

ANDHRA PRADESH PUBLIC SERVICE COMMISSION::VIJAYAWADA

SCHEME AND SYLLABUS FOR RECRUITMENT TO THE POST OF ANALYST GRADE-II IN A.P. POLLUTION CONTROL BOARD

SCHEME

(As per Annexure-VII of G.O.Ms.No.201, Finance (HR-I, Plg. & Policy) Dept., dt: 21.12.2017)

WRITTEN EXAMINATION (OBJECTIVE TYPE) DEGREE STANDARD				
Paper	Subject	No. of Questions	Duration Minutes	Maximum Marks
Paper-I	General Studies & Mental Ability	150	150	150
Paper-II	Concerned Subject	150	150	300
TOATAL				450 Marks
N.B: As per G.O.Ms. No.235 Finance (HR-I, Plg & Policy) Dept, Dt: 06/12/2016, for each wrong answer will be penalized with 1/3 rd of the marks prescribed for the question in all Objective type papers.				

SYLLABUS

PAPER – I

GENERAL STUDIES AND MENTAL ABILITY

1. Major Current Events and Issues pertaining to International, National and State of Andhra Pradesh.
2. General Science and its applications to the day to day life Contemporary developments in Science & Technology and Information Technology.
3. History of India – emphasis will be on broad general understanding of the subject in its social, economic, cultural and political aspects with a focus on AP and Indian National Movement.
4. Geography of India with focus on Andhra Pradesh.
5. Indian polity and Governance: constitutional issues, public policy, reforms and e-Governance initiatives.
6. Indian Economy and planning
7. Sustainable Development and Environmental Protection
8. Disaster management: vulnerability profile, prevention and mitigation strategies, Application of Remote Sensing and GIS in the assessment of Disaster
9. Logical reasoning, analytical ability and logical interpretation.
10. Data Analysis: Tabulation of data Visual representation of data Basic data analysis (Summary Statistics such as mean, median, mode and variance)and Interpretation.

PAPER – II (CONCERNED SUBJECT)

CHEMISTRY

1. CHEMISTRY OF NON-TRANSITION ELEMENTS

General characteristics of the non transition elements special features of individual elements; Synthesis' properties and structure of their Halides and Oxides, Polymorphism of Carbon, Phosphorus and Sulphur, Synthesis, properties and structure of boranes, Carboranes, borazines, Silicates, Carbides, Sulphurnitrogen compounds. Electron counting in boranes.

2. Terpenoids Classification of terpenoids, occurrence, isolation, general methods of structure determination. Isoprene and special isoprene rule. Structure determination and synthesis of the following representative molecules: Farnesol, Zingiberine, Cadinene and Abietic acid.

3. Amino acids and proteins - Definition of Amino acids, classification of Amino acids into alpha, beta, and gamma amino acids. Natural and essential amino acids - definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples - Glycine, Alanine, valine and leucine) by following methods: a) from halogenated carboxylic acid b) Malonic ester synthesis c) strecker's synthesis Physical properties: Zwitter ion structure - salt like character - solubility, melting points, amphoteric character, definition of isoelectric point. Chemical properties: General reactions due to amino and carboxyl groups - lactams from gamma and delta amino acids by heating peptide bond (amide linkage). Structure and nomenclature of peptides and proteins.

4. Solvent free reactions: Solvent free techniques - Reactions on solid mineral supports, Phase Transfer Catalysis - C-alkylation, N-alkylation, S-alkylation, Darzen's reaction, Wittig reaction. Ultrasound assisted green synthesis - Oxidation, Reduction, Hydroboration, Bouveault reaction, Strecker reaction, Microwave assisted green synthesis- Biginelli reaction, Aza-Michael reaction, Suzuki reaction, Stille reaction, Sonogashira reaction.

5. Spectroscopy- General features of absorption - Beer-Lambert's law and its limitations, transmittance, Absorbance, and molar absorptivity. Single and double beam spectrophotometers. Application of Beer-Lambert law for quantitative analysis of 1. Chromium in $K_2Cr_2O_7$ 2. Manganese in Manganous sulphate.

