

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

UNIVERSITY OF MALTA, MSIDA

MATRICULATION CERTIFICATE EXAMINATION
INTERMEDIATE LEVEL
SEPTEMBER 2012

SUBJECT: ENVIRONMENTAL SCIENCE
DATE: 10th September 2012
TIME: 9.00 a.m. to 12.00 noon

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) List the following resources under the appropriate heading:

water oxygen meat iron
oil wood coal copper

Renewable resources	Non-renewable resources

(4 marks)

(b) Mention **two** disadvantages of the recycling option in a solid waste management strategy.

(2 marks)

(Total: 6 marks)

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2. State whether each of the following statements is **TRUE** or **FALSE** by ticking the appropriate box. Give **one** reason for your answer.

(a) Sedimentation is the wearing off of rocks by air and water. True False

Reason: _____

_____ (2 marks)

(b) High clay particle content in soil improves aeration and water percolation. True False

Reason: _____

_____ (2 marks)

(c) Volcanoes may form when magma (lava) leaks from cracks in the crust. True False

Reason: _____

_____ (2 marks)

(d) Magnitude measures the strength of shaking produced by an earthquake at a certain location. True False

Reason: _____

_____ (2 marks)

(e) Metamorphic rocks can be formed from either sedimentary or igneous rocks. True False

Reason: _____

_____ (2 marks)

(f) Igneous rocks are formed when sedimentary rocks are submitted to high pressures and temperatures. True False

Reason: _____

_____ (2 marks)

(Total: 12 marks)

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3. (a) Explain what happens during temperature (or thermal) inversion.

(4 marks)

(b) Fill in the following table with short statements describing the features in the first column.

Feature	Photochemical Smog
Typical source	
Typical conditions	
Effect of temperature inversion	
Two harmful effects	
Two common pollutants	
One pollution control measure	

(8 marks)

(Total: 12 marks)

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4. Complete the following passage on ozone depletion by choosing the correct term from the following list. Each term may only be used **once** BUT not all terms are required.

atmosphere	toxic	excessive	North
cancer	hydrocarbons	non-toxic	ozone hole
chlorine	triatomic	ultraviolet	refrigeration
chlorofluorocarbons	infrared	troposphere	South
concentration	diatomic	materials	stratosphere

Ozone is a harmful pollutant when found in the _____ and affects plants, _____ and human health. However, ozone occurs naturally in the _____ where it absorbs harmful _____ radiation from the sun preventing it from reaching the earth and causing a number of health problems such as skin _____. Studies carried out in the 1980s and 1990s showed that the _____ of ozone in the upper atmosphere decreased significantly over the _____ pole as a result of the _____ use of chemical substances known as _____. These substances are inert, non-flammable and _____. They are relatively cheap to produce and are used in _____ and as propellants in aerosol sprays. Molecules of these compounds break up in the upper atmosphere to produce _____ free radicals. These radicals react with ozone molecules, converting them to _____ oxygen, creating a large area of ozone-depleted atmosphere called the _____.

(Total: 14 marks)

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5. There are four main types of bacteria that play a crucial role in the nitrogen cycle by transforming nitrogen into different nitrogenous compounds that can be used by other organisms. Fill in the table below by listing the types of bacteria involved and their function in the cycle.

Type of bacteria	Function

(Total: 8 marks)

6. The table below lists five different forms of interaction between organisms. Complete the table by:

- (i) giving an example for each interaction; and
(ii) inserting the following symbols to explain the interaction between the organisms.

+ = organism benefits

– = organism is harmed

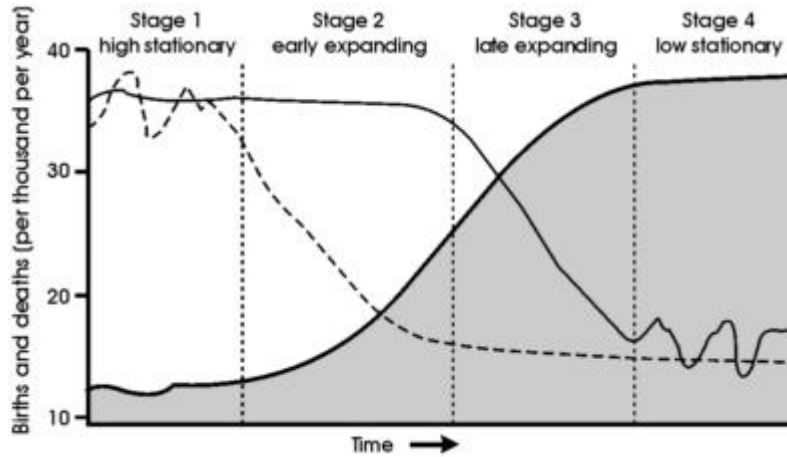
○ = organism neither benefits nor is harmed (neutral)

