UNIVERSITY OF RUHUNA – FACULTY OF TECHNOLOGY
BACHELOR OF ENGINEERING TECHNOLOGY HONOURS DEGREE
Level II (Semester I) Examination, November 2019.

Course Unit: TMS2112 Basic Environmental Science

Time Allowed Two Hours

All symbols have their usual meaning.

Answer all the questions in PART A and B.

PART – A

Choose the **BEST** possible answer and mark in the given answer sheet. Each question carries 2- marks.

1. The rise in global surface temperature of the earth during the last century is,
   a) 3 to 5 °C
   b) 5 to 10 °C
   c) 0 to 2 °C
   d) 0 to 0.5 °C

2. What are the two main gases produced by human activity that enhance the greenhouse effect?
   a) Carbon dioxide and ozone
   b) Methane and carbon dioxide
   c) Carbon dioxide and water vapour
   d) Carbon dioxide and sulphur dioxide

3. Which one of the following is a point source of pollution?
   a) Fertilizers and pesticides from agriculture
   b) Effluents from a rubber factory
   c) Urban area
   d) City streets

4. Which of the following statements best describes the mechanism that maintains Earth's surface at a temperature at which humans can live?
   a) Absorption of ultraviolet radiation at Earth's surface
   b) Balance between solar radiation and cooling by the oceans
   c) Absorption of incoming ultraviolet radiation by the ozone layer
   d) Equilibrium between incoming solar radiation and reradiated infrared radiation

5. Incineration of waste:
   a) Can be used to generate electricity
   b) Reduces the volume of waste
   c) Reduces the space requirement for landfills
   d) All of the above

6. Methyl chloroform, carbon tetrachloride, hydro fluorocarbons and chlorofluorocarbons are mainly known as,
   a) Mesosphere building substances
   b) Troposphere building substances
   c) Ozone building substances
   d) Ozone depleting substances

7. Which among the following gas is used as reference to calculate "Global Warming Potential (GWP)"?
   a) Carbon Dioxide
   b) Methane
   c) Ozone
   d) Nitrogen

8. Blue Baby Syndrome is caused by,
   a) High Nitrate levels in water
   b) High Phosphate levels in water
   c) High Fluoride levels in water
   d) High heavy metal contamination in water

9. Massive amount of water is held in underground rock structures known as,
   a) Fountains
   b) Springs
   c) Aquifers
   d) Groundwater

10. Which of the following are not considered as air quality parameter?
    a) Particulate matter level
    b) Sulfur dioxide level
    c) Ozone level
    d) Water vapour level

11. The pH of acid rain could be,
    a) 5.8
    b) 7.4
    c) 4.6
    d) 6.9

12. Which of the following emissions from human activities are responsible for acid rain?
    a) Carbon Dioxide
    b) Carbon Monoxide
    c) Particulate Matter
    d) Nitrogen Oxide

13. Ground level O_3 is known as secondary pollutant because,
    a) It affects indirectly to the air pollution
    b) It is not a widely spread pollutant
    c) Its effects are minor compared to primary air pollutant
    d) It is not emitted directly, but instead forms when precursor gases react in the presence of sunlight.

14. Cyclone separators are used in a coal power plant for,
    a) Reducing particulate matter emission
    b) Reducing carbon monoxide emission
    c) Reducing sulphur dioxide emission
    d) Reducing carbon dioxide emission

15. Which of the following gases is called the "silent killer" because it is colourless, odourless, tasteless and non- irritating.
    a) Carbon dioxide
    b) Nitrogen dioxide
    c) Carbon monoxide
    d) Nitric Oxide

16. This element was historically used in gasoline for motor vehicles and was phased out due to serious consequences such as, harm the kidneys, liver, nervous system and other organs, causing neurological impairments such as seizures, mental retardation and behavioural disorders.
    a) Acetone
    b) Methanol
    c) Toluene
    d) Lead

17. Cleaning products, varnishes, waxes, paints, and organic solvents contain a component which vaporize and escape easily into the atmosphere when they are used. These are known as,
    a) PAN
    b) Volatile Organic Compounds
    c) Particulate matter (PM_{10})
    d) Particulate matter ($PM_{2.5}$)

18. Cultural eutrophication is caused by,
    a) Human sewage
    b) Detergents
    c) Synthetic fertilizers
    d) All of above

19. An analysis of the types of shopping bags used by customers in supermarkets was undertaken. The study involved collecting data on raw materials used, energy consumption involved in manufacturing the different bags, recycling and re-using the bags, and major wastes released into the environment when the bags are disposed of. This type of analysis would be best described as,
    a) A life-cycle assessment.
    b) An environmental risk assessment.
    c) An environmental impact assessment.
    d) An environmental monitoring program.