6. Chromatography- General principles and classifications of chromatographic separations.
Thin layer chromatography: Classification, principle, experimental technique, sample application, development of plate, retardation factor.
Gas liquid chromatography: Gas liquid chromatography - instrumentation (columns and detectors), retention time and retention volume. Chromatographic behaviour of solutes, column efficiency and resolution, column processes and band broadening, time of analysis and resolution, Van-Deemter equation.
Paper Chromatography: Principles, R_f values, experimental procedures, choice of paper and solvent systems, developments of chromatogram - ascending, descending and radial. Two dimensional chromatography, applications.
Column Chromatography: Principles, experimental procedures, Stationary and mobile Phases, Separation technique. Applications.
High performance liquid chromatography: Theory and instrumentation- column performance, gradient elution, delivery system, sample introduction, separation columns, detectors and applications of HPLC.

7. Photochemistry: Difference between thermal and photochemical processes, Laws of photochemistry- Grothus Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield- Photochemical reaction mechanism- hydrogen- chlorine and hydrogen-bromine reaction. Qualitative description of fluorescence, phosphorescence, Jablonski diagram, Photosensitized reactions - energy transfer processes (simple example).

8. Heterocyclic Compounds: Introduction and definition: Simple five membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole - Aromatic character - Preparation from 1, 4, -dicarbonyl compounds. Paul-Knorr synthesis. Properties: Acidic character of pyrrole - electrophilic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions - Diels Alder reaction in furan. Pyridine- Structure - Basicity - Aromaticity- Comparison with pyrrole-one method of preparation and properties - Reactivity towards Nucleophilic substitution reaction.

BIOCHEMISTRY

1. **Enzyme inhibition:** Types of reversible inhibitors - competitive, non-competitive, uncompetitive mixed inhibition and partial inhibition. Substrate inhibition, Feedback inhibition and allosteric inhibition. Mechanism of reactions catalyzed by the following enzymes-Chymotrypsin, Trypsin, Carboxypeptidase, Ribonuclease and Lysozyme.
2. **Co-enzymes** - the mechanistic role of the following co-enzymes in enzyme catalyzed reactions - Nicotinamide nucleotides, Flavin nucleotides, Co-enzymes A, Lipoic acid, Thiamine pyrophosphate, Biotin, Tetrahydrofolate and Co-enzyme B12. Modern concepts of evaluation of catalysis-catalytic RNA (Ribozyme), abzymes (catalytic antibodies), Synzymes (Synthetic enzymes), Site-directed mutagenesis.
3. **Monomeric enzymes** - the Serine proteases, Zymogen activation, Oligomeric enzymes - Isoenzymes (LDH) and multienzyme complexes (pyruvate dehydrogenase complex). Covalent modification (Glycogen phosphorylase, Glutamine synthase, Chymotrypsin).
4. **Immunology-** Organs and cells of immune system. Innate and acquired immunity, Cell mediated and humoral immunity (T-cells and B-cells) Classification of immunoglobulins, structure of IgG. Epitopes/antigenic determinants. Concept of haptens. Adjuvants. Monoclonal antibodies. Antigen-antibody reactions- agglutination, immunoprecipitation, immunodiffusion. Blood group antigens. Immunodiagnosics- ELISA. Vaccines and their classification. Traditional vaccines-live and attenuated. Modern vaccines recombinant and peptide vaccines. Outlines of hypersensitivity reactions.
5. **Composition of blood and Lymph-** Plasma and cells-RBC, WBC, platelets, blood clotting, plasma proteins, separation and applications, plasma therapy. Lymph.
6. **Auto immunity-** Introduction, Auto recognition, classes of auto immune diseases. (Hashimoto disease, thyrotoxicosis, Systemic lupus erythematosis, Autoimmune haemolytic anaemia, Rheumatoid arthritis).
7. **Immunoglobulins (Igs)-** Types of Igs, nature and structure of Igs - Light chain, heavy chain and functions. Adjuvants, Antibody production, enzymatic cleavage of Igs, Haptens.
8. **Nervous system and excretory system** - Introduction to nervous system, general organization of nervous system. Neurons-structure, types, properties and functions; Neurotransmitters. Cerebrospinal fluid-composition and functions, Reflex-types and properties. Introduction to excretory system. Organisation of kidney, Structure and functions of nephron, Urine formation, Role of kidneys in maintaining acid-base and electrolyte balance in the body.
9. **Endocrinology-** Endocrinology organization of endocrine system. Classification of hormones. Outlines of chemistry, physiological role and disorders of hormones of thyroid, parathyroid, pituitary and hypothalamus. Introduction of gastrointestinal hormones. Mechanism of hormonal action - signal transduction pathways for glucocorticoids and insulin. Adrenalin, estrogen and progesterone.
10. **Nutritional Biochemistry-** Balanced diet. Calorific values of foods and their determination by bomb calorimeter. BMR and factors affecting it. Specific dynamic action of foods. Energy requirements and recommended dietary allowance (RDA) for children, adults, pregnant and lactating women. Sources of complete and incomplete proteins. Biological value of proteins. Malnutrition Kwashiorkar, Marasmus and PEM. Vitamins- sources, structure, biochemical roles, deficiency disorders of water and fat soluble vitamins. Introduction to nutraceutical and functional foods. Bulk and trace elements-Ca, Mg, Fe, I, Cu, Mo, Zn, Se and F.
11. **Clinical Biochemistry-** Plasma proteins in health and disease. Liver diseases-jaundice. Liver function tests - conjugated and total bilirubin in serum, albumin: globulin ratio, Serum enzymes in liver diseases-SGOT, SGPT, GGT, CPK, Acid and alkaline phosphatases. Serum lipids and lipoproteins. Normal and abnormal constituents of urine. Renal function tests-Blood urea, creatinine, GFR, creatinine clearance. GTT and gastric and pancreatic function tests.

