

# RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

## SYLLABUS FOR EXAMINATION FOR THE POST OF TEACHER, GRADE-II (SCIENCE) SANSKRIT EDUCATION DEPARTMENT

### (I) **General knowledge and Current affairs with special reference to Rajasthan:**

Current affairs of Rajasthan, Major current issues and happenings at state level related to Political, Socio economic, Games and Sports aspects.

Indian Constitution - salient features. Indian Political System - Union Executive - President : Powers and Functions. Prime Minister & Council of Ministers-Powers and Functions..

Office of Governor, Chief Minister and Cabinet Role and functions of state Secretariat, role of Chief Secretary, Local Government in Rajasthan - Rural and urban, Major institutions and their role in various developmental programmes - Women empowerment through local Governance.

(II) **Geographical, Historical and Cultural Knowledge of Rajasthan** - Location, Extention, relief features, climate, drainage, soil resource, Vegetation, Irrigation, Multipurpose Projects, Agriculture, Live Stock, Dairy Development, Minerals - Power resource, Population distribution and growth, Literacy, Sex-ratio, Religious Composition, Industries, Major Tourists Centres and Means of Transportation of Rajasthan.

Main centres of Uprising and Protest in Rajasthan in 1857.

Freedom movement in Rajasthan and freedom fighters of Rajasthan, Integration of Rajasthan - various stages. People, Religion and culture of Rajasthan - Saints of Rajasthan, Lok Devta and Deviyan, various temples.

Important fairs and festivals, Folk songs and dances, Historical Palaces and Forts, Major Centres of Sufism in Rajasthan - Ajmer, Sarwar and Nagaur.

### (III) **Educational Psychology :**

- 1 Educational Psychology - meaning, scope and contribution of educational psychology in field of Education.
- 2 Learning - Its Meaning, Factors affecting Learning, Different Theories of Learning and its implications for a teacher.
- 3 Development of Learner - Physical, Emotional and Social development of child and their implications for Learning.
- 4 Individual differences and Education for Special Children.
- 5 Motivation - Meaning and role in the process of learning.

### (IV) **School Subject (Science)**

#### **Physics :**

- 1 **Mechanics – I** - Physical world and measurement, Description of motion, Vectors, Laws of motion, Friction, Work, Energy and power, Rotational motion.
- 2 **Mechanics - II** - Periodic motion, S.H.M. its equation, K.E. and P.E., concept of free, forced and damped oscillations. simple pendulum, oscillation of a loaded spring, Universal law of gravitation, g, variation of g, orbital and escape velocity, planetary motion, Kepler's law, Hook's law, young's modulus, bulk modulus and shear modulus of rigidity. P.E. in a stretched wire, Type of waves, wave equation, superposition principle, Interference, beats,

