# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE-4 SEMESTER – S22 TO W25 – QUESTION BANK**

## Subject Name & Code:

**ENVIRONMENTAL SCIENCE, SUSTAINABILITY AND RENEWABLE ENERGY- BE04000101**

**Note on Question Sources:** This question bank is compiled from old GTU subjects (3110007 Environmental Sciences & 3161914 Renewable Energy Engineering) and the ESSRE list. Since the new syllabus (BE04000101) started in 2024-25, no direct previous papers exist. These questions are the **best available match** to the new syllabus topics and sub-topics.

# Unit 1 – Introduction to Environment

**Repeated Questions: (from GTU papers – appeared more than once)**

Discuss the scope of environmental sciences.
○ Appeared in: W24 (Q1a, 03 marks), S22 (Q1c – part of context)

Explain the various components of the environment.
○ Appeared in: W24 (Q1b, 04 marks), W23 (Q1b, 04 marks), S23 (Q1b, 04 marks), S22 (Q1b, 04 marks)

Discuss the significance of environmental sciences to different engineering disciplines.
○ Appeared in: W23 (Q1c, 07 marks), S24 (Q1c, 07 marks), S22 (Q1c, 07 marks)

**Other Important Questions: (from GTU papers – appeared once)**

Describe the objectives and guiding principles of Environmental Sciences.
○ Appeared in: W24 (Q1c, 07 marks)

How does our interaction with the environment impact the world, and what can we do to promote sustainability?
○ Appeared in: S25 (Q1c, 07 marks)

Define: Atmosphere, Hydrosphere, Biosphere.
○ Appeared in: S25 (Q1a, 03 marks)

Explain the role of an environmental engineer.
○ Appeared in: S25 (Q1b, 04 marks)

What is environmental science?
○ Appeared in: S22 (Q2a, 03 marks)

Define: Environment, Ecology, Pollution.
○ Appeared in: W22 (Q1a, 03 marks)

Define environmental pollution.
○ Appeared in: S24 (Q1a, 03 marks)

What is environmental degradation? List out causes of environmental degradation.
○ Appeared in: W22 (Q1b, 04 marks)

**Additional Questions from Mid-Sem / Excel File (not repeated in GTU papers)**

List any three principles of Environmental Science. (3 marks – Remember)
○ Source: Excel File

Explain the importance of environmental awareness for engineers. (3 marks – Understand)
○ Source: Excel File

Describe the importance of environmental awareness for engineers. (4 marks – Understand)
○ Source: Excel File

Describe/illustrate with examples how technology impacts the environment. (4 marks – Apply)
○ Source: Excel File
Analyze the causes of environmental degradation in industrial areas and suggest preventive measures. (7 marks – Analyze)
○ Source: Excel File
Assess the role of engineers in conserving the environment. (7 marks – Evaluate)
○ Source: Excel File

# Unit 2 – Environmental Pollution

**Repeated Questions: (from GTU papers – appeared more than once)**
Discuss major water pollutants and their effects.
○ Appeared in: W24 (Q2c, 07 marks), W22 (Q2c, 07 marks)
Write a short note on water quality parameters.
○ Appeared in: W24 (Q2c OR, 07 marks), S25 (Q2b, 04 marks), S22 (Q2c OR, 07 marks)
Differentiate between sound and noise.
○ Appeared in: W24 (Q2a, 03 marks), W23 (Q5a OR, 03 marks), S22 (Q4a, 03 marks)
Explain the concept of eutrophication.
○ Appeared in: W23 (Q3b, 04 marks), S25 (Q2c, 07 marks), S24 (Q3b, 04 marks), S22 (Q3b, 04 marks)
Give classification of air pollutants.
○ Appeared in: W23 (Q4b, 04 marks), W22 (Q2a, 03 marks), S22 (Q4b, 04 marks)
Describe effects of air pollution on plants, property, and human beings.
○ Appeared in: W24 (Q3c, 07 marks), W23 (Q2c, 07 marks), S24 (Q3c, 07 marks), S22 (Q3c, 07 marks)
Explain sources & effects of noise pollution.
○ Appeared in: W24 (Q3c OR, 07 marks), S23 (Q5a, 03 marks), S22 (Q5a OR, 03 marks)

