

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD
UNIVERSITY OF MALTA, MSIDA
MATRICULATION EXAMINATION
INTERMEDIATE LEVEL
SEPTEMBER 2016

SUBJECT: ENVIRONMENTAL SCIENCE
DATE: 30th August 2016
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. (a) Briefly describe (with the use of chemical equations) how ozone is formed in the stratosphere.

(4 marks)

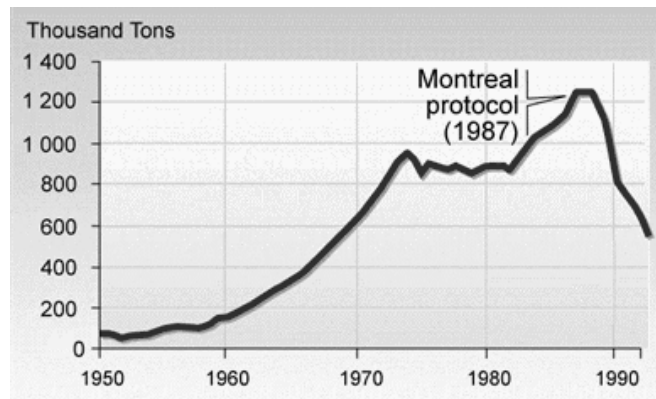
- (b) (i) Briefly explain what is meant by the expression 'the hole in the ozone layer'.

- (ii) Name **TWO** ways of how this 'hole' affects life on Earth.

(2, 2 marks)

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(c) The graph on the right shows the Global CFC Production over the years particularly before and after the Montreal Protocol where 'Ozone friendly' products started being manufactured.



Briefly explain what 'Ozone friendly' products are and why they were produced?

Source: http://www.grida.no/graphicslib/detail/global-cfc-production_83db

(4 marks)
(Total: 12 marks)

2. (a) Briefly explain how the majority of mountains are formed.

(2 marks)

(b) Briefly explain the following terms:

(i) Earthquake: _____

(ii) Earthquake Belt: _____

(iii) Volcanism: _____

(2, 2, 2 marks)

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(c) Explain the difference between:

(i) *Epicentre* and *Focus*: _____

(ii) *Magnitude* and *Intensity*: _____

(iii) *Ocean Trenches* and *Ridges*: _____

(2, 2, 2 marks)
(Total: 14 marks)

3. (a) Explain why the catalytic converter is an important means of controlling atmospheric pollution.

(2 marks)

(b) (i) Explain the role of the catalyst in this device.

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

(2 marks)

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- (c) (i) Fill in the table below by identifying the products formed when the gases listed are treated by the catalytic converter.

Gases entering Catalytic Converter	Product/s leaving Catalytic Converter
Unburnt hydrocarbons (from petrol)	
Carbon monoxide	
Nitrogen dioxide	

- (ii) Write a suitable word equation or a chemical equation to show the separate conversions of carbon monoxide and nitrogen dioxide.

Conversion of carbon monoxide:

Conversion of nitrogen dioxide:

(8 marks)

- (d) Explain why the use of the catalytic converter:

(i) does not affect stratospheric ozone depletion: _____

(ii) contributes to global warming: _____

(iii) affects acid rain: _____

(3 marks)
(Total: 15 marks)

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4. There are several gaseous pollutants that contribute to acid rain formation.

(a) Name **TWO** gases that are able to dissolve in rainwater making it acidic.

Name of gas 1: _____

Name of gas 2: _____

(2 marks)

(b) Write a word equation or chemical equation to show the reaction of one of the gases mentioned above with rainwater.

(2 marks)

(c) Explain why the presence of certain gaseous pollutants, such as carbon monoxide and nitrous oxide (or dinitrogen oxide), does not affect the pH value of rainwater.

(2 marks)

(d) Name **TWO** ecological effects and **TWO** other (e.g. material, health) effects brought about by acid rain.

