

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD  
UNIVERSITY OF MALTA, MSIDA  
MATRICULATION EXAMINATION  
INTERMEDIATE LEVEL  
MAY 2013

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**SUBJECT:** ENVIRONMENTAL SCIENCE  
**DATE:** 18<sup>th</sup> May 2013  
**TIME:** 09.00 a.m. to 12.00 noon

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**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.*

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**Section A**

*Answer all questions from this section.*

1. (a) Malta is composed of sedimentary rock. Name **two** other types of rock which exist in other countries.

\_\_\_\_\_ (2 marks)

(b) Explain how **each** of the two types of rock you mention in (a) can change to form a different type of rock.

(i) \_\_\_\_\_

(ii) \_\_\_\_\_

\_\_\_\_\_ (2 marks)

(c) Maltese rocks were formed through biogenic sedimentation.

(i) Briefly explain how biogenic sediments are formed.

\_\_\_\_\_

(ii) Give **one** piece of evidence that supports your explanation.

\_\_\_\_\_

(iii) Name **two** examples of locally found sedimentary rocks.

\_\_\_\_\_

(1, 1, 2 marks)  
**(Total: 8 marks)**

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2. Read the text below (ref: <http://rt.com/news/turkey-earthquake-kalkan-tremors-757/>) and answer the questions that follow:

A **magnitude** 5.6 quake has hit the eastern Mediterranean region, with tremors felt as far away as the Egyptian capital Cairo. The quake's **epicentre** lay in the Mediterranean Sea, east of the Greek island of Rhodes and south of the Turkish mainland. The quake occurred around 15.55 local time (13.55 GMT) at a depth of 19.4 km. The **intensity** of the earthquake was not high as no reports of deaths or damage in Greece and Turkey were reported. No tsunami warning has been issued. Earthquakes are a daily occurrence both in Greece and Turkey, which lie on top of geological fault lines.

(a) Briefly explain the difference between the **focus** and the **epicentre** of an earthquake.

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*(2 marks)*

(b) Briefly explain what is meant by the term '**earthquake belt**'.

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*(1 mark)*

(c) (i) Distinguish between **magnitude** and **intensity**.

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*(2 marks)*

(ii) Give **two** reasons why an earthquake could have a high magnitude, but a low intensity on the land.

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*(2 marks)*

**(Total: 7 marks)**

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3. (a) In the space below, draw and label a diagram to show the upper and lower aquifers as found in the Maltese Islands.

*(4 marks)*

(b) (i) Name **one** method of extracting underground water.

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*(1 mark)*

(ii) State **two** consequences of over-extraction of underground water.

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*(2 marks)*

(c) Mention **four** practices that may contaminate underground water during the recharging process.

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*(4 marks)*

**(Total: 11 marks)**

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4. Read the following statements and state whether they are **TRUE** or **FALSE** by ticking the appropriate box. Give **one** reason for your answer.

(a) **Global warming** is brought about by the presence of excessive amounts of greenhouse gases such as carbon dioxide, water vapour, dinitrogen oxide (nitrous oxide) and methane.

True  False

*Reason:* \_\_\_\_\_

\_\_\_\_\_  
(3 marks)

(b) **Natural gas** is a fossil fuel in the form of a colourless flammable gas which burns in an abundant supply of air to produce two other colourless products.

True  False

*Reason:* \_\_\_\_\_

\_\_\_\_\_  
(3 marks)

(c) **Biomass** is a material synthesized by biochemists using common laboratory reagents, in order to increase the supply of fuels.

True  False

*Reason:* \_\_\_\_\_

\_\_\_\_\_  
(3 marks)

(d) The **carbon footprint** is the amount of carbon present in the fuel that a person needs to drive a car for a period of one year.

True  False

*Reason:* \_\_\_\_\_

\_\_\_\_\_  
(3 marks)

(e) A **renewable resource** is any human-made material that can be re-used, regenerated or recycled several times without consuming much energy.

True  False

*Reason:* \_\_\_\_\_

\_\_\_\_\_  
(3 marks)

(f) **Deforestation** has an impact on climate change as less carbon dioxide is absorbed and more is produced by using slash and burn techniques.

True  False

*Reason:* \_\_\_\_\_

\_\_\_\_\_  
(3 marks)

**(Total: 18 marks)**

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5. The catalytic converter is a device installed in petrol-powered cars to remove most of the pollutants before these are released in the air. Explain each of the following statements on the catalytic converter, giving examples where necessary.

(a) The catalytic converter converts harmful primary pollutants to harmless gases.

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*(2 marks)*

(b) The device is not cheap as it works by having a honeycomb structure containing a number of metal catalysts.

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*(2 marks)*

(c) Catalytic converters cannot be used with leaded petrol.

