



 SUBJECT: **Environmental Science**
 DATE: 19th September 2020
 TIME: 9:00 a.m. to 12:05 p.m.

Answer **ALL** questions in Section A and any **TWO** questions from Section B.

Section A carries 80 marks and Section B carries 40 marks. You are advised to spend about two hours on Section A and one hour on Section B.

SECTION A: Answer ALL questions from this section.

1. (a) Complete the following account on soil formation by choosing the appropriate term or phrase from the following list. Each term may be used once or not at all.

| | | | |
|-------------|-----------|---------------|---------------|
| breaks down | builds up | anthropogenic | biological |
| bacteria | organic | inorganic | decomposition |
| physical | longer | chemical | natural |

Soil is a complex mixture of eroded rock, mineral nutrients, decaying _____ matter, water, air and living organisms. A couple of centimetres of fertile soil may take several years to form. Soil formation in colder and drier regions will take _____ than in warmer and wetter regions. Soil begins to form when the process of weathering _____ the parent rock. _____ weathering occurs when changing temperatures causes the rock to break apart. _____ weathering occurs when conditions alter the chemical composition of rock. _____ weathering occurs when living things contribute to the weathering process. The fertility of the soil is dependent on the breakdown of dead matter by soil _____ and fungi. The process is called _____ and ensures the availability of mineral nutrients in the soil.

(4)

This question continues on the next page.

(b) For each of the following processes decide whether it increases or decreases soil erosion by underlining the correct term. Give a reason for your answer.

(i) Multicropping: increases / decreases soil erosion (underline the correct term).

Reason: _____

_____ (2)

(ii) Gullyng: increases / decreases soil erosion (underline the correct term).

Reason: _____

_____ (2)

(iii) Overgrazing: increases / decreases soil erosion (underline the correct term).

Reason: _____

_____ (2)

(iv) Terracing: increases / decreases soil erosion (underline the correct term).

Reason: _____

_____ (2)

(Total: 12 marks)

2. The carbon and nitrogen cycles are pathways by which the chemical substances move through the living and non-living components of the Earth.

(a) Give **ONE** way how inorganic nitrogen enters living organisms.

_____ (1)

(b) Give **ONE** process how carbon from the atmosphere enters living organisms.

_____ (1)

(c) Give **TWO** examples of how the nitrogen cycle has been negatively impacted by humans.

_____ (2)

(d) Give **TWO** examples of how the carbon cycle has been negatively impacted by humans.

_____ (2)

(Total: 6 marks)

3. (a) State whether each of the statements below are true or false.

| | Statement | True or False |
|-------|--|----------------------|
| i. | A thermocline is the transition layer between the warmer mixed water at the surface and the cooler deep water below. | |
| ii. | It is very difficult to tell when you have reached the thermocline in a body of water. | |
| iii. | In the thermocline, the temperature decreases rapidly from the mixed layer temperature to the much colder deep water temperature. | |
| iv. | Tides are caused by the gravitational interaction between the sun and the moon. | |
| v. | Runoff is the water that collects or flows beneath the earth's surface, filling the porous spaces in soil, sediment, and rocks. | |
| vi. | The upper surface of groundwater is known as the water table. | |
| vii. | The world's freshwater resources are continuously replenished through precipitation. | |
| viii. | The world's highest concentration of freshwater is found in rivers and lakes. | |
| ix. | Reverse osmosis is a process that removes contaminants from water by pressure, forcing water molecules through a semipermeable membrane. | |
| x. | An example of a subduction zone is when an oceanic plate is forced underneath a continental plate. | |
| xi. | Transform fault boundaries occur at localities where continental plates are sliding past each other and cause volcanism and earthquakes. | |
| xii. | The lithosphere is a thin and shifting crust floating over the asthenosphere. | |

(6)

(b) Choose **THREE** false statements and give a reason why each statement is false.

(i) Statement number: _____

Reason: _____

_____ (1)

(ii) Statement number _____

Reason: _____

_____ (1)

(iii) Statement number _____

Reason: _____

_____ (1)

(Total: 9 marks)

Please turn the page.

4. Explain each of the following statements related to different aspects of atmospheric pollution:
(a) Burning of fossil fuels increases the incidence of acid rain.

(2)

(b) Acid rain creates a negative impact on the ecosystem.

(2)

(c) Both oxides of carbon are considered as pollutants, but carbon monoxide is more harmful than carbon dioxide.

(2)

(d) Even though there are several pollutants that contribute to the greenhouse effect, they all lead to the same outcome.

(2)

(e) Some pollutants are mostly dangerous in the stratosphere as they are responsible for the ozone hole.

(2)

(f) Nitrogen and oxygen are both harmless components of air. However, when they combine, they produce gases that are considered as harmful pollutants.

(2)

(Total: 12 marks)

5. Choose the correct term from the following list which best fits the description of the concept or process. Each term may be used once or not at all.

