

University of Ruhuna- Faculty of Technology

Bachelor of Engineering Technology Honours

Level 2 (Semester I) Examination, June/July 2023

Academic year 2021/2022

Course Unit: TMS 2112 Basic Environmental Science (Written)

Duration: 2 hours

Instructions to Candidates

- This paper contains **two parts (A and B)** on **8 pages**.
- Part A contains **20 multiple choice questions** and Part B contains **4 essay type questions**.
- Answer **all** questions.
- Answers for part A should be provided in the given answer sheet.
- Calculators are permitted to use.

PART A

1. Lithosphere is,

- i. The solid crust of earth
- ii. Covered with a thin layer of soil.
- iii. Made with rocks and minerals.
- iv. Consisted of mountains, plateaus, plains, valleys, landforms

- a) i and ii only
- b) ii and iii only

- c) i, iii and iv only
- d) All the above

2. Which of the following is not an anthropogenic source of Sulfur Dioxide emissions?

- a) Coal-burning power plants
- b) Fossil fuel burning
- c) Volcanic eruptions
- d) All the above

3. Which one of the following is the correct statement on oxides of Nitrogen (NO_x)?

- a) The primary health effect of nitric oxide results from its tendency to react with hemoglobin in red blood cells as same as CO.
- b) Cyclone separator is used in vehicle engines to control NO_x emissions.
- c) Reaction of atmospheric O₂ and N₂ at room temperatures create NO_x.
- d) Main NO_x emitting sources are organic materials burning and volcanic eruptions.

4. What is the incorrect statement regarding wet scrubbers installed in factories to reduce air pollution?
- Caustic soda and Sodium Carbonate are the most widely used scrubbing liquids.
 - These machines do not require frequent maintenance, so it is cost effective.
 - Wet scrubbers can be used to remove a wide range of pollutants from sulfur to acidic gases that contribute to acid rain.
 - These units tolerate a wide range of temperatures, making them ideal for operation in almost any environment.
5. Select the correct combination.
- Kyoto Protocol- Holding the increase in the global average temperature to well below 2°C above pre-industrial levels
 - Paris Agreement- Bring down the emission of six greenhouse gases such as CO₂, CH₄, N₂O, HFCs, PFCs, SF₆
 - Montreal Protocol - To eliminate the substances that cause Ozone depletion in the stratosphere
 - None of the above
6. Which of the following are considered as key factors, when selecting a proper land to construct a sanitary landfill,
- Low groundwater level
 - Far away from flooding
 - Should comprise sandy soil
 - Should be a less populated area
- i, ii and iv only
 - ii, iii and iv only
 - i, iii and iv only
 - All the above
7. An example of a physical test that is conducted to check the water quality,
- Hardness test
 - pH test
 - Turbidity test
 - None of the above
8. Drinking water containing viruses can result in.
- Hepatitis
 - Blue Baby Syndrome
 - Minamata disease
 - Cholera

9. Which is the incorrect statement regarding the blue water footprint?
- The volume of surface and groundwater consumed as a result of the production of a good or service.
 - It is calculated as the volume of water that is required to dilute pollutants to such an extent that the quality of the water remains above agreed water quality standards.
 - Irrigated agriculture, industry and domestic water usage have a blue water footprint.
 - It also includes water abstracted from the surface or groundwater in a catchment and returned to another catchment or the sea.
10. Which of the following is the correct statement regarding Mesosphere?
- It contains approximately 75% of the average atmosphere's mass and 99% of the total mass of water vapor and aerosols.
 - The infamous ozone layer is found within this region.
 - In this region the temperature falls with an increase in altitude, resulting in a temperature decrease to about -90°C .
 - It is warmed by the absorption of solar X-rays by the nitrogen and oxygen molecules in this outer layer.
11. Which of the following cannot be used as emergency preparedness equipment during chemical spillage?
- Sorbent pads
 - Mini boom
 - Earmuffs
 - Eye wash bottle
12. The biocapacity and the ecological footprint of three different countries are mentioned below. Identify the ecological debtor country/countries.

Country	Biocapacity (hectares per capita)	Ecological Footprint (hectares per capita)
USA	1.60	8.10
Sweden	10.6	7.25
India	0.45	1.12

- Sweden
- India and Sweden
- USA and India
- USA and Sweden

13. Which is the correct statement regarding "waste upcycling"?

- a) The act of taking something no longer in use and giving it a second life and new function
- b) Collecting and processing materials that would otherwise be thrown away as trash and turning them into new products.
- c) Policy approach under which producers are given significant responsibility for the treatment or disposal of post-consumer products.
- d) None of the above

14. A company needs to measure the environmental impact of its newly launched product which is developed using recycled materials and compare that with an existing product. What would be the most suitable tool for this task?

- a) Carbon footprint
- b) Life Cycle Assessment
- c) Eco Innovation
- d) None of the above

15. Which of the following are examples of an ecosystem?

i) Desert ii) Lakes iii) Coral Reef iv) Crop field

- a) i, iii and iv only
- b) iii and iv only
- c) ii only
- d) All the above

16. The disinfection process is a key step of water purification which destroys pathogenic microorganisms that may cause water-borne diseases. Which of the following is an example of a disinfection process?