20. Which of the following statements best describe thermal pollution?
    a) Increase in ambient air temperature with the increased amount of greenhouse gas emissions.
    b) Emission of hot air to the environment from industrial processes.
    c) Degradation of water quality by any process that changes ambient water temperature.
    d) None of the above.

PART – B

1) Most of the earth's surface is covered with water. "Natural Water Cycle" plays an important role in maintaining the earth's energy balance, living organisms and human societies.

i). Describe the natural water cycle using the key processes involved. [5.0]

ii). Explain using suitable diagrams how a typical landfill may lead to groundwater contamination with the aid of natural water cycle. [4.0]

iii). Why **prevention** of contamination is considered the best method to protect ground water? [3.0]

iv). Briefly describe two problems resulting from overuse of ground water in Sri Lanka. [3.0]

2)

i). Pollution may be defined as introduction of substances to a medium that brings harm to living organisms, disturbs ecological systems and damages structures or amenities. A very large number of streams, canals, rivers, lakes, reservoirs and the ocean are polluted due to the human activities. In general, sources of pollution can be categorized by "Point source pollution" and "Non-point source pollution".

a) Distinguish between "Point source pollution" and "Non-point source pollution" of surface water, giving examples. [3.0]

b) Name three water quality tests that are used to describe water pollution. [1.5]

ii). Eutrophication occurs naturally over centuries as a waterbody ages and are filled in with sediments. However, human activities have accelerated the rate and extent of eutrophication through both point-source and non-point discharges to waterbodies.

a) List four sources that may cause cultural eutrophication. [2.0]

b) Briefly explain two signs to identify a waterbody having eutrophication issues. [3.0]

c) Briefly describe four harmful effects of eutrophication of a waterbody. [4.0]

d) List three actions that can be taken towards prevention and reversal of eutrophication. [1.5]

3) Waste creates serious environmental, social and economic problems all over the world. Solid waste includes materials generated from the daily activities of human. Increasing population, developing economy, increasing rate of urbanization and consumption patterns has led to generate large amounts of waste. This has made the waste collection and disposal more challenging and almost all of these waste ends up in landfills, causing huge threat to the environment.

i). What is meant by "Climate Change"? How do landfills contribute to climate change? [3.0]

ii). List three advantages and three disadvantages of "Waste Incineration." [3.0]

iii). Represent the main stages of waste management hierarchy in "Integrated Solid Waste Management" in the pyramid format according to the weight given for each stage. [3.0]

iv). Prevention of unnecessary waste from being generated is also known as source reduction. Manufacturers adopt various techniques to achieve this practice. Write five waste prevention strategies that can be used when designing a product. [3.0]

v). Describe two special features of a product that is "Designed for Recycling". [3.0]

4) Indoor 24-hour mean Particulate Matter (PM) measurements collected from different households in Sri Lanka is shown in Table 1 below. These samples were chosen to represent rural, urban, low, middle and high income houses. According to WHO Guidelines, the recommended maximum concentrations of PM in air are, annual mean of 10 $\mu g/m^3$ and 24-hour mean of 25 $\mu g/m^3$.

i). Briefly describe what is Particulate Matter (PM). [2.0]

ii). What are the possible sources of PM in a household environment? [3.0]

iii). Considering the given data, identify the imminent problem in these households. [3.0]

iv). Based on these observations, develop a hypothesis to analyse the above problem scientifically. [4.0]

v). Based on your hypothesis, develop a prediction that can be tested in an experiment. [3.0]

Table 1 Indoor 24-hour mean PM concentration.

Sample No.	Indoor 24-hour mean PM concentration ($\mu g/m^3$)
1	369
2	218
3	097
4	086
5	196
6	186
7	246
8	220
9	191
10	135
11	169
12	188
13	087
14	250
15	242
16	274
17	204
18	210
19	140
20	080
21	042
22	053
23	032
24	040
25	060