Ecological effect 1: _____

Ecological effect 2: _____

Other effect 1: _____

Other effect 2: _____

(4 marks)

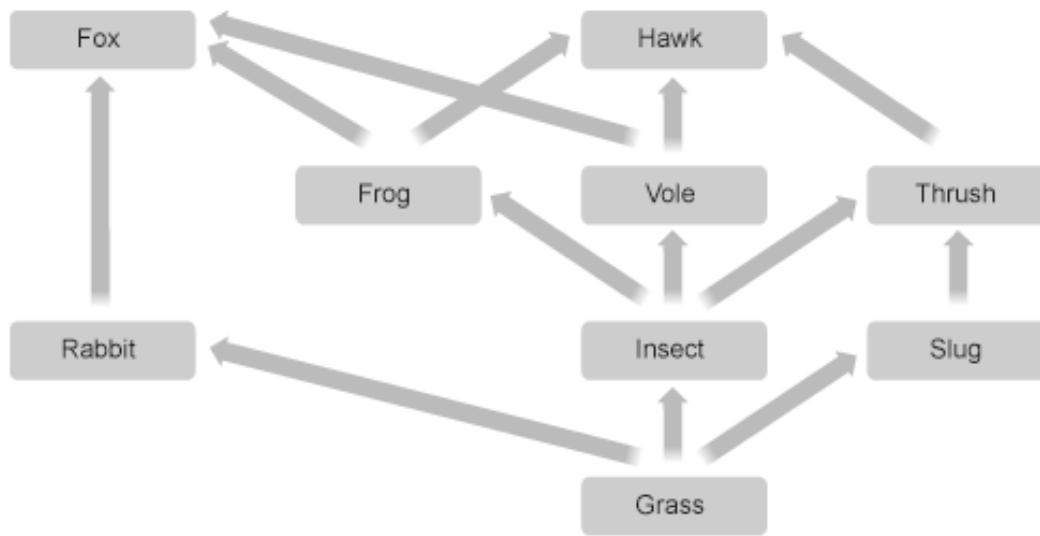
(e) Give **ONE** reason why acid rain is linked to the burning of fossil fuels.

(2 marks)

(Total: 12 marks)

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5. Look at the foodweb below and answer the following questions:



Source: http://www.bbc.co.uk/bitesize/ks3/science/organisms_behaviour_health/food_chains/revision/7/

(a) Which organism is the producer? _____ (1 mark)

(b) Name **TWO** tertiary consumers from the above food web.

(2 marks)

(c) Name **TWO** consequences of a drastic reduction in the number of rabbits in the community.

(2 marks)

(d) Write a food chain with **FOUR** trophic levels from the above food web.

(2 marks)

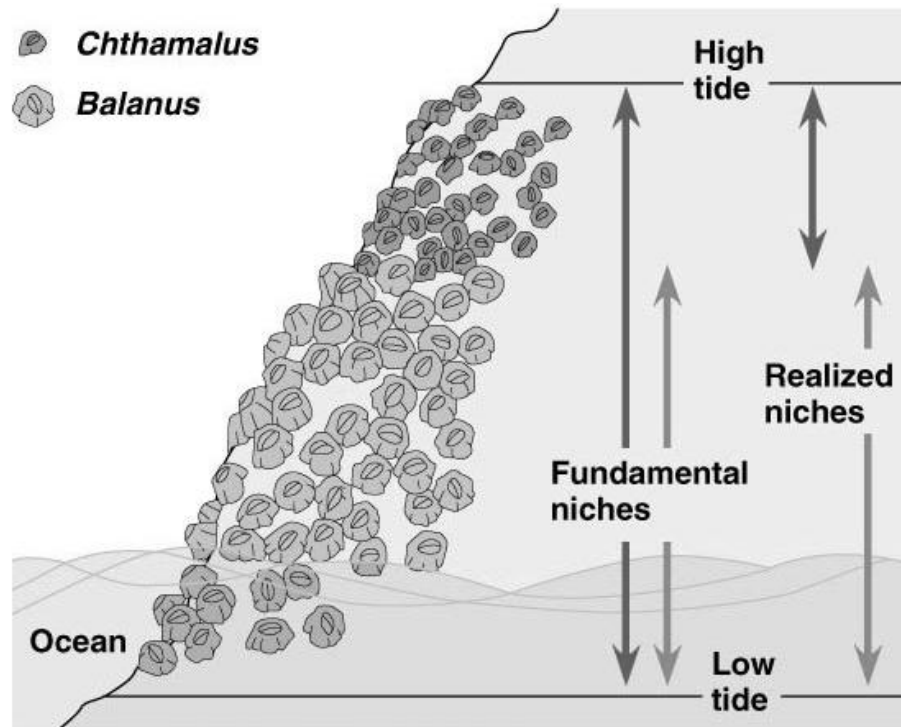
(e) Why do most food chains rarely have more than four trophic levels?