BIOLOGY

1. **Bacteria:** General characters and classification of Archaea and Eubacteria, Ultra structure, Nutrition and reproduction, and economic importance of Eubacteria. Salient features, biological importance of harmful and useful bacteria; Reproduction and Economic importance of bacteria.
2. **Viruses:** General account of Viruses: Definition, occurrence, discovery, prokaryotic & eukaryotic viruses, chemistry, symmetry, ultra structure of bacteriophage, plant and animal viruses, purification of viruses.
3. **Structural Organization of Plant Cells:** Structure and Function of Cell wall, Plasmodesmata, Plasma Membrane; Structure and Functions of Endoplasmic Reticulum, Golgi Apparatus, Lysosomes, Vacuoles, Chloroplast and Mitochondria. Cytoskeleton - elements, organization and function.
4. **Nucleus:** Interphase Nucleus, Nuclear membrane. Nucleosome structure and levels of Chromatin organization in Chromosomes, Euchromatin and heterocromatin, Structural organization of Centromere and Telomere. Sex chromosomes in plants. Cell cycle and its regulation, sex linked inheritance and diseases; types of chromosomes.
5. **Eukaryotic Genetics:** Mendelian principles, complementation test, Epistatic Gene interactions; Linkage and Crossing over, Gene Mapping using three point test cross, Cytoplasmic Inheritance.
6. **Microbial genetics:** Mapping of genes using Transformation, Conjugation and Transduction. Tetrad Analysis.
7. **Mutations:** Gene Mutations Types, Physical and Chemical Mutagens, Molecular basis of Gene Mutations.
8. **Principles of Evolution:** Origin of Life, Theories of organic evolution, Synthetic theory. Natural selection, Mechanisms of Speciation. Adaptive radiation, Isolating mechanisms; Speciation; Allopatricity and Sympatricity; Convergent evolution; Hardy - Weinberg Law, factors influencing equilibrium and gene frequencies: Centres of genetic diversity. Origin and Evolution of Wheat & Maize.
9. **Structure and Replication of DNA:** Nature of genetic material, and structure of DNA and polymorphism (A, B, and Z DNA) Biochemical and physical properties of DNA and RNA; DNA replication in prokaryotes and eukaryotes. Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, DNA damage and repair Mechanisms, Nucleosome structure and levels of Chromatin organization in Chromosomes, Cell cycle and its regulation.
10. **Gene expression:** Structure of prokaryotic and eukaryotic genes, RNA synthesis and processing; Transcription factors and machinery, formation of initiation complex, RNA polymerases, capping, elongation, and termination, RNA processing. RNA editing. splicing, and polyadenylation, RNA transport.
11. **Protein synthesis and processing:** Elucidation and features of genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, translational proof-reading, Posttranslational modification of proteins. Secondary structure, domains, motif and folds.