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*(2 marks)*

(d) Catalytic converters reduce the possibility of acid rain.

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*(2 marks)*

(e) Catalytic converters do not reduce the potential of global warming.

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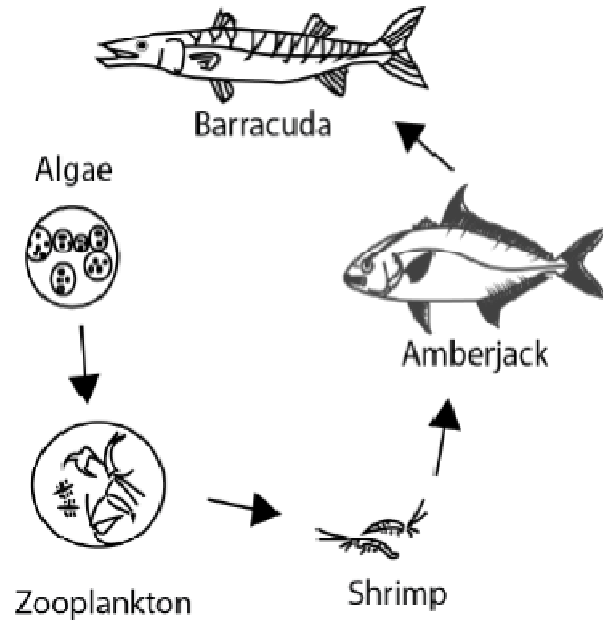
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*(2 marks)*

**(Total: 10 marks)**

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6. The diagram below represents a food chain that can be found in the waters off the Texas Gulf Coast.



(a) Fill in the following table from the information provided in the food chain.

Which is the producer?	
Which is the tertiary consumer?	
Which organism is expected to have the largest population?	
The population of which organism in the food chain would be the first to decline if commercial fishing over-harvested the amberjack to the point of extinction?	

**(4 marks)**

(b) Why are food chains not usually long?

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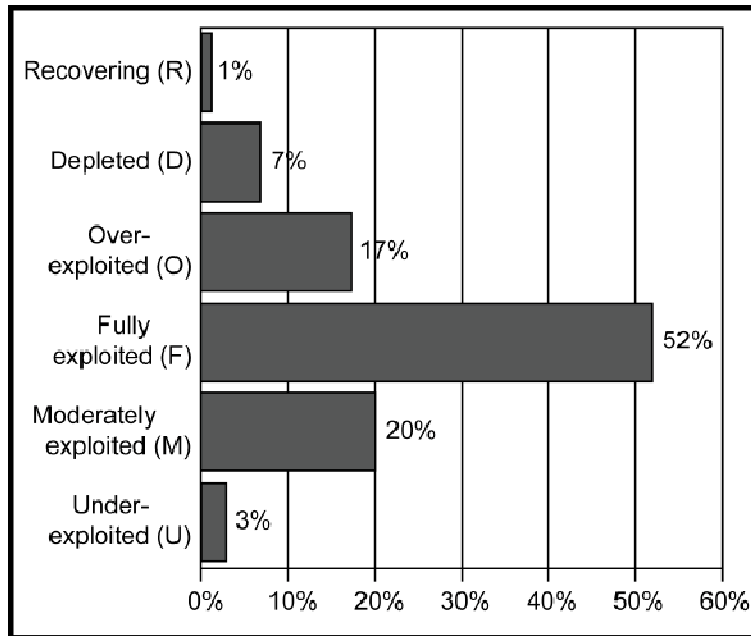


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**(2 marks)**  
**(Total: 6 marks)**

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7. During the last 50 years the annual world seafood catch has more than quadrupled, as fishing fleets have added new technologies and ventured into unexploited regions. This year, fishermen removed about 77 billion kg of wildlife from the sea. Studies show that our current rates of removal could lead to the collapse of global fisheries. The graph shows the condition of the remaining fish populations in the world’s oceans.



(a) From this graph, deduce what percentage of the global marine stocks has been fished to their limits or past their limits.

\_\_\_\_\_ (1 mark)

(b) Describe **one** way how extinction of a fish species can affect marine wildlife.

\_\_\_\_\_ (1 mark)

(c) Mention **two** examples of simple actions that can be taken by the average citizen concerned about the issue of overfishing.

\_\_\_\_\_  
 \_\_\_\_\_ (2 marks)

(d) Mention **two** ways how fishing can be rendered more sustainable.

\_\_\_\_\_  
 \_\_\_\_\_ (2 marks)  
**(Total: 6 marks)**

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8. Imagine that you are managing a large wildlife reserve that was formerly a cattle ranch. You know from historical accounts that wild sheep used to live there, but they were hunted until the local population was exterminated. After doing some research to determine what might be an appropriate starting population, you reintroduce them. Food is abundant and they have no natural predators. You then spend several years plotting graphs of the number of individuals (on the vertical axis) against the number of generations (on the horizontal axis).