- | | | |
|---------------------|--------------|-------------------|
| primary treatment | desalination | thermal pollution |
| secondary treatment | salinisation | aquifers |
| tertiary treatment | infiltration | leaching |

| Concept or Process | Term |
|--|------|
| The removal of inorganic salts from wastewater to improve its quality before being re-used, recycled or discharged into the environment. | |
| The process of water percolation into the soil and pores and hollows of permeable rocks. | |
| Porous, water-bearing layers of sand, gravel and rock below the Earth's surface, serving as reservoirs for groundwater. | |
| A process that removes solids from sewage by mechanical means before being discharged or subjected to further treatment. | |
| Removal of salt from water by distillation, freezing or by reverse osmosis. | |

(Total: 5 marks)

6. Give **ONE** reason to support each of the following statements on recycling of solids.

(a) Aluminium is an ideal metal for recycling.

_____ (2)

(b) Recycling paper can have negative effects on water courses.

_____ (2)

(c) Recycling of mixed plastic waste is not considered as a sustainable process.

_____ (2)

(d) The process of recycling glass is sustainable and cost-effective.

_____ (2)

(e) It is better to recycle metals rather than extracting them from their raw material.

_____ (2)

(Total: 10 marks)

7. Read the following news article and answer the questions that follow.

'Silent death': Australia's bushfires push countless species to extinction

Ecologists say that the months of intense and unprecedented fires that have burned through the Australian bush will almost certainly push several species to **extinction**. The fires have pushed back **conservation** efforts by decades.

Because of the fires, birds have lost the trees in which they breed, as well as the fruits and invertebrates they feed on. Ground-dwelling mammals that survived the fires emerge only to find an open landscape with nowhere to hide from their predators. In the burnt areas, the animal species that could not fly away – like koalas and greater gliders – are now gone. Wombats may have survived as they live underground, but even if they escaped the immediate fire front, there is essentially no grass or roots left in a burnt landscape and they will starve.

As the fires moved into Kosciuszko National Park, an ecologist from the University of Sydney said that he is now concerned about the **endangered** mountain pygmy possum. One important factor, he said, was the ecological role that many affected animals played. Bandicoots help to move fungal spores after feeding. These spores help promote regrowth after fires. If those animals die, that "ecological service" goes with them.

The director of the University of New South Wales Centre for Ecosystem Science concluded that the scale of the extent and severity of these bushfires will be a serious problem for many, many species and it will set back the **biodiversity** of these forests for decades.

Adapted from: <https://www.theguardian.com/environment/series/environmental-investigations>

(a) Explain the following terms as used in the article above:

(i) Extinction: _____
_____ (1)

(ii) Conservation: _____
_____ (1)

(iii) Endangered: _____
_____ (1)

(iv) Biodiversity: _____
_____ (1)

(b) From the article above, list **ONE** animal that can be classified as:

(i) a predator: _____ (1)

(ii) a herbivore: _____ (1)

(iii) a producer: _____ (1)

(c) The third paragraph of the article refers to a relationship between bandicoots and fungal spores. Name the term that is used to refer to this type of relationship and briefly explain it.

Name: _____ (1)

Explanation: _____

_____ (1)

(d) What type of ecological succession will be involved when the Australian bush area is restored?

_____ (1)

(e) Humans can help rectify the Australian bush situation through active restoration. Name **ONE** example of how this can be done.

_____ (1)

(Total: 11 marks)

8. (a) In the space below draw (i) a pyramid of biomass and (ii) a pyramid of numbers for the following food chain.



(i) Pyramid of biomass

(ii) Pyramid of numbers (4)

This question continues on the next page.

(b) Distinguish between a pyramid of numbers and a pyramid of biomass.

