

### अनुसूची-1

सहायक लोक स्वच्छता एवं अपशिष्ट प्रबंधन पदाधिकारी के लिए बिहार लोक सेवा आयोग द्वारा संचालित होने वाली बिहार लोक स्वच्छता एवं अपशिष्ट प्रबंधन संवर्ग संयुक्त प्रतियोगिता परीक्षा हेतु पाठ्यक्रम।

यह सहायक लोक स्वच्छता एवं अपशिष्ट प्रबंधन पदाधिकारी के समय-समय पर सहायक लोक स्वच्छता एवं अपशिष्ट प्रबंधन पदाधिकारी के पदों पर सीधी भर्ती हेतु बिहार लोक सेवा आयोग द्वारा बिहार लोक स्वच्छता एवं अपशिष्ट प्रबंधन संवर्ग संयुक्त प्रतियोगिता परीक्षा इस पाठ्यक्रम के आधार पर संचालित की जायेगी।

परीक्षा दो पत्रों की होगी जिसमें अनिवार्य पत्र-I एवं अनिवार्य पत्र-II होंगे। प्रथम पत्र सामान्य अध्ययन वस्तुनिष्ठ (Objective) होंगे। अनिवार्य पत्र-II जो रसायन/पर्यावरण विज्ञान अथवा रसायन/सिविल/पर्यावरण विज्ञान/लोक स्वास्थ्य अभियंत्रण/जैव प्रावैद्यिकी अथवा प्लानिंग/ आर्किटेक्चर के लिए होंगे।

I. लिखित परीक्षा (वस्तुनिष्ठ) के प्रत्येक पत्र के लिए विषय, पत्र समय और कुल अंक निम्नांकित होंगे:-

(क) अनिवार्य पत्र-I

पत्र संख्या	विषय	अवधि	कुल अंक
1	सामान्य अध्ययन	02 घंटा	100

(ख) अनिवार्य पत्र -II

2	ठोस एवं तरल अपशिष्ट प्रबंधन	02 घंटा	100
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कुल (1+2) = 200

### II. स्तर और पाठ्यक्रम।

निम्नांकित पाठ्यक्रम के अन्तर्गत पत्रों का स्तर ऐसा होगा जो किसी भारतीय विश्वविद्यालय के रसायन शास्त्र/पर्यावरण विज्ञान में स्नातक अथवा रसायन/सिविल/पर्यावरण विज्ञान/लोक स्वास्थ्य अभियंत्रण/जैव प्रावैद्यिकी में बैचलर ऑफ इंजिनियरिंग/बी-टेक की डिग्री अथवा प्लानिंग/आर्किटेक्चर में बैचलर की डिग्री के लिए समीचीन होगा।

(क) अनिवार्य पत्र-I

प्रथम पत्र	सामान्य अध्ययन	सामान्य अध्ययन के पत्र में समसामयिक घटनाओं तथा दैनिक प्रेक्षण से संबंधित विषयों एवं अनुभवों और उनके वैज्ञानिक पहलुओं की जानकारी सम्मिलित होगी।
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(ख) अनिवार्य पत्र-II