- stationary waves, resonance tube, sonometer. Melde's experiment, Doppler's effect in sound and light.
- 3 **Heat, thermodynamics and Radiation** - Concept of Heat and temperature, Temp. Scales, Thermal expansion of solid, liquid and gases, specific heat, Law of mixture, latent heat, Thermal capacity, Zeroth & first law of thermodynamics, Modes of transmission of heat, thermal conductivity, Thermal radiations, perfect blackbody, Wein's displacement law, Stefan's law, Kirchoff's law, Newton's law of cooling, Electric power, Joule's law, Chemical effect of current, Faraday's law of electrolysis, Thermoconductivity, Seeback effect, Peltier and Thomson effect.
  - 4 **Optics** - Laws of reflection, Reflection by plane and curved mirrors, Laws of refraction, total internal refraction - applications, Diffraction, Lenses, Image formation by lenses, Scattering of light, Eye, Defects of vision, Microscopes, Astronomical telescopes, Huygen's principle - reflection and refraction, Interference of light, young's double slit experiment, Frenel's Bi-prism, Diffraction of light, Frenel's HPZ, Fraunhoffer's diffraction, polarisation of light, law of malus, Nicol prism, polaroids.
  - 5 **Electrostatics** - Coulomb's law, electric field and potential due to a point charge, Dipole, concept of Dielectric, Gauss theorem - its applications, Electric lines of force, Force and torque experience by a dipole in uniform electric field, Capacity of a isolated spherical conductor, capacitor - principle, Types of Capacitors, series and parallel combinations of Capacitors, Energy of a Capacitor.
  - 6 **Magnetism** Natural and man made magnet, magnetic lines of force, Coulomb's law, magnetic moment, Torque on a magnetic dipole, magnetic field, magnetic induction, magnetic intensity, permeability, susceptibility & Intensity of magnetisation - their relations. Curie Law, Hysteresis, B-H curve. Classification of magnetic materials. Oersted's experiment, Biot - Savarts law, magnetic field by a straight Conductor & Circular Current Carrying Coil, Ampere's Circuital law, Solenoid, Toroid, Cyclotron, Moving Coil, Galvanometer, Ammeter, Voltmeter and Tangent Galvanometer, Faraday's Law, Lenz's Law, Self Induction, Mutual Induction, Electric Generators, Motor, Transformers.
  - 7 **Electricity** - Ohm's Law, Temperature dependence of resistance, colour code of resistors, series and parallel combination of resistors, resistivity, primary and secondary cells and their combination in series and parallel, Kirchoff's laws, wheat stone bridge and potentiometer - their applications, Mean and rms value of A.C., A.C. Circuit Containing resistance, Inductance and Capacitance, Series resonant Circuit, Q factor, Average power in A.C., Wattless Current, Choke Coil.
  - 8 **Atomic, Nuclear Physics and Radioactivity** - Einstein's Photoelectric equation, Photocell, matter waves, Debroglie's hypothesis, Nucleus, Mass defect, Binding energy, Nuclear reactions, Nuclear fission and fusion, Nuclear reactor, Radioactivity, laws of disintegration,  $\alpha$ ,  $\beta$  and  $\gamma$  rays, radioactive isotopes - uses, Radio Carbon dating.
  - 9 **Electromagnetic Waves and Communication** - Electromagnetic Waves- Properties, Electromagnetic spectrum, propagation of radio waves, Satellite Communication.
  - 10 **Solids and semi conductor devices** - Energy band in solids, Semi conductor, P-N Junction, Diodes, Diode as an rectifier, Junction transistor.

## Chemistry :

- 1 Atomic Structure : Fundamental Particles, Atomic models and their limitations, dual nature of particles, de-broglie equation, uncertainty principle, Modern concept of atomic structure, quantum numbers, Aufbau principle, Pauli's exclusion principle, Hund's rule, (n+l) rule. Electronic configuration of elements. Molecular orbital theory for simple homo-nuclear diatomic molecules. Mole concept, Chemical stoichiometry.
- 2 **States of matter** : Gaseous state - gas laws, ideal gas equation, Dalton's law of partial pressure, kinetic theory of gases, deviation from ideal behaviour, critical temperature and its importance, liquification of gases. Liquid state - properties of liquid, vapour pressure, surface tension and viscosity coefficient and its application. Solid state - classification of solids, crystal structure, Crystal defects.
- 3 Ionic bond, covalent bond, coordinate bond. General properties of ionic and covalent bond. Geometry of molecules, Valence shell electrons pair repulsion theory, Fajan's Rule, Valence bond theory, concept of resonance, directional properties of bond, hybridisation.
- 4 **Co-ordination Compounds** : Ligand and co-ordination number, IUPAC nomenclature and formulation of mono nuclear co-ordination compound, Isomerism, Stereoisomerism, Crystal field theory. Shapes, Colours, Magnetic properties in complexes, stability of co-ordination compounds, Organometallic compound (elementary knowledge)
- 5 **Classification of elements and periodicity in properties** : Modern concept of periodic table, types of elements - s, p, d and f block periodicity in properties-atomic and ionic radii, ionisation potential, electron affinity, electronegativity and valency.
- 6 **Chemical Equilibria** : Law of mass action and its application to homogeneous equilibria, Le-chatelier principle and its application to physical and chemical system. Factors affecting chemical equilibria.
- 7 **Ionic Equilibria** : Ionic equilibria in solutions, Acid-base concept, pH scale, Buffer solution. Dissociation of acid and base, Common ion effect and its importance. Solubility product and its uses.
- 8 **Oxidation - Reduction reaction** : Redox reactions, Oxidation numbers.
- 9 **Metals, Non-metals and Metallurgy** : Minerals and ores, General metallurgy, Metallurgy of Cu, Al and Zn. Use of important compounds of metals and non-metals in daily life.  
Non-metals and their compounds - Carbon, Nitrogen, Sulphur, Oxygen, Phosphorous, halogens, Allotropes of C,S and P and their uses. Cement and Plaster of Paris.
- 10 **Purification & characterisation of organic compounds** - Different methods of purification, qualitative & quantitative analysis, Tetravalency of carbon, overlapping of orbitals, sigma and pi-bond, shape of methane, ethane and ethyne molecules, effect of hybridisation on bond length and bond energy, functional groups, homologous series, classification of organic compounds, Nomenclature of organic compounds, Isomerism.
- 11 **Hydrocarbons** : Aliphatic hydrocarbons (Alkane, Alkene and Alkyne); Aromatic hydrocarbon (Benzene), concept of aromaticity, petroleum and petrochemicals.
- 12 Polymers, Bio-molecules, Chemistry in everyday life.
- 13 Environmental Chemistry – Atmosphere, air and water pollution.

