Index Number:_____ IM11.18m

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

INTERMEDIATE MATRICULATION LEVEL
2018 FIRST SESSION

SUBJECT:	**Environmental Science**
DATE:	28th April 2018
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. Complete the table below by filling in with the appropriate term related to renewable energy.

Statement	Word/Phrase
The heat energy generated and stored within the earth.	
The generation of electricity by using water falling under the force of gravity.	
A fuel that is produced through biological processes, such as agriculture and anaerobic digestion.	
A device that converts kinetic energy from the wind into electric current.	
A device that converts sunlight directly into electricity.	
Making use of the sun's energy for the heating and cooling of living spaces.	
Energy obtained from living organisms or recently dead biological material.	

(Total: 7 marks)

2. (a) What is the carbon cycle?

_____

_____ (2)

This question continues on next page.

(b) Briefly describe **ONE** way how carbon can be transferred:

(i) from the atmosphere to the biosphere;

_____

_____ (2)

(ii) from the hydrosphere to the atmosphere;

_____

_____ (2)

(iii) from the biosphere to the lithosphere.

_____

_____ (2)

(c) Name **TWO** harmful impacts on the carbon cycle resulting from human activities.

_____

_____

_____

_____ (2)

(Total: 10 marks)

3. (a) Briefly explain how atmospheric circulation in the form of winds maintains a balance in the global energy budget.

_____

_____

_____ (3)

(b) With reference to a deep water body, explain what is meant by the term thermocline.

_____

_____

_____ (3)

(c) Briefly explain how thermal pollution can have a negative impact on a body of water.

_____

_____

_____ (3)

(d) Briefly explain how temperature inversion (or thermal inversion) forms.

_____

_____

_____ (3)

(Total: 12 marks)

4. Distinguish between the following terms, giving suitable examples in each case.

(a) (i) Hazardous waste: _____

_____

Example: _____ (2)

(ii) Non-hazardous waste: _____

_____

Example: _____ (2)

(b) (i) Biodegradable plastic: _____

_____

Example: _____ (2)

(ii) Non-biodegradable plastic: _____

_____

Example: _____ (2)

This question continues on next page.

(c) (i) Greenhouse gases: _____

_____

Example: _____ (2)

(ii) Ozone-depleting gases: _____

_____

Example: _____ (2)

(Total: 12 marks)

5. A catalytic converter is a sophisticated device installed in the exhaust system of petrol engine vehicles that converts harmful gases in the exhaust to relatively harmless gases.

(a) Name **ONE** substance used as a catalyst in the catalytic converter.

_____ (1)

(b) Describe the role of the catalyst in the converter.

_____

_____ (2)

(c) Name **TWO** gaseous pollutants treated by the catalytic converter.

Gas 1: _____ Gas 2: _____ (2)

(d) Name **TWO** harmless products formed when the pollutants are treated by the catalytic converter.

Gas 1: _____ Gas 2: _____ (2)

(e) (i) Name **ONE** secondary pollutant formed if the untreated exhaust comes in contact with water.

_____ (1)

(ii) In the space below, write a chemical equation or a word equation to show the conversion of **TWO** pollutants in the car exhaust into harmless products.

(4)

(Total: 12 marks)

6. Identify whether the following statements are true or false. If the statement is false, provide a reason for your answer.

   (a) Genetic diversity is a measure of the number of species within a community or area.
   ❒ True ❒ False

   Reason: _____

   _____

   (b) Amensalism is a relationship between organisms of two species in which one species negatively affects the other without being itself affected. **❒ True ❒ False**

   Reason: _____

   _____

   (c) An ecotone is a community of organisms that provides stability in an ecosystem.
   ❒ True ❒ False

   Reason: _____

   _____

   (d) Intraspecific competition is an interaction that occurs among organisms of different species whenever organisms require the same limited resource. **❒ True ❒ False**

   Reason: _____

   _____

   (e) Keystone species are critical in maintaining the relationships of an ecosystem.
   ❒ True ❒ False

