

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD  
UNIVERSITY OF MALTA, MSIDA

MATRICULATION CERTIFICATE EXAMINATION  
INTERMEDIATE LEVEL  
MAY 2012

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**SUBJECT:** ENVIRONMENTAL SCIENCE  
**DATE:** 18<sup>th</sup> May 2012  
**TIME:** 9.00 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) Draw a simple diagram to show the principal vertical layers making up the atmosphere. (*In your diagram make sure that you label **ground level***).

(4 marks)

- (b) List **two** factors that determine the amount of solar radiation received by and lost from the Earth's surface.

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(1, 1 marks)

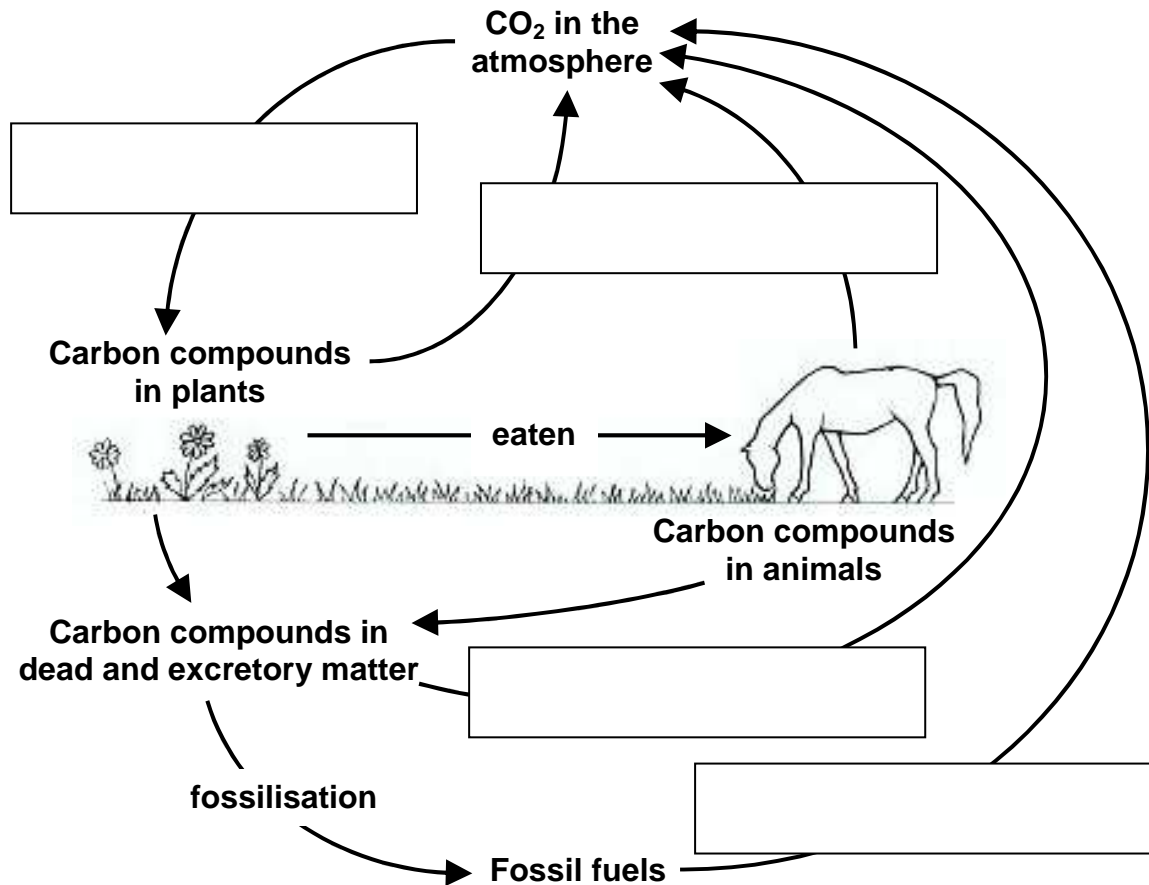
- (c) Mention **two** forces that control atmospheric motion.

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

2. Complete the following diagram of the carbon cycle by writing the appropriate terms in the blank spaces provided.



(Total: 4 marks)

3. (a) What is **ozone**?

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(2 marks)

- (b) Using simple chemical equations show how ozone is formed **and** broken down in the atmosphere.

**Ozone formation:**

**Ozone breakdown:**

*(2 marks)*

(c) Briefly describe why atmospheric ozone is important to life on Earth.

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*(2 marks)*

(d) List **two** consequences of the depletion of atmospheric ozone.

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*(2 marks)*

**(Total: 8 marks)**

4. (a) In the space below draw annotated diagrams to distinguish between (i) a **perched aquifer** and (ii) a **mean sea level aquifer**.