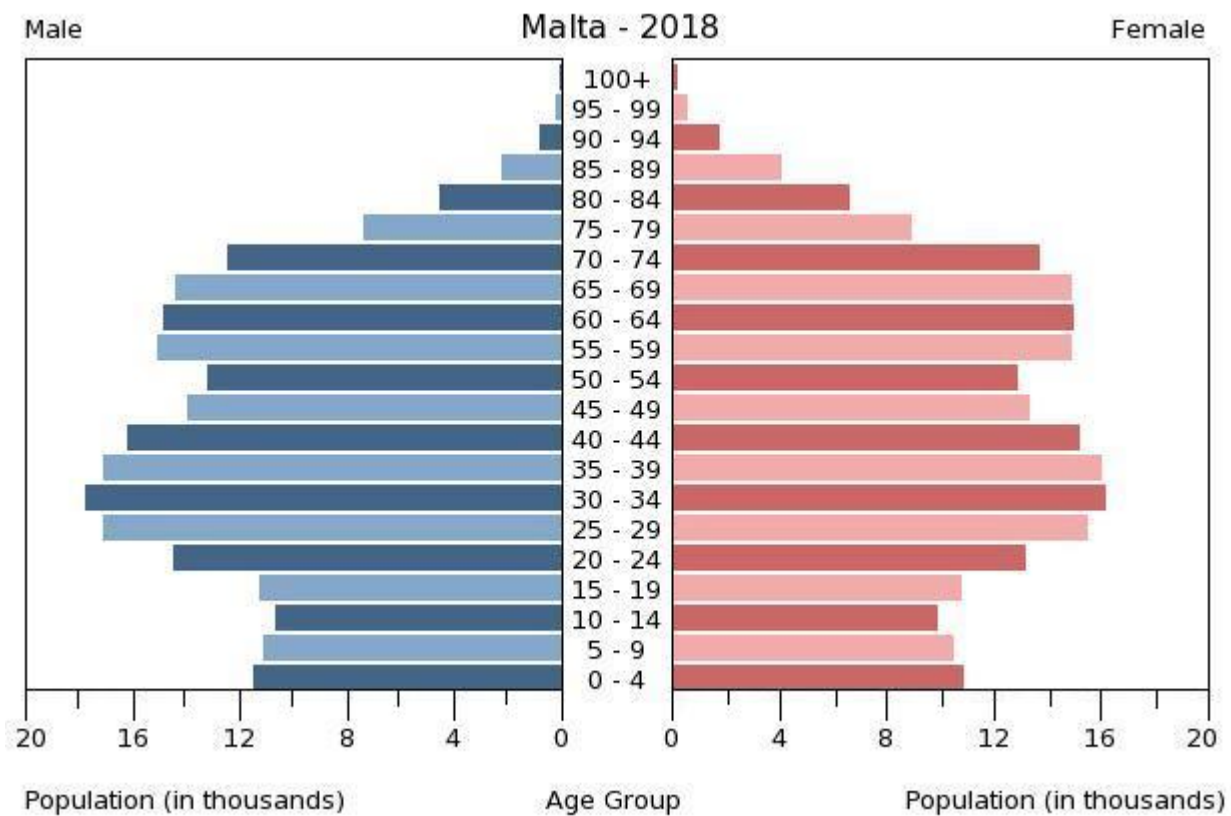
_____ (2)

(c) Explain the impact that logging would have on the above food chain.

_____ (2)

(Total: 8 marks)

9. This question deals with population pyramids.



Source: CIA World Factbook

(a) Besides birth rate, name another **TWO** factors that contribute to an increase or decrease in the population.

_____ (2)

(b) Give the total number of individuals between the ages of 35 – 39.

_____ (1)

(c) Calculate what percentage of this age group are females.

_____ (1)

(d) With every decade, Malta's population pyramid gets higher, but narrower at the bottom. What does this imply about the changing Maltese population?

 _____ (1)

(e) List **TWO** socio-economic consequences that are currently being faced in Malta due to the changes in our population.

 _____ (2)

(Total: 7 marks)

SECTION B: Answer any TWO questions from this section.

Write your answers in the space provided in this booklet. If you need more space to continue your answers you may request another booklet from your invigilator.

1. (a) Draw a diagram summarising the rock cycle. Briefly explain the processes involved when rocks change from one form to another. (12)
- (b) Extraction of mineral and non-mineral resources can have negative impacts on the environment. Describe **FOUR** ways how the environment can be impacted negatively during extraction. (8)

(Total: 20 marks)

2. Briefly explain the following:

- (a) The structure of the atmosphere and the variation of temperature within each of its layers. (5)
- (b) The greenhouse effect as a natural phenomenon. (5)
- (c) The Earth's overall radiation budget. (5)
- (d) Global climate circulation through polar cells, Ferrel cells and Hadley cells. (5)

(Total: 20 marks)

Please turn the page.

- 3. (a) Define the term smog. (2)
- (b) Explain photochemical smog referring to its occurrence, composition and chemical reactivity. (3)
- (c) State and explain **THREE** effects of photochemical smog on human health and / or the environment. (6)
- (d) Describe **TWO** effective control measures for photochemical smog. (4)
- (e) What is temperature inversion and how does it enhance the negative effects of air pollution? (5)

(Total: 20 marks)

- 4. Distinguish between the following pairs of terms:
 - (a) Fossil fuels and biofuels; (4)
 - (b) Reverse osmosis and water harvesting; (4)
 - (c) Eutrophication and biodegradation; (4)
 - (d) Catalytic converters and electrostatic precipitators; (4)
 - (e) Point source pollution and non-point source pollution. (4)

(Total: 20 marks)

- 5. (a) Sketch, label and briefly describe **THREE** types of biological population growth patterns. (9)
- (b) Explain the following statements relating to populations:
 - (i) In less developed countries (LDCs), a human population with a high fertility rate usually also exhibits a high mortality rate. (6)
 - (ii) Predator and prey populations cycle through time. Generally, the predator population peaks after there is a peak in the prey population. (5)

(Total: 20 marks)

- 6. (a) Define the term biome. (3)
- (b) Briefly explain the role of climates in the formation of earth's terrestrial biomes. Support your explanation by giving **TWO** examples of biomes. (7)
- (c) Explain the meaning of the term species diversity. (2)
- (d) Describe how species have become adapted to living in extreme biomes of the Tundra and the Desert. Give **FOUR** characteristics of flora or fauna present in each biome. (8)

(Total: 20 marks)