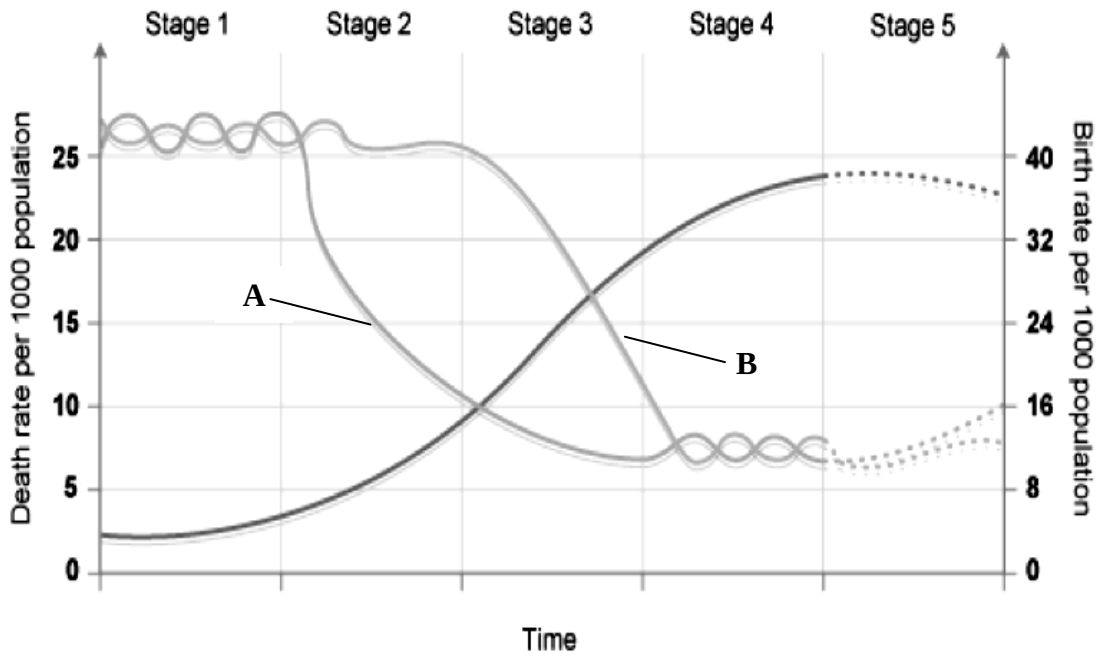
   Reason: _____

   _____

(Total: 8 marks)

Please turn the page.

7. The graph below shows stages in the demographic transition of a population.



Adapted from: http://gracenuwera.blogspot.com.mt/2013/03/topic-one-demographic-transition.html

(a) What is demographic transition?

_____

_____ (2)

(b) What characteristics of a population are shown by Line A and Line B?

Line A: _____

Line B: _____ (2)

(c) Briefly explain why the population size during Stage 1 is rather constant.

_____

_____

_____ (2)

(d) Provide a reason to explain why there is a decline in birth rate during Stage 3.

_____

_____ (1)

(e) Why does the population still show an overall increase in Stage 3 even though the birth rate is low?

_____

_____

_____ (2)

(f) Some countries, such as Germany and Japan, are experiencing Stage 5 of this demographic transition. What does this stage usually imply?

