UNIVERSITY OF RUHUNA – FACULTY OF TECHNOLOGY

BACHELOR OF ENGINEERING TECHNOLOGY

Level II (Semester I) Examination, October 2018

Course Unit: TMS2112 Basic Environmental Sciences

Time Allowed Two Hours

All symbols have their usual meaning.

Answer all the questions in both Part A and B

Part A

1) Which one of the following is a diffuse source of pollution?
   a) A pipe
   b) A city
   c) A ship
   d) A chimney

2) Coral reefs play a vital role in tropical waters around the planet. They are important breeding grounds for fish and other marine species. They also protect coastlines from storm erosion and remove carbon dioxide from the atmosphere. These actions would best be described as
   a) Social benefits.
   b) Ecosystem services.
   c) Biodiversity resources.
   d) Transport mechanisms.

3) The African Dwarf Crocodile is a species found in swamps and Rainforest Rivers in western Africa. The crocodile has been hunted as a food source and continual deforestation is causing a loss of its habitat. If these threatening processes continue, the species is thought to be at a high risk of extinction in the medium-term future. Which one of the following conservation categories would best be used to classify the species at present?
   a) Extinct
   b) Vulnerable
   c) Critical
   d) Endangered

4) An evaluation of a former factory site by the Environment Protection Authority has identified soil that is contaminated with heavy metals on part of the site and a number of other environmental concerns regarding water quality. This evaluation would be regarded as
   a) A life-cycle analysis.
   b) A bioremediation project.
   c) An environmental risk assessment.
   d) An ecologically sustainable development.

5) A company has produced a new manufacturing plan with a major focus on the concepts of 'reduce', 'reuse' and 'recycle'. This plan would be considered an example of
   a) The precautionary principle.
   b) A waste-minimisation strategy.
   c) An environmental risk assessment.
   d) An environmental impact assessment.

6) 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.

Refer the following description for questions (7) and (8).

A large dam is to be constructed to allow a small hydro-electric power plant to provide the electricity supply for a small town. This hydro-electric power plant will replace the current diesel generator.

7) One major environmental advantage of this change would be that hydro-electric power plants
   a) Last longer than diesel generators.
   b) Are cheaper to operate than diesel generators.
   c) Disturb ecosystems less than diesel generators do.
   d) Use a renewable energy source, while diesel is a non-renewable source.

8) An environmental risk assessment of the dam is to be conducted. The main purpose of the environmental risk assessment is to
   a) Ensure maximum local employment on the project.
   b) Minimise the number of people likely to object to the project
   c) Eliminate any disruption to the environment during construction.
   d) Balance any environmental damage against the benefit of the construction.

9) A pollutant can best be described as a
   a) Harmful solid, liquid or gas.
   b) Waste product created by human activity.
   c) Toxic substance controlled by government legislation.
   d) Substance introduced into the environment with undesired effects.

10) A major electronics company which produces refrigerators, changes the process for manufacturing the frames of the refrigerators so that less material has to be trimmed off. This is best described as an example of
   a) Hazard avoidance.
   b) Waste minimisation.
   c) The precautionary principle.
   d) Compliance with regulatory frameworks.

11) 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

12) Before implementing new construction project(infrastructure development), an evaluation should be done to see any possible adverse environmental impact from this project. This investigation could best be described as
    a) A regulatory framework.
    b) An Environmental Impact Assessment.
    c) An Environmental Management System.
    d) An ecologically sustainable development.

13) Any change or modification in the physical, chemical and biological properties of water that will have a detrimental consequence on living things
    a) Water pollution
    b) Point source pollution
    c) Purification
    d) Potable water

14) A likely pH of acid rain could be
    a) 5.8
    b) 7.4
    c) 4.6
    d) 6.9

15) What consists of collecting materials that can be broken down and reprocessed to manufacture new items?
    a) Composting
    b) Deep-well injection
    c) Recycling
    d) Source reduction

16) Leachate is:
    a) A by-product of waste incineration
    b) A non-recyclable type of plastic
    c) Liquid that results when garbage substances in a landfill dissolve in water
    d) The water-proof seal used to line modern sanitary landfills

