Index Number: _____ IM11.23s

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

INTERMEDIATE MATRICULATION LEVEL
2023 SECOND SESSION

SUBJECT:	**Environmental Science**
DATE:	5th September 2023
TIME:	4:00 p.m. to 7:05 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. Underline the correct word in the following sentences:

(a) About 90% of all marine life inhabits the (photic / bathyal / abyssal) zone. (1)

(b) The depth of the photic zone depends on the (density / temperature / transparency) of the water. (1)

(c) (Ice / Sand / Forest) has the lowest albedo. (1)

(d) Intense solar heating at the equator initiates (Hadley / Ferrell / Polar) Cells. (1)

(e) Plants return water vapour to the atmosphere by (respiration / transpiration / evaporation). (1)

(f) (Percolation / Leaching / Infiltration) is the downward movement of water through soils and porous rocks. (1)

(g) A (perched / mean-sea level / confined) aquifer is one that occurs above the regional water table. (1)

(h) A (thermosphere / temperature inversion / thermocline) is the transition layer between the warmer mixed water at the surface and the cooler deep water below. (1)

(Total: 8 marks)

2. (a) Complete the table below by filling in the appropriate strata of the Maltese geology. (5)

Description	Stratum
A hard type of rock that is the oldest of the rock strata that make up the Maltese Islands.	
A yellowish-green, thin, friable layer of rock.	
Water tends to accumulate above this blue-grey mudstone forming an aquifer that is used for irrigation.	
The youngest rock formation in the Maltese Islands that was used in the building of fortifications.	
The laying down of sediments mainly made up from the hard calcareous remains of tiny marine organisms.	

This question continues on the next page.

(b) Briefly explain how the rocks of the Maltese Islands are the result of biogenic sedimentation.

_____

_____

_____ (3)

(c) In the space below, draw a labelled diagram showing the internal structure of the Earth. (3)

(Total: 11 marks)

3. (a) What is the carbon cycle?

_____

_____ (2)

(b) The carbon cycle has five main processes: photosynthesis, respiration, sedimentation, extraction, and combustion. Name the process by which carbon is transferred from:

(i) the lithosphere to the atmosphere: _____ (1)

(ii) the biosphere to the lithosphere: _____ (1)

(iii) the atmosphere to the biosphere: _____ (1)

(c) The extraction of fossil fuels can bring about negative environmental impacts. Describe **THREE** such impacts on the environment. (6)

Impact 1: _____

_____

Impact 2: _____

_____

Impact 3: _____

_____

(Total: 11 marks)

4. Nitrate is considered as a major water pollutant.

(a) Describe **ONE** natural source and **ONE** anthropogenic source of nitrate pollution.

Natural source: _____

_____ (2)

Anthropogenic source: _____

_____ (2)

(b) Describe **ONE** major environmental effect of nitrate pollution on surface water.

_____

_____ (2)

(Total: 6 marks)

5. Complete the following paragraph on the occurrence of ozone in the atmosphere by choosing the appropriate term from the list below.

absorbs	nitrogen oxides	sunlight	global warming
chemical reaction	ozone-depleting	greenhouse	chlorofluorocarbons
decreases	secondary	troposphere	ultraviolet radiation
highly reactive	stratosphere	lowest	volatile organic compounds

About 90% of the ozone on earth occurs in the _____. This layer of the atmosphere _____ most of the _____ that reaches the earth. However, its amount _____ upon reacting with _____ and other _____ substances. Lower amounts of ozone occur in the _____ which is the _____ layer of the atmosphere. It is formed from a _____ between _____ and _____ close to the earth's surface. Such an interaction takes place in the presence of _____ and produces a _____ form of oxygen. This gas is considered as a _____ atmospheric pollutant and also a _____ gas that can contribute to _____.

(Total: 8 marks)

6. (a) Name **TWO** non-renewable energy resources.

_____

_____ (2)

(b) Name **ONE** advantage and **ONE** disadvantage of using the following renewable energy resources. *Do not use the same advantage more than once in your answers.*

(i) Wind Energy

Advantage: _____ (1)

Disadvantage: _____ (1)

(ii) Solar Energy

Advantage: _____ (1)

Disadvantage: _____ (1)

(iii) Hydroelectric Power

Advantage: _____ (1)

Disadvantage: _____ (1)

(iv) Geothermal Energy

Advantage: _____ (1)

Disadvantage: _____ (1)

(Total: 10 marks)

7. (a) Ecosystems require energy to carry out their functions.

