's hypothesis, Heisenberg's uncertainty principle. Postulates of quantum mechanics, Schrodinger wave equation and a particle in a box, energy levels, wave functions and probability densities, Schrodinger wave equation for H-atom, Separation of variables, Radial and angular functions, hydrogen like wave functions, quantum numbers and their importance
Chemical Bonding: Valence bond theory, Hybridization, VB theory as applied to ClF_3 , BrF_5 , $\text{Ni}(\text{CO})_4$, XeF_2 , Dipole moment, Molecular orbital theory.
Stereochemistry of carbon compounds: Stereo isomerism, Stereo isomers: enantiomers, diastereomers - Conformational and Configurational isomerism- Conformational, Enantiomers, Optical activity asymmetric and dissymmetric molecules, General Principles of Inorganic qualitative analysis: Molecular symmetry: Concept, types, The symmetry operations of a molecule form a group, Theory of quantitative analysis Principles of volumetric, gravimetric analysis, introductory treatment to Pericyclic Reactions.

II. INORGANIC CHEMISTRY:

Periodicity and Periodic Properties, s,p,d, and f block elements Theories of bonding in metals: Valence bond theory, Explanation of metallic properties and its limitations, Free electron theory, thermal and electrical conductivity of metals, limitations, Band theory, formation of bands, explanation of conductors, semiconductors and insulators. Metal carbonyls and related compounds - EAN rule, classification of metal carbonyls, structures and shapes of metal carbonyls of V, Cr, Mn, Fe, Co and Ni, Metal nitrosyls and metallocenes
Coordination Chemistry: IUPAC nomenclature, bonding theories, Isomerism in coordination compounds - structural isomerism and stereo isomerism, stereochemistry of complexes with 4 and 6 coordination numbers. Spectral and magnetic properties of metal complexes, Reactivity of metal complexes, Stability of metal complexes: Hard and soft acids bases (HSAB): Classification, application of HSAB principles - Stability of compounds / complexes. Bioinorganic chemistry: Essential elements, biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and chloride, Metalloporphyrins - haemoglobin, structure and function, Chlorophyll, structure and role in photosynthesis.

III. ORGANIC CHEMISTRY:

Structural theory in Organic Chemistry, Bond polarization, Alicyclic hydrocarbons Cycloalkanes Benzene and its reactivity, Concept of resonance, resonance energy, Heat of hydrogenation, heat of combustion of Benzene, mention of C-C bond lengths and orbital picture of Benzene, Concept of aromaticity, Huckel's rule. Application to Benzenoid (Benzene, Naphthalene) and Non Benzenoid compounds (cyclopropenyl cation, cyclo pentadienyl anion and tropylium cation) Reactions . General mechanism of electrophilic substitution, mechanism of nitration, Friedel Craft's alkylation and acylation, Orientation of aromatic substitution. Definition of ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like NO_2 and Phenolic).

Orientation effect of (i) Amino, methoxy and methyl groups (ii) Carboxy, nitro, nitrile, carbonyl and Sulfonic acid groups. (iii). Halogens (Explanation by taking minimum of one example from each type). Halogen compounds, Hydroxy compounds - Polyhydroxy compounds: Carbonyl compounds, Physical and chemical properties Base catalysed reactions with mechanism: Aldol, Cannizzaro reaction, Perkin reaction, Benzoin condensation, Haloform reaction, Knoevenagel reaction. Oxidation of aldehydes: Baeyer-Villiger oxidation of ketones with mechanism. Reduction: Wolf-Kishner reduction, MPV reduction, reduction with LiAlH_4 and NaBH_4 Analysis of aldehydes and ketones. Carboxylic acids and derivatives physical and chemical properties, Active methylene compounds Acetoacetic esters: Malonic ester: Synthetic applications, inter conversion: Nitrogen compounds: Carbohydrates: Amino acids and proteins