**Other Important Questions: (from GTU papers – appeared once)**
Define and explain: Pollution, Ecosystem, Wholesome Water, Environmental Degradation.
○ Appeared in: W24 (Q2b, 04 marks)
What are the primary sources of e-waste in India? Explain with examples.
○ Appeared in: W24 (Q3a, 03 marks), S23 (Q2c, 03 marks)
Enlist and explain factors affecting municipal solid waste generation.
○ Appeared in: W24 (Q3b, 04 marks), S24 (Q4b, 04 marks)
What are the steps for improving e-waste management by government and industry?
○ Appeared in: W24 (Q3a OR, 03 marks), S23 (Q2c OR, 03 marks)
State different methods of solid waste disposal. Explain one in detail.
○ Appeared in: W24 (Q3b OR, 04 marks)
Define biomedical waste and list its sources.
○ Appeared in: W23 (Q4a, 03 marks), S24 (Q3a, 03 marks), S22 (Q5a, 03 marks)
Explain the structure of the atmosphere with a neat sketch.
○ Appeared in: W22 (Q2c OR, 07 marks)
Differentiate between point and non-point sources of water pollution.
○ Appeared in: W22 (Q3a, 03 marks)
Define: Garbage, Incineration, Eutrophication, Particulate matter (PM).
○ Appeared in: W22 (Q2b, 04 marks)
Enlist sources of biomedical waste and discuss color coding for segregation.
○ Appeared in: W22 (Q3c OR, 07 marks)
State different methods of biomedical waste treatment. Explain any one in detail.
○ Appeared in: W24 (Q4b, 04 marks)
Give the classification of biomedical waste.
○ Appeared in: W24 (Q4b OR, 04 marks), S24 (Q3a, 03 marks)
State Indian ambient air quality standards.
○ Appeared in: W23 (Q4b OR, 04 marks)

**Additional Questions from Excel File (not repeated in GTU papers)**
Identify common air pollutants and their sources. (3 marks – Remember)

○ Source: Excel File
Explain the effects of particulate matter (PM) on human health. (3 marks – Understand)
○ Source: Excel File
Explain the effects of $SO_2$ and NOx on human health. (3 marks – Understand)
○ Source: Excel File
Describe the concept of Ambient Air Quality Standards. (3 marks – Understand)
○ Source: Excel File
Interpret water quality standards with suitable examples. (4 marks – Apply)
○ Source: Excel File
Interpret Ambient Air Quality Standards with suitable examples. (4 marks – Apply)
○ Source: Excel File
Demonstrate methods to control noise pollution in residential areas. (4 marks – Apply)
○ Source: Excel File
Compare the causes and effects of land pollution with water pollution. (4 marks – Analyze)
○ Source: Excel File
Differentiate between solid waste, biomedical waste, and e-waste in terms of sources and impacts. (4 marks – Analyze)
○ Source: Excel File
Demonstrate strategies for controlling noise pollution in urban areas. (7 marks – Apply)
○ Source: Excel File
Suggest engineering solutions for management of biomedical waste. (7 marks – Apply)
○ Source: Excel File
Analyze the causes and effects of acid rain and propose engineering solutions for mitigation. (7 marks – Analyze)
○ Source: Excel File
Justify the need for strict regulations on e-waste management. (7 marks – Evaluate)
○ Source: Excel File
Propose a pollution control plan for an urban industrial zone. (7 marks – Create)
○ Source: Excel File