(2 marks)

(Total: 9 marks)

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6. The diagram below shows two species of barnacle: *Chthamalus* and *Balanus*.



Source: <http://www.perkepi.com/ecological-niche>

(a) Define the term *niche*.

(1 mark)

(b) Distinguish between the *fundamental* and the *realized* niche.

(2 marks)

(c) Which species of barnacle seems to be the better competitor and why?

(2 marks)

(d) What are these barnacles competing for?

(1 mark)

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(e) Distinguish between *interspecific* and *intraspecific* competition.

(2 marks)
(Total: 8 marks)

7. Fill in the following table with the following terms. (*Terms can be used once, more than once or not at all*)

- | | | | |
|-------------------|------------------|------------------|-------------------|
| Ecology | Producer | Consumer | Decomposer |
| Population | Community | Ecosystem | Succession |
| Niche | Habitat | Biome | Biosphere |

	Organism that eats plants and/or other animals.
	All the populations in the ecosystem.
	The portion of the earth in which life exists.
	An area on the earth identified by climate, plant and animal life.
	Any plant that manufactures food by photosynthesis.
	The place in the ecosystem where an organism lives.
	Organism that breaks down dead organisms.
	All the members of a species found in a particular location.
	The study of the relationship of organisms with their living and non-living environments.
	A community and the physical environment.

(Total: 10 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) Describe **FIVE** major causes of soil erosion and how they can be tackled. (10 marks)
(b) Explain the meaning of the term *sustainable agriculture*. Discuss practices (except any practices you have already mentioned in part (a)) that characterise sustainable agriculture. (2, 8 marks)
2. (a) Discuss how processes of extraction and purification of finite resources can have a negative impact on the environment. (8 marks)
(b) How does resource substitution help to minimize the negative impacts mentioned in part (a)? (2 marks)
(c) By the year 2020, Malta must fulfil an EU obligation that 10% of its energy is produced from renewable sources. Discuss **FIVE** ways by which Malta can fulfil this obligation. (10 marks)
3. With the inauguration of the third and largest sewage treatment facility, Malta claims that it is the first country in the Mediterranean to be able to treat all its sewage water before dumping it at sea.
(a) Describe **THREE** different problems brought about by dumping of untreated sewage water in the sea. Your answer must include reference to the impact on ecology, health and economy. (6 marks)
(b) An old dictum says that ‘the solution to pollution is dilution’. Explain the meaning behind this saying and why it is particularly not applicable for the Maltese context. (5 marks)
(c) Describe briefly the principles behind the physical, biological and chemical processes that remove some or most of the pollutants from wastewater in a sewage treatment plant. (9 marks)
4. (a) Distinguish between the following terms, giving **ONE** suitable example in each case:
(i) *primary* and *secondary* air pollutants;
(ii) *toxic* and *non-toxic* components of polluted air;
(iii) *bioaccumulation* and *biomagnification*;
(iv) *point sources* and *non-point sources* of pollution. (16 marks)
(b) Describe **ONE** suitable technique that may be used to control the emission of the following atmospheric pollutants:
(i) oxides of nitrogen;
(ii) carbon monoxide;
(iii) oxides of sulfur;
(iv) particulate matter. (4 marks)

