Faculty of Technology - University of Ruhuna

Bachelor of Engineering Technology Honours

Level 2 (Semester I) End Examination – June / July 2025

Academic Year 2024/2025

Course unit: TMS2112 Basic Environmental Science **Duration: 2 hours**

INSTRUCTIONS TO THE CANDIDATES:

- This paper contains two parts (A and B). Part A contains 10 MULTIPLE-CHOICE QUESTIONS, and Part B contains 4 ESSAY-TYPE QUESTIONS.
- Answer ALL questions.
- This examination accounts for 60% of the module assignment. The total maximum mark attainable is 100. The marks assigned for each question sections are indicated in square brackets.
- Part A carries 20 marks (2 marks per question), and Part B carries 80 marks (20 marks per question).
- This is a closed book examination.
- If you have a doubt as to the interpretation of the wording of a question, make sure you take your own decision, but clearly state it on the answer script.
- The use of electronic communication devices is forbidden during this examination. Students are permitted to use a calculator only.
- All examinations are conducted under the rules and regulations of the University.

PART A

1. Which of the following is considered a non-renewable energy resource?
   (a) Coal
   (b) Wind
   (c) Geothermal
   (d) Biomass

2. Eutrophication in freshwater bodies is primarily triggered by an excess of which two nutrients?
   (a) Carbon and Oxygen
   (b) Nitrogen and Phosphorus
   (c) Calcium and Magnesium
   (d) Sulphur and Iron

3. In the waste management hierarchy, which approach is considered the most preferred and sustainable?
   (a) Recycling
   (b) Energy Recovery
   (c) Safe Disposal
   (d) Prevention/Source Reduction

4. In the PDCA cycle of ISO 14001, what does the 'C' stand for?
   (a) Control
   (b) Correct
   (c) Check
   (d) Comply

5. What is the primary purpose of conducting a Hazard Identification and Risk Assessment (HIRA) in the workplace?
   (a) To eliminate all workplace activities.
   (b) To evaluate risks and implement controls to mitigate them.
   (c) To punish employees for unsafe behaviour.
   (d) To speed up the manufacturing process.

6. Which sector is globally the largest contributor to anthropogenic Greenhouse Gas (GHG) emissions?
   (a) Agriculture
   (b) Waste Management
   (c) Deforestation
   (d) Energy and Electricity Generation

7. Prolonged occupational exposure to noise levels above what general threshold is widely considered harmful to human hearing without PPE?
   (a) 40 dB
   (b) 60 dB
   (c) 85 dB
   (d) 120 dB

8. A core concept of the "Circular Economy" is to:
   (a) Design out waste and keep materials in use.
   (b) Increase the ecological footprint of products.
   (c) Maintain a Take-Make-Dispose linear model.
   (d) Encourage planned obsolescence.

9. Which of the following represents the correct logical sequence of the scientific method?
   (a) Hypothesis → Observation → Experiment → Conclusion
   (b) Observation → Hypothesis → Experiment → Conclusion
   (c) Experiment → Hypothesis → Observation → Conclusion
   (d) Observation → Conclusion → Hypothesis → Experiment

10. According to the Brundtland Report, "Sustainable Development" is development that:
   (a) Prioritizes economic growth above all environmental concerns.
   (b) Meets the needs of the present without compromising the ability of future generations to meet their own needs.
   (c) Halts all industrial production to save natural resources.
   (d) Focuses entirely on social equity without regard to the economy.

[2 x 10 Marks = 20 Marks]

PART B

Question 01

A. The scientific method is a systematic process used to investigate environmental phenomena and solve ecological problems.

(a) State **four (4)** key characteristics of a good scientific hypothesis.

[04 Marks]

(b) Briefly explain how the scientific method can be applied to investigate a sudden, unexplained fish kill in a local lake. Provide **three (3)** logical steps of action.

[06 Marks]

B. The Sustainable Development Goals (SDGs) guide global environmental and human development efforts.

(a) Identify **three (3)** specific SDGs that directly relate to environmental conservation and briefly state the primary focus of each.

[06 Marks]

(b) Explain how the "Economic" and "Environmental" pillars of sustainability can sometimes conflict, providing **one (1)** industrial example.

[04 Marks]

Question 02

A. Eutrophication has become a major issue in Sri Lankan freshwater ecosystems due to agricultural and industrial runoff.

(a) Define Eutrophication and state **two (2)** anthropogenic (human-made) causes.

[04 Marks]

(b) Describe **two (2)** severe long-term environmental consequences of eutrophication on aquatic life.

[04 Marks]

B. Effective waste treatment techniques are required to manage different waste streams safely.

(a) Differentiate between "Hazardous Waste" and "Non-Hazardous Waste", providing **one (1)** manufacturing industry example for each.

[04 Marks]

(b) Explain the process of "Composting" as a solid waste treatment method and list **two (2)** of its main environmental benefits.

[08 Marks]

Question 03

A. Implementing an Environmental Management System (EMS) requires a thorough understanding of an organization's operations.

(a) For a large-scale textile dyeing plant, identify **two (2)** significant environmental aspects and state the corresponding environmental impact for each.

[04 Marks]

(b) Explain the role and responsibilities of "Top Management" in ensuring the successful implementation of ISO 14001 within a facility.

[06 Marks]

B. Occupational Health and Safety (OHS) is vital to protect workers in technological environments.

(a) Explain the concept of the "Hierarchy of Hazard Control" and list its **five (5)** levels in order from most effective to least effective.

[06 Marks]

(b) State **two (2)** types of Personal Protective Equipment (PPE) specifically required when handling highly corrosive liquid chemicals.

[04 Marks]

Question 04

A. Transitioning to sustainable energy sources is a critical step in reducing industrial emissions.

(a) List **two (2)** advantages and **two (2)** disadvantages of utilizing Solar Energy in a manufacturing facility.

[04 Marks]

B. A packaging manufacturing company wants to evaluate its environmental impact by calculating its carbon footprint for the year 2025. Use the provided data below:

Table 1: Annual Energy Consumption

Source/Activity	Type of Fuel	Annual Consumption (Liters)
Factory Boiler (Stationary)	Fuel Oil	15,000
Backup Generator (Stationary)	Diesel	5,000
Delivery Trucks (Mobile)	Petrol	12,000

Table 2: Electricity Data

Annual Electricity Consumption from National Grid	1,800,000 kWh
National Grid Emission Factor:	0.568 $kgCO_2e/kWh$

Table 3: Standard Emission Factors

Fuel Oil Emission Factor	2.68 $kgCO_2e$/Liter
Diesel Emission Factor	2.68 $kgCO_2e$/Liter
Petrol Emission Factor	2.31 $kgCO_2e$/Liter

Calculate the total GHG emissions and the overall Carbon Footprint:

(a) Calculate the Direct GHG emissions (Scope 1) resulting from stationary combustion.

[04 Marks]

(b) Calculate the Direct GHG emissions (Scope 1) resulting from mobile combustion.

[04 Marks]

(c) Calculate the Indirect GHG emissions (Scope 2) resulting from imported grid electricity.

[04 Marks]

(d) Determine the Total Carbon Footprint of the packaging facility for the year 2025 in tons of CO_2e (tCO_2e). Show the final conversion clearly.

[04 Marks]

-End of the Paper-