# Unit 3 – Sustainability

**Repeated Questions: (from GTU papers – appeared more than once)**
Discuss the need for sustainable development.
○ Appeared in: W24 (Q4a, 03 marks), S24 (Q2a, 03 marks), S22 (Q1a, 03 marks)
Write a short note on acid rain.
○ Appeared in: W24 (Q4c, 07 marks), S22 (Q5c, 07 marks)
Write a short note on global warming due to greenhouse gases.
○ Appeared in: W24 (Q4c OR, 07 marks), W23 (Q3c OR, 07 marks)
Explain ozone layer depletion.
○ Appeared in: W23 (Q3c, 07 marks), S24 (Q4c, 07 marks), S22 (Q5c OR, 07 marks)
Discuss the benefits of calculating carbon footprints.
○ Appeared in: W24 (Q4a OR, 03 marks), W23 (Q3a, 03 marks)
Describe the applications of the 4R principle with example.
○ Appeared in: W24 (Q5c, 07 marks), S24 (Q5b OR, 04 marks), W23 (Q5c, 07 marks)
Explain the need of the 4R concept for waste minimization.
○ Appeared in: W24 (Q5c OR, 07 marks)
Narrate/Explicate the concept of 4R.
○ Appeared in: S22 (Q3a, 03 marks), W23 (Q5c OR, 07 marks)
Define green building and state its objectives.
○ Appeared in: W24 (Q5b OR, 04 marks), S24 (Q5a, 03 marks), S22 (Q5b, 04 marks)
Explain the fundamental principles of green building.
○ Appeared in: W23 (Q4c, 07 marks), S24 (Q5c, 07 marks)
Write a brief note on the concept of a smart city.
○ Appeared in: W24 (Q5b, 04 marks), S24 (Q5a OR, 03 marks)
Enlist features/core infrastructure elements of a smart city.
○ Appeared in: W23 (Q5b OR, 04 marks), S22 (Q5b OR, 04 marks)

**Other Important Questions: (from GTU papers – appeared once)**
Explain the concept of Clean Development Mechanism (CDM).
○ Appeared in: W23 (Q3a OR, 03 marks), S25 (Q4c, 07 marks)
List international steps for mitigation of global change.
○ Appeared in: W22 (Q5a OR, 03 marks)
Distinguish between primary and secondary carbon footprint.
○ Appeared in: W22 (Q5b OR, 04 marks)
What is the greenhouse effect? Discuss various greenhouse gases.
○ Appeared in: W22 (Q4c, 07 marks)
Explain the benefits of green buildings.
○ Appeared in: W22 (Q5c, 07 marks)
Explain different green building rating systems.
○ Appeared in: W23 (Q4c OR, 07 marks), S24 (Q5c OR, 07 marks)
Differentiate between recycle and reuse with example.
○ Appeared in: S22 (Q3a OR, 03 marks)
Differentiate between recycle and recover.
○ Appeared in: W22 (Q3b, 04 marks)
Explain 4R concept with suitable example.
○ Appeared in: W22 (Q3b OR, 04 marks)
Give an example of how the 4R principles can be applied in a household.
○ Appeared in: S23 (Q5a, 03 marks)

**Additional Questions from Excel File (not repeated in GTU papers)**

Define sustainability and circular economy. (3 marks – Remember)
○ Source: Excel File
Describe the concept of the 4R's with practical examples. (3 marks – Understand)
○ Source: Excel File
Explain the role of Sustainable Development Goals (SDGs) in engineering projects. (4 marks – Apply)
○ Source: Excel File
Apply the concept of 4R's to reduce waste in a college campus. (4 marks – Apply)
○ Source: Excel File
Explain with examples how green buildings contribute to sustainability. (4 marks – Apply)
○ Source: Excel File
Compare traditional building practices with green building principles. (4 marks – Analyze)
○ Source: Excel File
Analyze the impacts of climate change on agriculture. (4 marks – Analyze)
○ Source: Excel File
Assess the effectiveness of climate change mitigation strategies adopted globally. (7 marks – Evaluate)
○ Source: Excel File
Justify the importance of SDGs in engineering solutions. (7 marks – Evaluate)
○ Source: Excel File
Propose a sustainable waste management plan for a mid-sized engineering college campus. (7 marks – Create)
○ Source: Excel File
Propose a green building design for an engineering laboratory. (7 marks – Create)
○ Source: Excel File

# Unit 4 – Renewable Energy

**Conventional vs Renewable Energy & Need**
Explain the need for renewable energy.
○ Appeared in: W25 (Q1a, 03 marks), W22 (Q1a, 03 marks)
○ Matches: "Need of renewable energy"
Explain advantages and limitations of renewable energy.
○ Appeared in: W25 (Q1b, 04 marks), S24 (Q1a, 03 marks), S25 (Q1a & Q1b combined)
○ Matches: "Advantages, limitations" (but covers general RE, not source-wise)