- 14 **Zero group elements** : Position in periodic table, isolation, compounds of zero group elements.
- 15 **d-block elements** : Electronic configuration, general characteristics for e.g. colour, oxidation state, tendency to form complexes, magnetic properties, catalytic properties, alloys.
- 16 **f-block elements** : Lanthanides and Actinides, Electronic configuration, Lanthanide contraction and its consequences, Super heavy elements.
- 17 **Bio-Inorganic Chemistry** : Role of bulk and trace metal ions in biological system with special reference to Mg, Ca, Fe, Cu, Na and K.
- 18 **Reaction Mechanism** : Inductive, Mesomeric and Hyper - conjugation. Addition and substitution : Electrophyls and Nucleophyls. Electrophilic addition and substitution reaction, Nucleophilic substitution reactions ( $SN_1$  and  $SN_2$ ), Elimination reactions.
- 19 **Chemical Kinetics** : Order and Molecularity of reactions, first and second order reactions and their rate expressions (no derivation), Zero and Pseudo order reactions, Collision theory and activated complex theory.
- 20 **Solutions** : Osmotic pressure, Lowering of vapour pressure, depression of freezing point and elevation of boiling point. Dilute Solutions, Determination of molecular weight in solution. Association and dissociation of solutes.
- 21 **Electrochemistry** : Electrochemical cells, electrode potentials, measurement of e.m.f. Conductance : Cell constant, specific and equivalent conductivity, Kohlrausch's Law and its applications, solubility and solubility product, equivalent conductivity at infinite dilution of weak electrolytes, hydrolysis and hydrolysis constant, Dry batteries.

## **Biology :**

- Cell structure and functions** of cell organelles, Cell inclusions, Nucleic acid (DNA and RNA) Cell division (Mitosis, Meiosis), Genetic code, types of RNA and protein synthesis, Duplication of DNA, Watson Crick model, B-DNA, Z-DNA
- Types of plant tissues**, internal structure of root, stem and leaves, Secondary growth, Anomalous secondary growth, Annual rings, heartwood and sap wood, tyloses
- Structure of flower**, Types of inflorescence, reproduction in plants, Double fertilisation, types of embryosacs polyembryony, Apomixis, Parthenocarpy Alternation of generation, Economic botany: Timber plants, Medicinal plants Fibre yielding plants, Condiments and spices
- Water relations**, Osmosis, DPD, Plasmolysis, Water potential Absorption of water, Ascent of sap, Transpiration, Guttation, Stomatal movement, Antitranspirants
- Photosynthesis**, types of pigments, light and dark reaction,  $C_4$  cycle, Organisation of Photosystems, Red drop phenomenon, Chemosynthesis, Bacterial photosynthesis  
Law of limiting factor, factors affecting photosynthesis, Crassulacean Acid Metabolism
- Respiration**, types of respiration, Glycolysis, Krebs cycle and Oxidative phosphorylation, Respiratory quotient (R..Q.), Photorespiration, Electron transport system
- Enzymes**, classification, mechanism of action, factors affecting enzyme activities, Isoenzymes, Regulation of enzyme activity

