



## GUJARAT ENVIRONMENT MANAGEMENT INSTITUTE (GEMI)

(An Autonomous Institute of Government of Gujarat)

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### 1. Syllabus for the post of Assistant Environmental Engineer's examination

Sr. No	Particular	Marks (Total Marks 100)
1	<p><b>Environmental Chemistry:</b> Beer - Lambert's Law - Limitations - UV visible spectroscopy - basic principles - application - Atomic absorption spectroscopy - Principles - applications Gas chromatograph - Principles and applications, distribution of microorganisms - Water, Air and Soil, Indicator organisms, coliforms - fecal coliforms, E. coli, Streptococcus, Clostridium, Ecotoxicology - toxicants and toxicity, factors influencing toxicity, effects - acute, chronic, bio concentration, bioaccumulation, bio magnification, bioassay, bio monitoring.</p> <p><b>Principles of Physical Chemistry:</b> Reversible reactions, equilibrium constant, Le-Chatelier principle. Reaction rate Order and molecularity, kinetic equations of different orders, reversible and consecutive reactions. Catalysis-type, characteristics, activation energy, mechanism of catalyst action, acid base catalysts. Photo catalysis. Adsorption-classification, adsorption of gases on solids, adsorption from solutions, ion exchange adsorption, applications, Longmuir theory</p>	15 Marks

	<p><b>Environmental quality measurement laboratory:</b></p> <p>Physical and chemical characteristics of water - pH, Electrical conductivity, Turbidity, Alkalinity, Acidity, Hardness, Sulphates, Fluorides, Nitrates. Analysis of solids content of water: Total solids, suspended solids, volatile solids, non volatile solids, Residual chlorine analysis, Optimum coagulant dose, Break point Chlorination.</p> <p>Concept of dissolved oxygen, BOD and COD - Ambient air quality Analysis: Determination of SPM, CO, NO<sub>x</sub> and SO<sub>x</sub>.</p> <p>Soil Analysis: pH, Conductivity, Cation exchange capacity, Sodium Adsorption ratio</p>	
2	<p><b>Physico-chemical process for water and wastewater treatment:</b> Water Quality-Physical, chemical and biological parameters of water- Water Quality requirement - Potable water standards -Wastewater Effluent standards -Water quality indices. Water purification systems in natural systems-Physical processes-chemical processes and biological processes-Primary, Secondary and tertiary treatment-Unit operations-unit processes.</p> <p>Mixing, Clarification - Sedimentation; Types; Aeration and gas transfer - Coagulation and flocculation, coagulation processes - stability of colloids - destabilization of colloidstransport of colloidal particles, Clariflocculation.</p>	15 Marks

	<p>Adsorption, adsorption equilibria- adsorption isotherms, Disinfection - chlorine dioxide; chloramines; ozonation; UV radiation</p> <p>Ion Exchange-processes, Application Membrane Processes, Reverse osmosis, Ultrafiltration, Electrolysis.</p>	
3	<p><b>Solid and hazardous waste management:</b> Types and Sources of solid and hazardous wastes - Need for solid and hazardous waste management - Legislations on management and handling of municipal solid wastes, hazardous wastes, and biomedical wastes.</p> <p>Handling and segregation of wastes at source - storage and collection of municipal solid wastes - Analysis of Collection systems - Need for transfer and transport - Transfer stations - labeling and handling of hazardous wastes.</p>	10 Marks
4	<p><b>Air quality management:</b> Air pollutants - Sources and classification of pollutants and their effect on human health vegetation and property- Effects - Reactions of pollutants and their effects-Smoke, smog and ozone layer disturbance - Greenhouse effect - Ambient and stack sampling.</p> <p>Atmospheric diffusion of pollutants - Transport, transformation and deposition of air contaminants - Air sampling &amp; pollution measurement methods - Ambient air quality and emission standards - Air pollution indices</p>	10 Marks

5	<p><b>Ground Water Contamination &amp; Pollution Transport:</b></p> <p>Introduction: Ground water and the hydrologic cycles, Ground water as a resource, Ground water contamination, Ground water as a Geotechnical problem, Ground water and geologic processes, Physical properties and principles, Darcy's Law, Hydraulic Head and Fluid Potential Piezometer and Nests, Hydraulic conductivity and permeability</p>	5 Marks
6	<p><b>Environmental impact assessment:</b> Evolution of EIA - Concepts - Methodologies - Screening - Scoping - Base line studies - Mitigation - Matrices - Check list.</p> <p>Rapid and Comprehensive EIA - Legislative and Environmental clearance procedures in India - Prediction tools for EIA.</p> <p>Assessment of impacts - Air - Water - Soil - Noise - Biological.</p> <p>Socio cultural environment - Public participation - resettlement and rehabilitation.</p>	10 Marks
7	<p>International Conventions on environment - Stockholm, Rio - 1992, Johannesburg, Rio - 2012; Montreal Protocol, Kyoto Protocol</p>	5 Marks
8	<p><b>Environmental Legislation and Management System:</b></p> <p>Introduction : Indian Constitution and Environmental Protection - National Environmental policies - Precautionary Principle and Polluter Pays Principle - Concept of absolute liability - multilateral environmental agreements and Protocols - Montreal Protocol, Kyoto</p>	10 Marks

agreement, Rio declaration - Environmental Protection Act, Water (P&CP) Act, Air (P&CP) Act - Institutional framework (SPCB/CPCB/MOEF)

**Water (P & Cp) Act, 1974:** Power & functions of regulatory agencies - responsibilities of Occupier, Provision relating to prevention and control, Scheme of Consent to establish, Consent to operate - Conditions of the consents - Outlet - Legal sampling procedures, State Water Laboratory - Appellate Authority - Penalties for violation of consent conditions etc. Provisions for closure/directions in apprehended pollution situation.

**Air (P & Cp) Act, 1981:** Power & functions of regulatory agencies - responsibilities of Occupier, Provision relating to prevention and control, Scheme of Consent to establish, Consent to operate - Conditions of the consents - Outlet - Legal sampling procedures, State Air Laboratory - Appellate Authority - Penalties for violation of consent conditions etc. Provisions for closure/directions in apprehended pollution situation.

**Environment (Protection) Act 1986:** Genesis of the Act - delegation of powers - Role of Central Government - EIA Notification - Siting of Industries - Coastal Zone Regulation - Responsibilities of local bodies mitigation scheme etc., for Municipal Solid Waste Management - Responsibilities of Pollution Control Boards under Hazardous Waste rules and that of occupier, authorization - Biomedical waste rules - responsibilities of generators and role of Pollution Control Boards

	Basic Knowledge of Industrial Safety	
9	Reasoning and Logic, Basic Mathematics	5 Marks
10	General Knowledge question on State, National and International issues. Current Events including Politics, Sports, Culture, Literature, Awards, Films, Science, Space Research, Current News, Finance, Budget	15 Marks

**Note:**

- ❖ **There shall be negative marking. For each incorrect answer, 0.25 marks will be deducted from the candidates' total marks. No negative marks will be awarded, if the "E" option is selected.**
- ❖ **Date of examination will be announced shortly.**