द्वितीय पत्र	ठोस एवं तरल अपशिष्ट प्रबंधन	1. Solid Waste Management Unit 1: Types of solid wastes: municipal solid waste, industrial wastes, hazardous wastes, bio medical waste, E- waste. Evolution of Solid Waste Management - Solid waste: A consequence of life - Waste generation in a technological society - Material flow and waste generation - The development of solid waste management - Integrated solid waste management - Planning for integrated waste management - Operation of solid waste management system.
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		<p><b>Unit II: Municipal Solid Waste Characteristics - Solid waste generation – Composition - Determination of composition, Particle size - Heat value - Bulk and material density - Types of materials recovered - Mechanical properties - Biodegradability.</b></p> <p><b>Unit III: Collection of Solid Waste, Refuse collection systems- Commercial wastes - Transfer stations - Collection of recyclable materials - Litter and street cleanliness - Design of collection system.</b></p> <p><b>Unit IV: Solid waste processing, treatment and disposal: Biological process – Composting - production of biofertilizers and energy. Thermal process – Incineration, gasification, wet oxidation, pyrolysis, palletization and energy production. Waste management through Reduce, Recycle and Reuse. Kitchen waste management. Landfills - Classification - Types and methods. Design Engineering. Current Issues in Solid Waste Management - Public and private ownership and operations - Role of the solid waste engineering.</b></p> <p><b>2. Liquid waste Management</b></p> <p><b>Unit I: Introduction – Waste management : an overview , Liquid wastes: Municipal, Domestic and Industrial wastewater , Solid wastes : Municipal and Industrial Solid wastes , Environmental Engineering and Environmental Systems – an overview: Mass-balance approach to problem solving</b></p> <p><b>Unit II: Wastewater - Water resource and its significance – Water: a remarkable substance of planet earth, Water pollution : Types, sources and impacts – Surface water, ground water pollution, Wastewater : Domestic – black and grey water; industrial and agricultural wastewater</b></p> <p><b>Unit III: Wastewater Treatment - Flow – Sheets: Unit operations and unit processes , Primary treatment, Pre – treatment : Screening – bar racks, Grit removal, Communication, Flow – equalization., Sedimentation : Design concepts, Secondary treatment : Chemical unit processes: Precipitation, Coagulation, Disinfection Process design , Biological unit processes : nature and kinetics of biological growth : Aerobic process – activated sludge system, trickling filters , Anaerobic process – CSTR, Anaerobic Filters, UASB Oxidation ponds Process design. Advanced techniques: Membrane filtration, Gas stripping, Ion exchange, Advanced Oxidation Process (AOP).</b></p> <p><b>Unit IV – Water reuse: Water reclamation and reuse: Water reclamation technologies – process flow diagrams; Public health and environmental issues in water reuse, Agricultural and landscape irrigation; ground water recharge with reclaimed water – ground water recharge guidelines; Risk assessment for water reuse, Industrial water reuse: Cooling tower makeup water.</b></p> <p><b>3. Hazardous Waste Management</b></p> <p><b>Unit I: Introduction - Definition and classification of</b></p>
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		<p>hazardous waste- Need for hazardous waste management – Sources of hazardous wastes – Effects on community – terminology and classification – Storage and collection of hazardous wastes – Problems in developing countries – Protection of public health and the environment.</p> <p>Unit II: Biomedical and Chemical Wastes - Biomedical wastes – Types – Management and handling – control of biomedical wastes - Chemical wastes – Sources – Domestic and Industrial - Inorganic pollutants – Environmental effects – Need for control – Treatment and disposal techniques – Physical, chemical and biological processes – Health and environmental effects.</p> <p>Unit III: Physical and Chemical Treatments - Filtration and separation – Chemical precipitation – Solidification and stabilization technique – Chemical oxidation and Reduction – pervaporation – ozonation – Evaporation.</p> <p>Remedial actions - Techniques : Containment techniques – In situ Biotreatment options – Site remediation – Phytoremediation – Biofiltration</p> <p>4. Waste Management Rules, Regulations &amp; its Compliances.</p> <p>5. Environmental Impact Assessment &amp; Environmental Clearances. Site authorization &amp; Consent to Establish &amp; Consent to operate From Pollution Control Board of Bihar.</p>
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नोट:- सहायक लोक स्वच्छता एवं अपशिष्ट प्रबंधन पदाधिकारी के पदों पर नियुक्ति हेतु विषय एवं पाठ्यक्रम उपरोक्त के अनुसार होगी। विभाग उपरोक्त अनुसूची में अंकित विषय एवं पाठ्यक्रम को समय-समय पर आवश्यकतानुसार संशोधित कर सकेगा।

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### SCHEDULE-1

Syllabus for Bihar Public Sanitary and Waste Management Cadre Combined Competitive Examination conducted by Bihar Public Service Commission for Assistant Public Sanitary and Waste Management Officer

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This is a syllabus for Assistant Public Sanitary and Waste Management Officer. The Bihar Public Sanitary and Waste Management Cadre Combined Competitive Examination will be conducted by the Bihar Public Service Commission for direct recruitment to the posts of Assistant Public Sanitary and Waste Management Officer in consultation with Bihar Public Service Commission by the Urban Development and Housing Department from time to time.

The examination will be of two papers, in which Paper-I and Paper-II will be compulsory. The first paper will be General Studies Objective. Compulsory Paper-II will be Bachelor Degree in Chemistry/ Environmental Science Or, Bachelor of Engineering in Chemical/ Civil/ Environmental Science/ Public Health Engineering/ Bio Technology or Bachelor Degree in Planning/Architecture.

I. The Paper, Subject, Duration and Total Marks for written examination (Objective type) will be as follows: -

(A) Compulsory Paper-I

No. of Paper	Subject	Duration	Total marks
1	General Studies	02 Hours	100

(B) Compulsory Paper-II

2	Solid and Liquid Waste Management	02 Hours	100
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Total (1+2) = 200

#### II. Level and Syllabus:

Level of papers will be such as the syllabus of Bachelor Degree in Chemistry/ Environmental Science or, Bachelor of Engineering in Chemical/ Civil/ Environmental Science/ Public Health Engineering/ Bio Technology or Bachelor Degree in Planning/Architecture of Indian University as expedient.