17) Incineration of solid waste:
    a) Can be used to generate electricity
    b) Reduces the volume of waste
    c) Reduce the need for landfills
    d) All of the above

18) Integrated waste management arranges all of the strategies of dealing with municipal solid waste in order, with the goal of minimizing what ends up in a landfill, the first step in waste management is,
    a) Incineration
    b) Reuse
    c) Recycle
    d) Reduce

19) A factory uses recycled paper to produce pulp that is then used to make paper. If 75% of the recycled paper is converted into pulp, how much recycled paper is required to produce 1 tonne of pulp?

a) 0.25 tonnes
b) 0.75 tonnes
c) 0.95 tonnes
d) 1.33 tonnes

20) Which of the following is the best description of sulphur dioxide?

a) A gas less dense than air
b) A gas more dense than air
c) A gas insoluble in water
d) An acidic liquid at ordinary room temperature

21) The Environment Protection Authority (EPA) has guidelines for the maximum amount of noise that may be heard from the turbines outside the boundaries of the wind farm. This is best described as an example of

a) Life Cycle Analysis.
b) Waste Minimisation.
c) Regulations.
d) Environmental Management System.

22) Which of the following is likely to be caused by the enhanced greenhouse effect on Earth?

a) Rising sea levels
b) More extensive acid rain
c) Snowfalls at lower altitudes
d) A direct threat to marine life

23) Which of the following groups contains only examples of renewable energy sources?

a) hydroelectric, coal, wind
b) nuclear, natural gas, solar
c) solar, wind, hydroelectric
d) hydroelectric, natural gas, wind

24) The haze that creates when sunlight reacts with nitrogen and volatile organic compounds that emits from fossil fuel emissions of automobiles and factories, is called

a) Fog
b) Smog
c) Flame
d) Smoke

25) A group of plants, animals or living organisms living together and interacting with the physical environment in which they live, is a

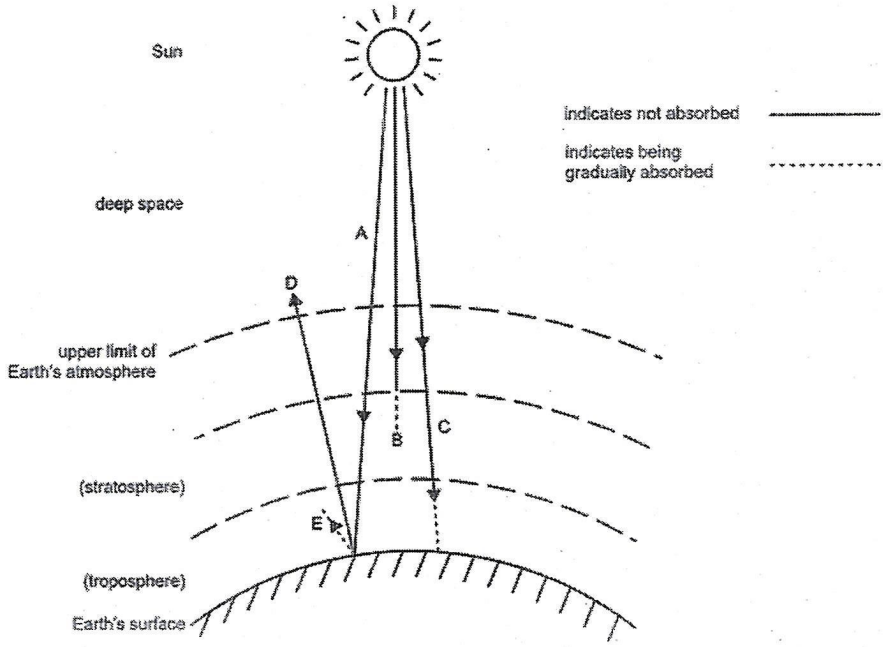
a) Natural system
b) Sub system
c) Bio system
d) Ecosystem

Part B

1. Global warming is the term used to describe a gradual increase in the average temperature of the Earth's atmosphere and its oceans. Scientific researchers have shown that global surface temperature of the Earth has increased by 0.74 ± 0.18 °C during past 100 years.

    a. What does cause global warming?
    b. What is climate change?
    c. Explain how global warming affects climate change.
    d. Briefly explain how the greenhouse gasses contribute to keep the Earth warm enough for living.