ENVIRONMENTAL SCIENCE

1. **Ecosystem** – Definition - Components - Structure - Types - Functions - Interrelationship of different ecosystems - Food chain - Food web – Productivity - Ecological energetics - Energy flow in the ecosystem-Ecological efficiency-Ecological Concepts of the Species- Habitat and Niche, ecological succession.
2. **Soil Nutrients**-Soil profile - Soil texture Soil classification-Soil organic matter-Soil microbes-Biogeochemical cycles (C, N, P, K)-Ecological aspects and their importance for maintenance of eco-balance - Food production and future human existence in the environment - Eco-friendly programmes.
3. **Toxicological Chemistry:** Introduction to toxicology and toxicological Chemistry Toxicants - Dose-Response Relationships - Reactions of acids and bases on surfaces - Toxic chemicals in the environment - Biochemical aspects of As, Cd, Pb, Hg, CO, O₃, PAN. Pesticides, MIC and carcinogens in air.

4. **Water Chemistry:** Water pollutants - Types - Sources - Heavy metals - Metalloids - Organic, Inorganic, Biological and Radioactive - Types of reactions in various water bodies including marine environment – Eutrophication - Ground water - Potable water.
5. **Environmental Degradation:** Man and Environment - Man made Degradation - Deforestation - Urbanization - Industrialization - Mining - Dam building and other activities.
6. **Environmental Toxicology:** Introduction of Toxicology - History and Types of Toxicology - Toxicity (LD₅₀ and LC₅₀) - Hazards - Risk Benefits - Risk ratio to tolerance limits - Acceptable daily intake - Threshold Value - Pesticide Toxicology - Detoxification - Resistance and Metabolism - Pesticide - Pesticide Classification - Pest Surveillance - Pest resistance - Residue and Effect - Heavy Metal Toxicology - Toxicology of some Hydrocarbons - Industrial Toxicology and Risk Assessment.
7. **Water Pollution:** Sampling, analysis and prevention - Determination of pH, DO, BOD. COD, Solids, color, turbidity, various forms nitrogen, phosphates, fluorides, sulphates, hardness, heavy metals, oil and grease, phenols, pesticides and radio nuclides.
8. **Air Pollution:** Sampling and analysis of SO₂, NO_x, NO₂, CO₂, fluoride, hydrocarbons and particulates - Cryogenic sampling - Impinges – Scrubbers – Adsorption - Absorption for analysis of SO₂, NO₂, CO₂, fluoride and hydrocarbons - Automobile emissions - Types and their control methods - Auto cyclic engines - Gaseous pollutant monitoring - Particulate - Ringleman Scale - Dosimetry - High volume samples - Analysis and control of particulate matter.
Indoor Air Pollution: Sources - Classification - Respirable particulates - Radon and biological contaminants - Analysis and design.
9. **Alternate energy Sources:** Need for alternate energy sources - Renewable energy sources.
Solar Energy: Importance - Collection of Thermal Energy - Flat Plate Collector-Solar Air Collector - Solar Concentrators - Thermal Energy Storage - Non-convective Solar Pond - Photovoltaic Systems.
10. **EIA Methodologies:** Physical Environment Assessment - Flora Assessment - Plant Survey - Animal population size - Aquatic Assessment - Necessity of public participation in environmental decision making - Prediction and assessment of visual impacts of socio-economic environment.
Eco-planning: Definition And concept - Land use policy for India - Urban and rural planning for India - Land use pattern - Cost benefit Analysis - Limits to Growth theory.
11. **Environmental Hazards and Management:** Pollutants: kinds- Air, Water, Soil, Sound, Radiation, Heavy Metals and Atomic Pollution, Effects on Plants and Ecosystems, strategies for pollution waste water treatment.
Waste management and bio-energy: Conventional, Non conventional energy resources, Environmental impacts, biogas digester, design and methanogenesis.
12. **Climatic Changes:** Green House Gases and Global Warming, Ozone hole, Impact on Plant and Ecosystem, Restoration.

Date: 02/02/2024
Place: Vijayawada

Sd/-
Secretary