(A) Compulsory Paper-I

<b>First Paper</b>	General Studies	The paper of General Studies will include information about current events and topics related to daily observations and experiences and their scientific aspects.
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(B) Compulsory Paper-II

<b>Second Paper</b>	Solid and Liquid Waste Management	1. Solid Waste Management Unit 1: Types of solid wastes: municipal solid waste, industrial wastes, hazardous wastes, bio medical waste, E- waste. Evolution of Solid Waste Management - Solid waste: A consequence of life - Waste generation in a technological society - Material flow and waste generation - The development of solid waste management - Integrated solid waste management - Planning for integrated waste management - Operation of solid waste management system. Unit II: Municipal Solid Waste
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Characteristics - Solid waste generation - Composition - Determination of composition, Particle size - Heat value - Bulk and material density - Types of materials recovered - Mechanical properties - Biodegradability. Unit III: Collection of Solid Waste, Refuse collection systems- Commercial wastes - Transfer stations - Collection of recyclable materials - Litter and street cleanliness - Design of collection system. Unit IV: Solid waste processing, treatment and disposal: Biological process - Composting - production of bio fertilizers and energy. Thermal process - Incineration, gasification, wet oxidation, pyrolysis, palletization and energy production. Waste management through Reduce, Recycle and Reuse. Kitchen waste management. Landfills - Classification - Types and methods. Design Engineering. Current Issues in Solid Waste Management - Public and private ownership and operations - Role of the solid waste engineering.2. Liquid waste Management Unit I: Introduction - Waste management: an overview, Liquid wastes: Municipal, Domestic and Industrial wastewater, Solid wastes: Municipal and Industrial Solid wastes, Environmental Engineering and Environmental Systems - an overview: Mass- balance approach to problem solving Unit II: Wastewater - Water resource and its significance - Water: a remarkable substance of planet earth, Water pollution: Types, sources and impacts - Surface water, ground water pollution, Wastewater: Domestic - black and grey water; industrial and agricultural wastewater Unit III: Wastewater Treatment - Flow - Sheets: Unit operations and unit processes, Primary treatment, Pre - treatment: Screening - bar racks, Grit removal, Communication, Flow - equalization., Sedimentation: Design concepts, Secondary treatment: Chemical unit processes: Precipitation, Coagulation, Disinfection Process design, Biological unit processes: nature and kinetics of biological growth: Aerobic process - activated sludge system, trickling filters, Anaerobic process - CSTR, Anaerobic Filters, UASB Oxidation ponds Process design. Advanced techniques: Membrane filtration, Gas stripping, Ion exchange, Advanced Oxidation Process (AOP). Unit IV - Water reuse: Water

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		<p>reclamation and reuse: Water reclamation technologies – process flow diagrams; Public health and environmental issues in water reuse, Agricultural and landscape irrigation; ground water recharge with reclaimed water – ground water recharge guidelines; Risk assessment for water reuse, Industrial water reuse: Cooling tower makeup water.3. Hazardous Waste Management Unit I: Introduction - Definition and classification of hazardous waste- Need for hazardous waste management – Sources of hazardous wastes – Effects on community – terminology and classification – Storage and collection of hazardous wastes – Problems in developing countries – Protection of public health and the environment. Unit II: Biomedical and Chemical Wastes - Biomedical wastes – Types – Management and handling – control of biomedical wastes - Chemical wastes – Sources – Domestic and Industrial - Inorganic pollutants – Environmental effects – Need for control – Treatment and disposal techniques – Physical, chemical and biological processes – Health and environmental effects. Unit III: Physical and Chemical Treatments - Filtration and separation – Chemical precipitation - Solidification and stabilization technique – Chemical oxidation and Reduction – pervaporation – ozonation – Evaporation. Remedial actions - Techniques : Containment techniques – In situ Bio treatment options – Site remediation – Phytoremediation – Bio filtration 4. Waste Management Rules, Regulations and its Compliances. 5. Environmental Impact Assessment and Environmental Clearances. Site authorization and Consent to Establish and Consent to operate From Pollution Control Board of Bihar.</p>
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**Note: The subject and syllabus for appointment to the posts of Assistant Public Sanitary and Waste Management Officer will be as above. The department may revise the subject and syllabus mentioned in the above schedule as per need, from time to time.**