**Solar Energy – Principles of generation**
Explain photovoltaic system / solar cell working / types.
○ Appeared in: W25 (Q3c, 07 marks), W23 (Q2a, 03 marks), S24 (Q1b, 04 marks), S25 (Q2a, 03 marks), S22 (Q3a, 03 marks)
○ Matches: "principles of generation of solar energy"
Explain solar cooker and methods to improve performance.
○ Appeared in: W25 (Q2a, 03 marks), S25 (Q2c, 07 marks), W22 (Q5b, 04 marks)
○ Matches: application example, but syllabus only says "principles" – optional.
Explain solar still with sketch.
○ Appeared in: W25 (Q2b, 04 marks), W24 (Q3b, 04 marks), S23 (Q1c, 07 marks)
○ Matches: application – not mandatory.

**Wind Energy – Principles of generation**
Explain basics of lift and drag in wind turbines.
○ Appeared in: W23 (Q3b, 04 marks), S23 (Q2a, 03 marks), S22 (Q3b, 04 marks)
○ Matches: part of "principles of generation of wind energy"
Explain horizontal axis vs vertical axis wind turbines.
○ Appeared in: W24 (Q4a, 03 marks), S23 (Q3b, 04 marks)
○ Matches: basic types – acceptable.

**Hydropower – Principles of generation**
No direct question on "principles of hydropower generation" in the 6th sem file (they focus on OTEC, tidal, wave).
○ **Missing** – use Excel or textbook.

**Biomass Energy – Principles of generation**
What is biomass energy?
○ Appeared in: W25 (Q4a, 03 marks)
○ Matches: definition.
Explain types of biogas plants / floating drum biogas plant.
○ Appeared in: W24 (Q3c, 07 marks), W23 (Q3c OR, 07 marks), S22 (Q4c, 07 marks), W25 (Q5c OR, 07 marks)
○ Matches: principles of generation (biogas production).
Explain factors affecting biogas generation.
○ Appeared in: W25 (Q4c, 07 marks), S24 (Q4c, 07 marks), S23 (Q3c, 07 marks)
○ Matches: operational principles.

**Geothermal Energy – Principles of generation**
Explain vapor dominated vs liquid dominated geothermal plants.
○ Appeared in: W24 (Q4b, 04 marks), S24 (Q5b, 04 marks)

○ Matches: principles of generation.
Explain advantages and applications of geothermal energy.
○ Appeared in: W23 (Q4c, 07 marks), S23 (Q5b, 04 marks)
○ Matches: advantages & limitations.
**Tidal Energy – Principles of generation**
Explain tidal power generation methods – single/double basin systems.
○ Appeared in: W23 (Q4c, 07 marks), S22 (Q4c, 07 marks), S25 (Q5a, 03 marks), W24 (Q4b, 04 marks)
○ Matches: principles of generation of tidal energy.

**Questions from Excel File (Aligned with New Syllabus Topics)**
List different types of renewable energy sources. (3 marks – Remember)
○ Source: Excel File
Define green hydrogen. (3 marks – Remember)
○ Source: Excel File
Describe the limitations of conventional energy sources. (3 marks – Understand)
○ Source: Excel File
Explain the need for renewable energy in sustainable development. (3 marks – Understand)
○ Source: Excel File
Demonstrate the working principle of solar photovoltaic systems. (4 marks – Apply)
○ Source: Excel File
Explain the process of wind energy generation with a diagram. (4 marks – Understand+Apply)
○ Source: Excel File
Compare conventional energy sources with renewable energy sources in terms of efficiency and environmental impact. (4 marks – Analyze)
○ Source: Excel File
Analyze the environmental impacts of geothermal energy. (4 marks – Analyze)
○ Source: Excel File
Compare hydropower and biomass energy in terms of efficiency. (4 marks – Analyze)
○ Source: Excel File
Justify the role of wind and hydropower in India’s energy mix. (7 marks – Evaluate)
○ Source: Excel File
Justify the role of renewable energy in India’s energy security. (7 marks – Evaluate)
○ Source: Excel File
Assess the potential of tidal energy in coastal regions of India. (7 marks – Evaluate)
○ Source: Excel File
Develop a case study on the potential of green hydrogen as a future energy carrier in India. (7 marks – Create)
○ Source: Excel File
Propose a hybrid renewable energy system for a rural community. (7 marks – Create)
○ Source: Excel File

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