RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF ASSISTANT DIRECTOR IN DEPARTMENT OF SCIENCE AND TECHNOLOGY

Paper- I

Unit-I

- Nature of matter, fundamental particles, modern concept of atomic structure, quantum numbers, electronic configuration of atoms, valence electrons.
  General properties of ionic bond, covalent bond, coordinate bond and hydrogen bond.
  Modern concept of periodic table, Periodicity in properties – atomic radius, ionic radius, ionization enthalpy, electron gain enthalpy, electronegativity.
- Acid-base and salts, concept of pH and buffer solution.

Unit-II

- Classification and IUPAC nomenclature of organic compounds, general method of purification, free radicals, carbocations, carbanions, electrophiles and nucleophiles, type of organic reactions, resonance, hyperconjugation, inductive effect, electromeric effect, isomerism.
- Chemistry in daily life, concept of radioactivity and its applications, principle and applications of green chemistry.

Unit-III

- Vectors Basic definitions, vector addition and multiplication (Dot and Cross Product).
- Motion in one dimension, uniformly accelerated motion, motion with uniform velocity.
- Newton's laws of motion, impulse, momentum, conservation of momentum, Friction.
- Work done by a constant/variable force, kinetic and potential energy, Power.

Unit-IV

- Universal laws of gravitation, gravitational acceleration (g), variation of g, orbital velocity, escape velocity, planetary motion, Kepler's laws.
- Electrostatics, Electric field and potential, Gauss's Law, Electric current, Ohm's law, resistance and resistivity, Magnetic Effect of Current and Electromagnetic Induction.
- Laws of reflection and refraction, Image formation by lenses and mirrors, total internal reflection, defects in vision, microscope, telescope.

Unit: V-

- **Cell and Molecular Biology**: Structure and functions of cell and cell organelles; Nucleic acids: DNA and RNA; Central dogma: DNA replication, transcription and translation; Biomolecules: Proteins, Carbohydrates, Lipids and Vitamins.
- **Genetics:** Mendelian work and Mendelism; Blood groups, Rh factor and Genetic disorders. Sex determination and sex-linked inheritance, maternal inheritance. Mutations and chromosomal aberrations.
- **Biotechnology & Genetic Engineering**: Recombinant DNA technology - Tools and techniques; gene cloning, cloning vectors, DNA amplification, Polymerase Chain Reaction. Gene transfer techniques; genomic library; Plant and animal tissue culture; DNA finger printing; Genetically Modified crops. Application of biotechnology in agriculture and medicine; Transgenic animals and plants.
- **Evolution:** Lamarkism, Darwinism, Natural selection, Adaptation, Neo-Darwinism, Neo-Lamarkism; Concept of species and speciation.

Unit: VI-

- **Ecology:** Structure and functions of ecosystem; Food chain, food web and ecological pyramids; Ecological succession; Energy flow; Pollution (air, water, soil and noise); Biogeochemical cycles – Carbon, Nitrogen, Oxygen, Phosphorus; Major biomes of the world.
- **Environmental Biology**: Red Data Book. Environmental laws; Major environmental issues - Global warming, Greenhouse effect, Acid rain, El-Nino and La-Nina, Ozone depletion, Deforestation, Carbon emission, Radiation hazards. Wildlife and its conservation; endangered species; Sanctuaries and National parks with special reference to the state of Rajasthan. Environmental Impact Assessment (EIA). Carbon foot printing.
- **Microbiology:** Viruses, Bacteria, Mycoplasma, Phytoplasma, Spiroplasma, Mycorrhizae and Lichens. Microbes in Human welfare.
- **Human Health:** Genetics and Lifestyle Diseases; Human diseases: Communicable, Non-communicable and Zoonotic, Endemic, Epidemic, Pandemic- their Diagnosis and Control, Immunization and Vaccination; Drugs and Alcohol abuse. Nutrition, tissue and organ transplantations and Bio- treatment techniques. Important medicinal plants with special reference to Rajasthan.

Unit: VII-

- Basic Concepts and Applications of: Computer Science, Networking and its types, Robotics, Artificial Intelligence, Machine learning, Internet of things, Blockchain and Crypto currency, 5G technology, Augmented and Virtual Reality, Big data, Cloud computing, Quantum Computing, Cyber Security and Nano Technology.
- Digital Literacy and Social Media Platforms, Digital India initiatives, Development of science and technology in Rajasthan, Government policies related to Science and Technology. Contribution of Indian Scientists in Science and Technology.