(i) What is the primary source of this energy? _____ (1)

(ii) Name the process by which green plants capture this energy.

_____ (1)

(iii) Mention **TWO** ways in which organisms utilize the acquired energy.

_____

_____ (2)

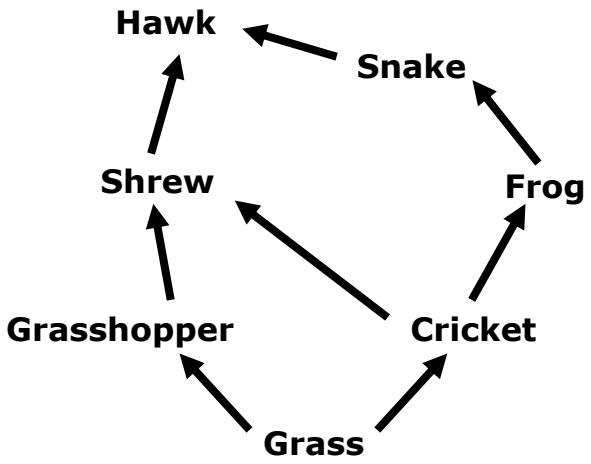
(iv) Mention **TWO** ways in which organisms lose energy to their surroundings.

_____

_____ (2)

This question continues on the next page.

(b) Consider the food web shown below and answer the questions that follow.



(i) From the food web give an example of a:

Producer: _____

Top carnivore: _____

Primary consumer: _____

Secondary consumer: _____ (4)

(ii) In the space below write down a food chain that is made up of **FOUR** trophic levels, using the information provided in the food web above.

(2)

(iii) Explain why the population density of large carnivores is always much lower when compared to the population density of herbivores sharing the same ecosystem.

_____

_____

_____ (2)

(iv) What would happen if all shrews and frogs were eliminated?

_____

_____

_____ (2)

(Total: 16 marks)

8. Below are two age-gender population diagrams of the Maltese population at two different centuries.

Diagram A

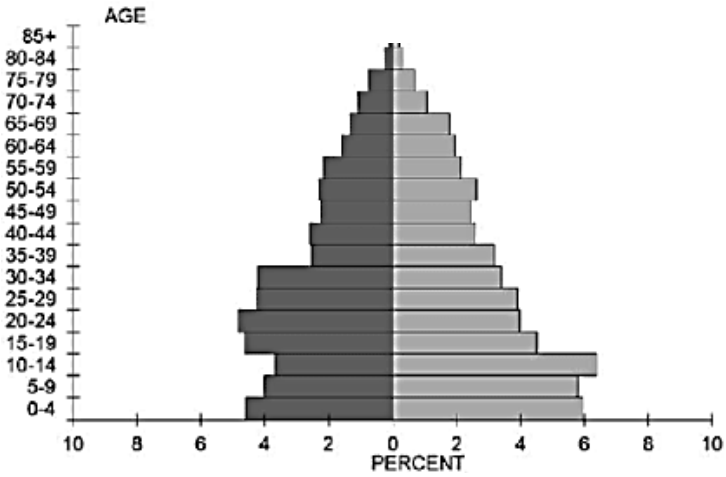
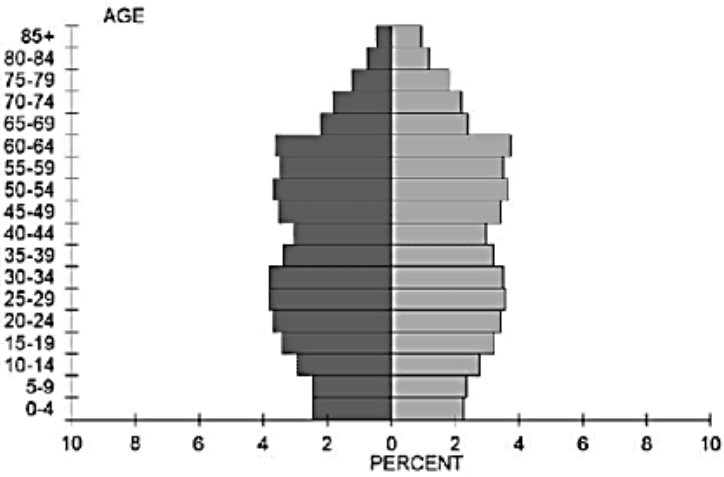