8. **Regulation in animals** (Nervous system, Endocrine system), regulation in plants by hormones Auxin, Gibberellins, Cytokinins, Ethylene, Abscisic acid, application of plant hormones in agriculture and horticulture, Photoperiodism, Vernalisation and seed dormancy, Avena culture test, Bioassay of hormones, Richmond -Lang effect, Plant movements.
9. **Ecology** Types of pollution, Global warming, Green house effect, Acid rains, ozone depletion Biodiversity, Sancturies, National parks, Endangered species, Deforestation, Biotic communities, Ecosystem, Food chains, ecological pyramids, wild life and its conservation, Biogeochemical cycles, Radiation hazards.
10. **Structure and function of animal tissues**, Various systems of human
11. **Life cycle** of Plasmodium, Ascaris, Liverfluke, Economic importance of Protozoa and Insects. Social insects. External and internal structure of Amoeba, Earthworm Cockroach and Frog ,
12. **Heredity and Evolution**, Darwinism, Neo Darwinisim, Lamarckism, Natural selection and Adaptation, Concepts of species and speciation. Palentological evidences and morphological evidences of evolution,Hardy-Winberg law, Origin of life
13. **Genetics and genetic engineering** : Mendelism, Linkage, Crossing over, hybridization, sex determination and sex linked inheritance, Blood groups, Rh factor, Mutation, gene mapping and human genome project ,Genetic engineering, clones, techniques of gene transfer, applications of biotechnology, Totipotency Tissue culture and its applications, transgenic animals, Linkage and crossing over, One gene one enzyme hypothesis , Operon model of gene. Polyploidy.
14. **Taxonomy of animals**, Five kingdom system,Characteristics upto family level with suitable example. Symmetry , Coelom , segmentation and embryogenesis.
15. **Taxonomy of plants:** Eukaryota, Prokaryota, Virus, Mycoplasma, Lichens and elementary knowledge of Ulothrix, Riccia and Pteridium, Selaginella, Pinus, Cycas and Ephedra. Economic importance of Gymnosperms.
16. **Embryology of animals**, Spermatogenesis, Oogenesis, fertilization, Cleavage, Gastrulation, organogenesis and fate of three germinal layers, test tube baby. Embryology of frog

**(V) Educational Methodology (Science) :**

- 1 Definition and concept of science, place of science in school curriculum, nature of science, scientific attitude, values of science, correlation of science with other school subjects, aims of science teaching in Secondary Schools, Scientific literacy, Scientific method, Teachers' beliefs, Constructivism in science.
- 2 Principles of developing science curriculum at secondary level, factors affecting the selection and organisation of science curriculum, NPE-1986, POA (1992) and National curriculum frame work - 2005, Unit plan and lesson plan, Taxonomy of educational objectives, writing objectives in behavioural terms. Role of Science teacher.
- 3 Methods and approaches - Lecture method, demonstration, laboratory method, problem solving, project method, inductive and deductive method, inquiry approach, discovery method, programmed instruction, panel discussion, team teaching, multi sensory teaching aids.

4. Co-curricular activities, Science lab, planning and equipping science lab, Safety precaution for work in science lab, science-club, field trip, I.T. interventions in science teaching.
5. Evaluation - Concepts, type and purposes, type of post items, objective type, S.A. and Essay, preparation of blue print, evaluation of practical work in science, comprehensive and continuous evaluation in science.

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Scheme and syllabus of competitive examination for the post of Teacher Grade II (Science)

- 1 The competitive examination shall carry 200 marks.
- 2 Duration of examination shall be two hours.
- 3 The question paper of written examination shall carry multiple choice type questions.
- 4 Paper shall include following subjects carrying the number of marks as shown against them :-

(i)	General Knowledge and Current Affairs with special reference to Rajasthan.	60 Marks
(ii)	Geographical, Historical & Culture Knowledge of Rajasthan.	60 Marks
(iii)	Educational Psychology	10 Marks
(iv)	School Subject (Science)	40 Marks
<b>Note :</b> Standard of contents of School subject shall be of the praveshika standard.		
(v)	Educational Methodology (Science)	30 Marks
	<b>Total</b>	<b>200 Marks</b>

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