Unit: VIII

- Renewable Energy Technologies: Green Energy, Solar Energy, Wind Energy. The Environmental Impact of Manufacturing and Disposal of Renewable energy.
- Indian Space Programme, Satellites and their orbits, various launch vehicles. Advancement in Defence Technology in India.
- Intellectual Property Rights: Patents and the types of patents (utility patents, design patents, etc.); Trademarks; Copyrights; Trade Secrets. Bio-piracy.
- International Treaties and Agreements: the TRIPS Agreement, the Paris Convention, and the Berne Convention.

Unit: IX- Remote Sensing and GIS-

- Introduction to Remote Sensing: Stages in Remote Sensing, Sensors, Sensor Resolutions, Satellite & Airborne Remote Sensing Technologies, products of Remote Sensing, interpretation of Satellite Imageries.
- Environmental Monitoring, using remote sensing for monitoring land use, vegetation, water bodies, and natural resources. Familiarity with applications of remote sensing in precision agriculture, crop monitoring, and soil analysis. Disaster Management, Urban and Regional Planning.
- Knowledge of Geographic Information Systems (GIS), including data formats (raster, vector), Data input and editing, Spatial & Non-spatial data analysis. GPS: their types and uses.

Unit X:

- Importance, present status and scope of Agriculture and Horticulture in Rajasthan. Soil and Water conservation. Soil fertility and productivity, bio-fertilizers. Problematic soils and their management in Rajasthan. Essential plant nutrients and their functions. Concept, Scope and problems of dryland Agriculture in Rajasthan. Tillage, organic farming, irrigation methods, moisture conservation practices, water harvesting. Introduction about important Agronomical and Horticultural crops of Rajasthan.
- Importance of fruits, Vegetables, Spices, Medicinal and Aromatic crops in Rajasthan. Basic Horticulture, plant propagation and nursery management. Special horticultural practices, Introduction about Hi-tech Horticulture. Ornamental gardening and landscaping. Principles of fruits and vegetable preservation. Physiological disorders and harvest Indices of important fruits and vegetables of Rajasthan. Tissue culture, Transgenic crops, role of plant growth regulators.

Unit XI:

- Farm management and Agricultural marketing, crop insurance. Agricultural development and poverty alleviation programmes in India. Care and management of livestock. Common infectious and contagious diseases of livestock their prevention and control. Introduction about important Indian & exotic breeds of cow, buffalo, goat, sheep, camel and poultry.
- Major diseases (fungal, bacterial, nematode & viral) and insect pests of field, vegetables, fruits, ornamental, seed spices and medicinal crops of Rajasthan and their control measures. Bio-control agents and their importance in plant protection. Plant quarantine, Lac culture, Sericulture & Apiculture.

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Scheme of Examination

The Scheme of competitive examination shall consist of written examination and interview as mentioned below-

(i) Written examination and

(ii) Interview

A. Written Examination:

The written examination shall consist of the following papers carrying the marks and time allowed, as shown against them: -

Paper	Subjects	Marks	Time
I	Subject concerned with the post	150	3 Hours.
II	General Studies of Rajasthan	50	2 Hours.
	Total Marks	200	

B. Interview:

(i) The interview shall carry 24 marks.

(ii) To the extent of three times of total number of vacancies (category wise), the candidates, who obtain such minimum qualifying marks in written examination as may be fixed by the Commission, shall be summoned for interview.

1. The competitive examination shall carry 150 marks and 150 questions in Paper I and 50 marks and 100 questions in Paper II of Multiple Choice Type questions.
2. There shall be two papers. Duration of Paper I will be Three hours and Paper II will be two hours.
3. 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 answers.

उक्त पद हेतु आयोजित की जाने वाली परीक्षा के लिए ओ.एम.आर. उत्तरपत्रक में प्रश्नों के विकल्प भरने के संबंध में विशेष निर्देशः–

1. Each question has five options marked as 1, 2, 3, 4, 5. You have to darken only one circle (bubble) indicating the correct answer on the Answer Sheet using BLUE BALL POINT PEN.
2. It is mandatory to fill one option for each question.
3. If you are not attempting a question then you have to darken the circle '5'. If none of the five circles is darkened, one third (1/3) part of the marks of question shall be deducted.
4. After solving question paper, candidate must ascertain that he/she has darkened one of the circles (bubbles) for each of the questions. Extra time of 10 minutes beyond scheduled time, is provided for this.

A candidate who has not darkened any of the five circles in more than 10% questions shall be disqualified.