Diagram B



Adapted from (https://www.researchgate.net/profile/Philip-Von-Brockdorff/publication/332078014/figure/fig2/AS:791750771740672@1565779502153/Demographic-transition-of-the-Malta.png)

(a) Considering the two population diagrams above, state the letter of the diagram that represents the following and provide an explanation for your answer:

(i) the Maltese population in the year 1960:

Age-gender population diagram: _____ (1)

Explanation: _____

_____ (1)

(ii) the Maltese population in the year 2017:

Age-gender population diagram: _____ (1)

Explanation: _____

_____ (1)

(iii) a more stable population:

Age-gender population diagram: _____ (1)

Explanation: _____

_____ (1)

(b) Mention **ONE** factor that can increase the death rate of the global human population.

_____ (1)

(c) Explain why the global human population has undergone a very rapid increase in the post-industrial revolution.

_____

_____

_____

_____ (3)

(Total: 10 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) Briefly explain the phrase "sustainable use of resources". (4)
   (b) Explain the term resource substitution and give **TWO** examples of how it can help ensure the sustainable use of resources. (4)
   (c) Discuss the key causes behind the following negative impacts on the environment resulting from unsustainable agricultural activities:
      (i) soil erosion; (4)
      (ii) loss of biodiversity; (4)
      (iii) water pollution; (2)
      (iv) air pollution. (2)

(Total: 20 marks)

2. (a) Explain how the processes of weathering, erosion, transport, and sedimentation contribute to the formation of sedimentary rocks. (8)
   (b) Describe how volcanic activities contribute to the formation of igneous rocks and their significance in shaping the Earth's crust. (4)
   (c) Explain how subduction zones influence the formation of metamorphic rocks and their transformation from existing rocks. (4)
   (d) Draw a simple diagram showing the interconnections between the different stages of the rock cycle outlined above. (4)

(Total: 20 marks)

3. (a) Mention **TWO** main objectives of solid waste management. (2)
   (b) Solid waste can be classified into different types depending on the sources. Distinguish between the following by indicating **TWO** typical components of each:
      (i) municipal waste; (2)
      (ii) industrial waste; (2)
      (iii) agricultural waste. (2)
   (c) Explain the difference between hazardous or non-hazardous solid waste. Illustrate your answer with **TWO** suitable examples. (6)
   (d) Distinguish between the terms re-using and recycling which are both fundamental principles of a modern waste management programme. (4)
   (e) Give **TWO** reasons why recycling is **not** always the best option in waste management plans. (2)

(Total: 20 marks)

4. (a) Hydrocarbons such as propane and butane (found in local cooking gas) burn completely in air to produce a colourless gas A and water vapour. When they burn in a limited supply of air, they produce a second colourless gas B and water vapour. Both gas A and gas B are considered as atmospheric pollutants. Name each gas, explain the danger associated with each gas and describe their potential effect (if any) on the human body and the environment. (6)
   (b) Explain how only one of the gases mentioned in part (a) makes rainwater slightly acidic (with a typical pH value between 5.00 and 5.5). (2)
   (c) Combustion of fossil fuels may also produce significant amounts of sulfur dioxide, nitrogen oxides and particles of carbon as atmospheric pollutants. Describe the causes and effects of these pollutants. (6)
   (d) Explain how catalytic converters eliminate carbon monoxide, nitrogen monoxide and unused petrol vapour (hydrocarbons) from car exhaust. (6)

(Total: 20 marks)

5. Distinguish between the following terms including an example for each:
   (a) Resilience and resistance of ecosystems; (4)
   (b) Amensalism and Commensalism; (4)
   (c) Endoparasite and Ectoparasite; (4)
   (d) Specialist species and generalist species; (4)
   (e) Emigration and Immigration. (4)

(Total: 20 marks)

6. (a) Define the following terms and state **ONE** advantage and **ONE** disadvantage of each:
   (i) Crude birth/death rates; (3)
   (ii) Ecological release; (3)
   (iii) Aquaculture/fish farming; (3)
   (iv) Pyramid of biomass; (3)
   (v) Pyramid of numbers; (3)
   (vi) Marine protected areas. (3)
   (b) Mention **ONE** example of a wildlife reserve and **ONE** example of a marine protected area in Malta. (1, 1)

(Total: 20 marks)

DO NOT WRITE ABOVE THIS LINE

DO NOT WRITE ABOVE THIS LINE

DO NOT WRITE ABOVE THIS LINE

DO NOT WRITE ABOVE THIS LINE