Interaction	Organism 1	Organism 2	Example
Parasitism			
Predation			
Competition			
Mutualism			
Commensalism			

(Total: 10 marks)

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7. The figure below shows a diagram of the demographic transition model.



(a) **On the diagram** label the three graphs. (3 marks)

(b) Describe how the population structure of a country in stage 2 of the demographic transition model is different from that of a country in stage 4.

(5 marks)

(c) In most developed countries, life expectancy has increased. Suggest **three** reasons for this change.

(3 marks)

(Total: 11 marks)

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8. Use the terms below to complete the following passage. Each term can be used once, more than once or not at all.

sun	producers/autotrophs	primary	ecosystem
energy	trophic	secondary	bacteria

The _____ is a dynamic set of interactions between populations of organisms and the abiotic environment. The _____ is the ultimate source of energy from all organisms. Energy then flows from _____ such as grass, to _____ consumers such as mice and on to consumers such as cats at higher _____ levels. _____ is lost from one level to another. The activities of decomposers, such as fungi or _____, allow nutrients/minerals to be recycled.

(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) By means of a well labelled diagram illustrate the main processes involved in the Hydrological Cycle (Water Cycle). **(8 marks)**
- (b) Briefly explain **two** human activities that are leaving an impact on the hydrological cycle. **(4 marks)**
- (c) Freshwater is a rare resource in Malta. Discuss this statement in relation to:
 - (i) the various natural and artificial processes by which freshwater is made available and stored; and
 - (ii) the conservation measures adopted to preserve the quality and quantity of freshwater. **(4, 4 marks)**

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2. (a) Define plate tectonics and state how it helps to explain the formation of continents. **(3 marks)**
- (b) Through the use of diagrams, briefly describe the different types of plate boundaries. **(9 marks)**
- (c) Distinguish between a mineral and a rock. **(2 marks)**
- (d) (i) Draw a simple diagram to illustrate the different layers of Maltese rock.
- (ii) Briefly explain biogenic sedimentation by referring to the formation of Maltese rock. **(2, 4 marks)**
3. (a) (i) Define the term 'biological oxygen demand', BOD. **(3 marks)**
- (ii) Describe the 'activated sludge process', or any other alternative technique which is used to reduce most of the BOD in a sewage (wastewater) treatment plant. **(4 marks)**
- (b) (i) Explain why the effluent from a sewage treatment plant needs to be treated with chlorine or ozone before being disposed into the sea / river / lake. **(2 marks)**
- (ii) Explain how dissolved nitrate, phosphate and heavy metal ions can be removed from wastewater in a tertiary sewage treatment. **(3 marks)**
- (c) (i) What is meant by the term 'thermal pollution'? **(2 marks)**
- (ii) Describe **two** negative effects of thermal pollution. **(6 marks)**
4. Explain the following statements concerning solid waste management.
- (a) Some energy may be recovered from a properly managed sanitary landfill. **(4 marks)**
- (b) Solid waste incinerators are generally cost effective but may not be completely safe for the environment. **(4 marks)**
- (c) Aluminium is an ideal metal for recycling. **(4 marks)**
- (d) Recycling of plastic waste may have a number of disadvantages over other methods of plastic waste disposal. **(4 marks)**
- (e) Another way of reducing plastic waste is to produce degradable plastic. **(4 marks)**
5. (a) Distinguish between the following models of population growth: linear growth, exponential growth, sigmoid growth, irruptive growth. **(7 marks)**
- (b) Discuss the main limitations on the growth of the human population during the Palaeolithic period and Neolithic period. **(6 marks)**
- (c) Describe **two** reasons for increase in the human population throughout recorded history (i) before and (ii) after the Industrial Revolution. **(2, 2 marks)**
- (d) List **three** reasons why human population growth has decreased or stopped in more developed countries. **(3 marks)**