IV. PHYSICAL CHEMISTRY:

Liquid state: Intermolecular forces, structure of liquids (qualitative description). Structural differences between solids, liquids and gases, Liquid crystals, the meso-morphic state, Classification of liquid crystals into Smectic and Nematic, Differences between liquid crystal and solid/liquid, Application of liquid crystals as LCD devices. Solid state: Classification of solids, crystalline state, seven crystal systems, close packed structure of solids, nearest neighbours, ionic radii, simple ionic compounds, point defects. Solutions: Liquid-liquid - ideal solutions, Raoult's law. Ideally dilute solutions, Henry's law. Non-ideal solutions, Vapour pressure, composition and vapour pressure-temperature curves. Azeotropes-HCl-H₂O, ethanol-water systems and fractional distillation, partially miscible liquids-phenol-water, trimethylamine-water, nicotine-water systems. Effect of impurity on consolute temperature, immiscible liquids and steam distillation, Nernst distribution law, Calculation of the partition coefficient, Applications of distribution law; Catalysis: Types of catalysis, Electrochemistry: Electrochemical cells and cell reactions. Electrode potentials, Nernst equation and its relation to DG, Electrochemical series, emf of galvanic cells, Faraday's laws of electrolysis: Electrolytic conductance, specific, equivalent and molar conductance, Kohlrausch's law: concentration cells. Chemical kinetics: Rates of chemical reactions, order of reactions- first, second, third and zero order reactions with examples, effect of temperature on rate of reaction, Thermodynamics.

V. CHEMISTRY AND INDUSTRY:

Physico-Chemical methods of analysis, Separation techniques Spectrophotometry, spectroscopy, Spectral interpretation, Drugs, formulations, pesticides and green chemistry, Macromolecules, Material Science and catalysis

Part - VI

TEACHING METHODOLOGY (Marks: 12)

- 1. The Nature of Science:** Nature and scope of science, Science, ideology and Society, Structure of Science (a) Substantive structure – Empirical knowledge, Theoretical Knowledge – (Facts, Concepts, hypothesis, theory, Principle Law), (b) Syntactic Structure of Science – Scientific inquiry, Processes of Science, Attitudes of inquiry.
- 2. The History and Development of Science:** A brief introduction to oriental and western science, Contribution of the following Scientists in the Development of Science: Aryabhatta, Bhaskara Charya, Aristotle, Copernicus, Newton, Einstein, C.V. Raman, Various organizations working for the development of science in India.

- 3. Aims and Values of teaching Physical Sciences:** Aims of teaching Physical Sciences, Values of teaching Physical Science, Correlation of Physics and with other subjects.
- 4. Objectives of teaching Physical Sciences:** Meaning and importance of objectives, Bloom's Taxonomy of Educational objectives, Specific /Behavioral objectives / (Instructional objectives), Critique on Bloom's Taxonomy.
- 5. Approaches and Methods of teaching Physical Sciences:** Inductive and Deductive Approaches, Micro Teaching, Team Teaching, Lecture Method, Lecture cum Demonstration Method, Historical Method, Heuristic Method, Project Method, Laboratory method, Problem Solving Method, Scientific Method, Multimedia Approach in Teaching Learning process, Programmed Learning, CAI and CAL.
- 6. Planning for effective instruction in Science:** Year Plan, Unit Plan, Lesson Plan, Learning experience, characteristics, classification, source and relevance.
- 7. Teaching Learning Material (TLM):** Characteristics and Importance of TLM, Classification and Types of TLM, Hardware and Software in TLM, *TLM Principles* to be followed, Edgar Dale's cone of learning experience.
- 8. Science laboratories:** Importance of Practical work in science, Planning of Science laboratories, Procurement, care and maintenance of laboratory equipment, Registers, Management of safety and science kits, Development of improvised Apparatus.
- 9. Physical Science Curriculum:** Principles of Curriculum Construction, Defects in the existing school science curriculum, Qualities of a good Science Text Book.
- 10. Non-formal Science Education:** Science Clubs, Science Fairs – purposes, levels, organization, advantages, Science Library, Role of NGOs and State in popularizing Science.
- 11. Evaluation:** Concept and Process of Evaluation, Tools of Evaluation, Preparation of Scholastic Achievement Test (SAT), Analysis and interpretation of Scores.