2. In the diagram below (not to scale) the lines/arrows A–E can indicate ultraviolet (UV), visible or infrared radiation (IR).



    a. Write which type of radiation best fits each line.
        A = _____
        B = _____
        C = _____
        D = _____
        E = _____

    b. Write two naturally occurring greenhouse gases.
    c. Write a greenhouse gas that does not occur naturally but has been introduced into the atmosphere by human activity.
    d. Name a gas contributing to the greenhouse effect that occurs naturally but has been substantially increased by human activity.
    e. Explain the difference between the natural and enhanced greenhouse effects.
    f. Explain the impact of the enhanced greenhouse effect on life on earth.

3. The hourly average sulphur dioxide (SO_2) emission concentration is being monitored at a monitoring station in a smelter's large chimney. The smelter operates from 6.00 a.m. to 3.00 p.m every day.

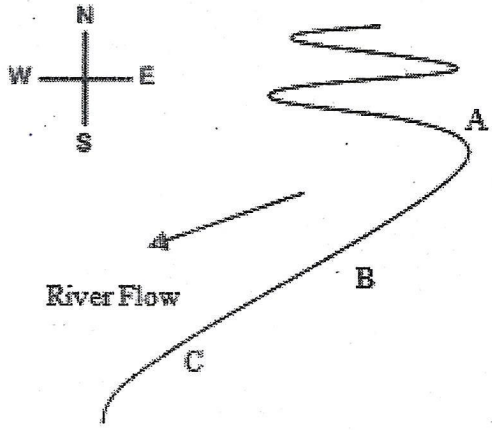
Time	Hourly average sulphur dioxide concentration. ppb (parts per billion)
6.00a.m.	20
7.00a.m.	40
8.00 a.m.	120
9.00 a.m.	160
10.00 a.m.	220
11.00 a.m.	180
12.00noon	160
1.00p.m.	40
2.00p.m.	20
3.00p.m.	20

a. Sketch the sulphur dioxide emission concentration against time.
b. The national standard for the sulphur dioxide emission is a maximum concentration of 160ppb average per hour. Show the national standard value by a line on the above sketch.
c. Based on the sketch you have drawn, describe the sulphur dioxide emission from this smelter.
d. Is the smelter a point-source pollution or non-point source pollution? Explain.
e. What can be the possible environmental impacts from this smelter?

4) The following diagram shows a river flowing through a rural farming area. The river flows generally from north to south, passing locations A, B and C in order. An environmental scientist takes three water samples at each location A, B and C. She then analyses each sample to find concentrations of the following pollutants: nitrates, copper and hydrocarbons.

Local health standards specify the maximum allowable quantities of these pollutants in drinking water are to be

Hydrocarbons – 50 mg/L
Nitrates – 50 mg/L
Copper – 2 mg/L



	Nitrates (mg per liter)			Copper (mg per liter)			Hydrocarbons (mg per liter)		
Sample Number	Sample1	Sample2	Sample3	Sample1	Sample2	Sample3	Sample1	Sample2	Sample3
Location A	0.25	0.22	0.25	0.003	0.003	0.005	40	45	30
Location B	1.75	1.63	1.65	0.010	0.008	0.09	220	260	280
Location C	1.95	1.76	1.88	0.011	0.010	0.009	450	400	350

a. Why were the three samples taken at the same location to measure concentrations of pollutants?
b. What may be the major source of pollutants in this area?
c. Compare the Nitrates, Copper and Hydrocarbon quantities in the above 3 locations of the river?
d. Apart from above 3 pollutants, name 2 or 3 other types of pollutants in a farming area.
e. Considering above observations, what can be the imminent problem of the water quality in this river and develop a hypothesis to analyze the above problem scientifically?
f. Based on your hypothesis, develop a prediction that can be tested in an experiment.