- a) Chlorination with UV light treatment
- b) Flocculation
- c) Filtration
- d) Distillation

17. This primary air pollutant is a colorless, odorless and tasteless highly toxic gas. It is toxic because it binds with hemoglobin and reduces oxygen (O₂) delivery to the body's organs and tissues. Identify the gas.

- a) Nitrous Oxide
- b) Carbon Monoxide
- c) Sulfur Dioxide
- d) Carbon dioxide

18. Which one of the following is an example/s of renewable energy source/s?

- i) Crude oil
- ii) Biomass
- iii) Natural Gas
- iv) Coal

- a) i only
- b) i, iii and iv only
- c) ii only
- d) iii and iv only

19. What would be a key feature of a company which is certified with ISO 14001:2015 environmental management system?

- i) Annual plan with responsible persons to achieve the environmental objectives.
- ii) Install energy efficiency motors by replacing obsolete motors.
- iii) Hand over the waste materials to a third party and earn additional income for purchasing raw materials.

- a) i and ii only
- b) ii and iii only
- c) i and iii only
- d) All of the above

20. Which of the following is an example of climate change adaptation?

- a) Reducing certain activities that generate GHG emissions
- b) Capturing and safely storing GHGs
- c) Breeding crops that tolerate heat and drought
- d) Enhancing the forest cover

PART B

1. Water pollution has become one of the biggest environmental concerns all over the world and it has been predicted that by 2025, half of the world's population will be living in water-stressed areas.
 - a) List three (3) sources of water pollution.
(03 marks)
 - b) Define non-point source pollution by giving an example.
(04 marks)
 - c) Briefly describe two (2) main reasons behind the huge amount of wastewater generation in Textile industries.
(04 marks)
 - d) Briefly explain thermal pollution with an example and list two harmful effects caused by it.
(04 marks)
2. Faculty of Technology, University of Ruhuna is willing to establish ISO 14001:2015 environmental management system. Suppose that you are given the responsibility to handle the system development and implementation process.
 - a) Write down three (3) reasons why organizations are developing an environment management system in their premises.
(03 marks)
 - b) The first step of developing the EMS is the identification of interested parties. List down four (4) interested parties of the faculty and write down their needs & expectations.
(04 marks)
 - c) Preparation of the aspect register is one of the most important parts of the EMS development. Considering the canteen located inside the faculty, list out four environmental aspects and their possible environmental impacts.
(04 marks)
 - d) Under the EMS development, it is targeted to reduce electricity consumption by 10% by the end of 2023. Suggest two (2) possible actions that can be taken to reduce the electricity consumption of the faculty.
(04 marks)

3. Climate change is a long-term shift in global or regional climate patterns. Greenhouse Gas emissions due to human activities are the main reasons behind climate change.

a) List down two (2) pieces of evidence for climate change.

(02 marks)

b) Briefly explain why the energy sector has become the highest man-made greenhouse gas emission sector in the world.

(03 marks)

c) Carbon footprint is an important concept to understand the impact of an organization or an individual on global warming. The following data is given to calculate the carbon footprint of a Tea Factory for the year 2022.

(10 marks)

Data	Type of fuel	Annual Consumption (l)
Company-owned Car	Petrol	3,000
Boiler	Fuel Oil	15,500
Van (Employee Transportation)	Diesel	9,500

GHG	Global Warming Potential
CO ₂	1
CH ₄	28
N ₂ O	265

Annual Electricity Consumption	4,046,100 kWh
National Grid Emission Factor	0.568 kg/kWh

Fuel	Source	Density	Net Calorific Value	Emission Factor	GHG
		kg/m ³	TJ/Gg	Mt/TJ	
Fuel oil	Stationary	970	40.4	77.4	CO ₂
				0.003	CH ₄
				0.0006	N ₂ O
Diesel	Stationary	870	43	74.1	CO ₂
				0.003	CH ₄
				0.0006	N ₂ O
Diesel	Mobile	870	43	74.1	CO ₂
				0.0039	CH ₄
				0.0039	N ₂ O
Petrol	Mobile	755	44.3	69.3	CO ₂
				0.033	CH ₄
				0.0032	N ₂ O

Calculate the total GHG emission for the following categories and carbon footprint.

- i) Category 1: Direct GHG emissions
- ii) Category 2: Indirect emissions from transportation
- iii) Category 3: Indirect GHG emissions from imported energy
- iv) The carbon footprint of the Tea Factory for the year 2022

4. Waste generation has increased massively around the world in recent decades. By 2050, worldwide municipal solid waste generation is expected to have increased by roughly 70 percent to 3.4 billion metric tons.

- a) Write down three (3) reasons for massive waste generation all over the world. (03 marks)
- b) Open dumping is a widely practiced waste disposal technique in Sri Lanka. Write down two (2) adverse health impacts caused by open dumping. (02 marks)
- c) Briefly explain three (3) reasons why incineration is considered as one of the most hygienic and effective ways of waste treatment. (06 marks)
- d) Discuss two (2) major actions taken by Sri Lankan government on waste management. (04 marks)

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