(a) What is a **wildlife reserve**?

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(2 marks)

(b) Define the term **population**.

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(2 marks)

(c) What would you expect to happen to the sheep population over the first few generations?

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(2 marks)

(d) By the 10th generation, the population begins to reach carrying capacity.

(i) Define **carrying capacity**.

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(2 marks)

(ii) What happens to the population growth as it comes closer to its carrying capacity?

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(1 mark)

(iii) What happens to the population growth after the carrying capacity is reached?

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(1 mark)

(iv) Compare the birth rate and death rate after the carrying capacity is reached.

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(1 mark)



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(e) In the space below, sketch the graph that would have been obtained by the 15<sup>th</sup> generation.

(3 marks)

(Total: 14 marks)

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**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) (i) Briefly explain what is meant by *particulate matter* (PM) and how it constitutes a threat to public health. (In your answer refer to differently sized PM). (2, 2 marks)
- (ii) Name **three** sources of naturally occurring PM and **three** sources which result from human activity. (6 marks)
- (b) (i) Explain why methane is considered a source of air pollution. (3 marks)
- (ii) Name **two** major sources of methane. (2 marks)
- (iii) State **two** ways how methane emission may be reduced. (2 marks)
- (c) Explain how smog is formed and mention one of its effects on health. (2, 1 marks)

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2. (a) Describe the physical nature of the troposphere and explain how it filters, absorbs and reflects portions of the electromagnetic spectrum that are harmful to humans and other life forms. **(3, 2 marks)**
- (b) (i) Name **two** factors which affect the albedo ratio. **(2 marks)**
- (ii) Explain how the global temperatures change when the planet's albedo increases. **(2 marks)**
- (iii) Name **one** type of ground surface which has a high albedo value and explain why it has such a high value. **(2 marks)**
- (iv) Explain how the greenhouse gases present in the atmosphere help to maintain the planet's temperature stable. **(3 marks)**
- (c) (i) Explain why the presence of sunlight and NO<sub>2</sub> gas would lead to formation of ozone in the lower atmosphere. **(2 marks)**
- (ii) Explain 'ozone depletion' in terms of the rate of formation and destruction of ozone. **(2 marks)**
- (iii) Name **one** beneficial effect and **one** harmful effect of ozone. **(2 marks)**
3. (a) Domestic solid waste can be treated safely in a number of ways. Such methods include the use of engineered landfills and recycling.
- (i) Draw a simple diagram and briefly explain the basic features of an engineered landfill. **(3, 6 marks)**
- (ii) Discuss **one** advantage and **one** disadvantage in the recycling of **each** of the following materials:
- paper;
  - glass. **(2, 2 marks)**
- (b) Another possible option for the disposal of some waste is 'incineration'. Discuss **one** benefit and **one** disadvantage of incineration over other methods of solid waste treatment. **(4 marks)**
- (c) Describe **three** measures which an average family can adopt to reduce domestic waste. **(3 marks)**

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4. Discuss briefly each of the following statements which include various terms encountered in environmental science.
- (a) The greenhouse effect is not a pollution phenomenon, but a natural occurrence that is beneficial to life on Earth. **(4 marks)**
  - (b) Most plastics are non-biodegradable. However certain types of plastics can undergo biodegradation while others undergo photodegradation. **(4 marks)**
  - (c) Pollution from certain metals can reach toxic levels in organisms by bioaccumulation and biomagnification via the food chain. **(4 marks)**
  - (d) Thermal pollution of water bodies can be detrimental to aquatic life. **(4 marks)**
  - (e) The presence of pathogenic microorganisms in fresh water supplies can pose a serious hazard to human health. **(4 marks)**
5. (a) Define the following terms:
- i. biosphere;
  - ii. biome;
  - iii. ecosystem;
  - iv. community;
  - v. niche;
  - vi. biotic factors;
  - vii. interspecific competition. **(10 marks)**
- (b) Why does competition occur? **(1 mark)**
- (c) List **two** factors that animals compete for and **two** factors that plants compete for. **(4 marks)**
- (d) Explain the competitive exclusion principle. **(5 marks)**
6. (a) Give **three** characteristics of a temperate forest. **(3 marks)**
- (b) Describe **five** threats that such forests are facing. **(5 marks)**
- (c) Give **four** examples of uses of timber. **(4 marks)**
- (d) Suggest **five** possible effects of deforestation. **(5 marks)**
- (e) Explain **three** ways in which forests can be managed sustainably. **(3 marks)**
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