*(2, 2 marks)*

(b) Define **infiltration**.

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*(2 marks)*

(c) List **two** factors that affect infiltration.

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*(2 marks)*

**(Total: 8 marks)**

**5.** (a) Explain the term **photochemical smog**.

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*(4 marks)*

(b) Explain why photochemical smog is more likely to occur in regions such as Marsa than in other regions such as Bahrija.

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*(4 marks)*

(c) Briefly explain each of the following statements related to photochemical smog.

(i) Nitrogen monoxide (or nitric oxide), NO, is a primary pollutant generated mostly during the morning rush hours.

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*(2 marks)*

(ii) Nitrogen monoxide is almost immediately oxidised to a brown gas.

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*(2 marks)*

- (iii) The brown gas dissociates in the presence of solar radiation to produce **free radicals** of oxygen.

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(2 marks)

- (iv) The oxygen radical reacts with other substances such as oxygen molecules to produce other secondary pollutants such as ozone.

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(2 marks)

- (v) One effective way to control photochemical smog is the use of a catalytic converter.

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(2 marks)

(Total: 18 marks)

6. (a) Name **two** atmospheric pollutants which react with water and bring about acid rain.

Pollutant 1: \_\_\_\_\_

Pollutant 2: \_\_\_\_\_

(2 marks)

- (b) Write a balanced chemical equation **OR** a word equation to show how one of these gases reacts with water to form an acidic solution.

(2 marks)

- (c) Explain why acid rain in Malta would have a negative impact on buildings and monuments but would hardly affect agriculture.

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(4 marks)

(Total: 8 marks)

7. Complete the table below by inserting the appropriate term for each definition.

| Term | Definition  |
|------|---|
|      | A large climatic region that has characteristic vegetation.   |
|      | A group of interacting living organisms.  |
|      | All the living organisms in a particular area, and the nonliving component with which the organisms interact. |
|      | The environmental area in which a species lives.  |
|      | The role and relationships of an organism within its community.   |
|      | All the organisms that belong to the same species and live in the same geographical area.                     |
|      | A group of organisms capable of interbreeding and producing fertile offspring.                                |

(Total: 7 marks)

8. (a) Write an equation that includes birth rate, death rate, immigration rate and emigration rate to represent a population that is stable in size.

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(2 marks)

(b) Define the term **carrying capacity**.

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(2 marks)

(c) Suggest **two** density-dependent factors that might prevent population growth.

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(2 marks)

(d) Suggest **two** density-independent factors that might prevent population growth.

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*(2 marks)*

**(Total: 8 marks)**

**9.** (a) What does a pyramid of numbers illustrate?

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*(2 marks)*

(b) What does a pyramid of biomass illustrate?

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*(2 marks)*

(c) Consider the following food chain:

**Oak tree** → **Insects** → **Small birds**

Sketch (i) a **pyramid of numbers**

(ii) a **pyramid of biomass**

*(2, 2 marks)*

(d) Explain the shape of the pyramid of biomass.

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*(3 marks)*

**(Total: 11 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 agricultural practices are bringing about the process of desertification. In your discussion you should include the major causes and impacts of soil erosion and desertification. *(10 marks)*
  - (b) Briefly describe **five** main soil conservation techniques aimed at counteracting the consequences of modern agriculture on the environment. *(10 marks)*
  
2. (a) Define the concept of **sustainable development**. *(2 marks)*
  - (b) With reference to the **extraction** of fossil fuels:
    - (i) Outline the negative environmental, social and economic impacts of the unsustainable practices in this human activity. *(4, 4, 4 marks)*
    - (ii) Suggest **three** actions that could be adopted to make this human activity more sustainable. *(6 marks)*
  
3. Distinguish between each of the following terms, illustrating your answers with suitable examples where necessary.
  - (a) Greenhouse effect and global warming. *(4 marks)*
  - (b) Inert waste and hazardous waste. *(4 marks)*
  - (c) Fossil fuels and biofuels. *(4 marks)*
  - (d) Bioaccumulation and biomagnification. *(4 marks)*
  - (e) Primary atmospheric pollutants and secondary atmospheric pollutants. *(4 marks)*
  
4. (a) Name **three** major greenhouse gases and describe **one** natural source and **one** anthropogenic source by which **each** gas is introduced into the environment. *(9 marks)*
  - (b) (i) Give **three** pieces of evidence suggesting that increased levels of greenhouse gases lead to global warming and climate change. *(3 marks)*
    - (ii) Discuss the impact of climate change on each of the following:
      - agriculture;
      - forests;
      - coastal waters;
      - biodiversity. *(8 marks)*