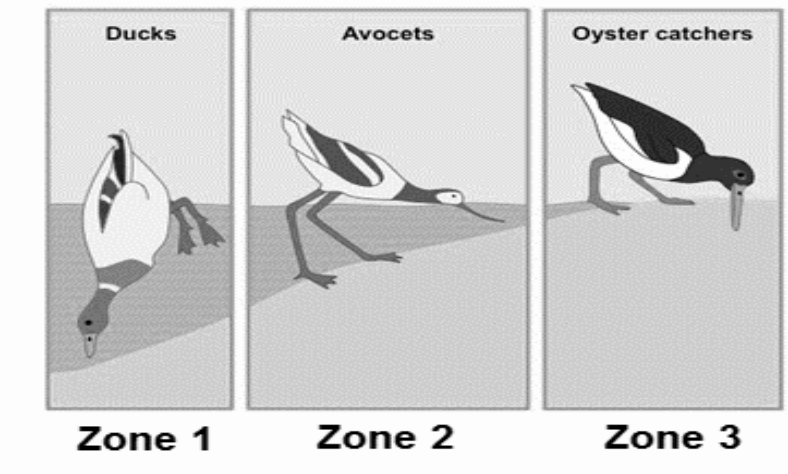
_____

_____

_____ (1)

(Total: 10 marks)

8. The picture below illustrates the ecological niches of different birds. Each of the species below inhabits a specific zone along the water course. Duck populations can occupy Zone 1 and Zone 2. However, when Avocets are present, the ducks shift their population to occupy only Zone 1. Oyster catchers inhabit only in zone 3 and are specialist species.



Adapted from http://ib.bioninja.com.au/_Media/niche2_med.jpeg

(a) Define the term ecological niche.

_____

_____

_____ (3)

This question continues on next page.

(b) By referring to the distribution of ducks, distinguish between a fundamental niche and a realised niche.

_____

_____

_____

_____

_____ (4)

(c) Give **ONE** advantage and **ONE** disadvantage of being a specialist species.

Advantage: _____ (1)

Disadvantage: _____ (1)

(Total: 9 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) Discuss how agriculture impacts biodiversity. (8)
   (b) Explain how each of the following measures of sustainable agriculture have a positive effect on the environment:
   (i) soil conservation techniques; (4)
   (ii) biological pest control; (4)
   (iii) reduction in the use of chemical fertilisers. (4)

(Total: 20 marks)

2. Distinguish between each pair of terms:
   (a) weather and climate using the Maltese Islands as an example; (5)
   (b) coastal zone and open sea; (5)
   (c) upper (perched) and lower (mean sea level) aquifers, with reference to the Maltese Islands; (5)
   (d) reverse osmosis and water harvesting. (5)

(Total: 20 marks)

3. Distinguish between each of the following terms, related to atmospheric pollution, illustrating your answers by giving examples where necessary:
   (a) ground level ozone and stratospheric ozone; (4)
   (b) point source pollution and non-point source pollution; (4)
   (c) natural greenhouse effect and enhanced greenhouse effect; (4)
   (d) pollution from hydrocarbons and from chlorofluorocarbons; (4)
   (e) industrial (or London) smog and photochemical (or Los Angeles) smog. (4)

(Total: 20 marks)

4. (a) The main method of disposal of non-recyclable solid waste used in Malta is the engineered landfill. Draw a labelled diagram to describe the basic features of an engineered landfill and outline **TWO** improvements of such technique over the use of open dumps. (10)
   (b) One alternative technology that is used to dispose of non-recyclable solid waste is incineration. Write a short account to describe the basic principles involved in incineration and name **TWO** advantages and **TWO** disadvantages of incineration over other methods of solid waste disposal. (7)
   (c) Outline **THREE** benefits of composting of food and organic waste. (3)

(Total: 20 marks)

5. (a) Using a graph, explain the Exponential Growth Model which is typical of the human population. (6)
   (b) Name a major development that occurred during (i) the Neolithic period and (ii) the Industrial Revolution that allowed humans to experience this type of population growth. (4)
   (c) Humans have also surpassed the earth's carrying capacity for human population. Describe how (i) grazing and (ii) over-fishing have put pressure on the world's environmental resources. (6)
   (d) Define conservation areas and legislative tools and discuss how both can lead to preservation of biodiversity. (4)

(Total: 20 marks)

6. Clearly distinguish between the following. Support your answers with examples where necessary.
   (a) Resistance and Resilience of ecosystems. (4)
   (b) Autogenic and Allogenic succession. (4)
   (c) Grazer food chains and Decomposer food chains. (Provide a food chain for each type). (12)

(Total: 20 marks)

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