

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

**MATRICULATION EXAMINATION
INTERMEDIATE LEVEL
SEPTEMBER 2014**

SUBJECT:	BIOLOGY
DATE:	6 th September 2014
TIME:	9.00 a.m. to 12.00 noon

Directions to Candidates

- *Answer ALL questions in Section A and TWO questions from Section B.*
 - *Write all your answers to questions from Section A in the spaces provided in this booklet. Candidates are advised that under no circumstances should answers to Section A be submitted in the separate answer booklet provided.*
 - *Write all your answers to questions from Section B in the separate answer booklet provided.*
 - *If more than two questions from Section B are attempted, only the first two answers shall be taken into consideration.*
 - *The mark allocation is indicated at the end of each question. Marks allocated to parts of questions are also indicated.*
 - *You are reminded of the necessity for good English and orderly presentation in your answers.*
 - *In calculations you are advised to show all the steps in your working, giving your answer at each stage.*
 - *The use of electronic calculators is permitted.*
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For examiners' use only:

Question	1	2	3	4	5	6	7	8	9	10	11	Total
Score												
Maximum	10	8	7	8	8	9	25	25	25	25	25	100

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SECTION A: Answer **all** questions in this section.

1. The rate of photosynthesis in plants is dependent on a number of factors including light intensity, carbon dioxide concentration, and air temperature. Use your knowledge about the effect of each of these factors on the rate of photosynthesis to explain the following observations.

1.1 The rate of photosynthesis is reduced in very low light intensities.

[two marks]

1.2 The rate of photosynthesis may be reduced at very high light intensities.

[two marks]

1.3 Some crop plants are grown in enclosures enriched in carbon dioxide.

[two marks]

1.4 The rate of photosynthesis increases with increasing temperatures, up to around 35°C.

[two marks]

1.5 The rate of photosynthesis may decrease at temperatures above 35°C.

[two marks]

[Total: ten marks]

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2. A DNA strand is made up of a sugar-phosphate 'backbone' bonded to a series of organic bases. Organic bases from different strands can bond to each other to form a double helix.

2.1 Name the sugar molecule that is found in the backbone of a DNA strand.

[one mark]

2.2 Name the four organic bases that are found in a DNA strand.

[two marks]

2.3 What type of chemical bond joins the organic bases to the sugar-phosphate backbone of a DNA strand?

[one mark]

2.4 What type of chemical bond joins organic bases from complementary DNA strands in a double helix to each other?

[one mark]

The letters below represent the organic bases of a DNA strand.

GGGGGCCCCCCACCGGTTA

2.5 What would the base sequence of the complementary strand be?

[three marks]

[Total: eight marks]

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3. Define each of the following terms:

3.1 Chromosome:

[three marks]

3.2 Gene:

[two marks]

3.3 Allele:

[two marks]

[Total: seven marks]

4. Every winter, medical practitioners prescribe the Influenza Vaccine to their patients. Influenza is caused by a virus.

4.1 Briefly explain why vaccination may prevent a person from contracting influenza.

[four marks]

4.2 Why would a course of antibiotics not be effective in curing influenza?

[two marks]

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4.3 What is the role of memory cells in the immune system of the human body?

[two marks]

[Total: eight marks]

5. Unicellular organisms, such as protozoans, do not have a complex respiratory system for gaseous exchange, whilst large animals, such as humans, all do.

5.1 Why do unicellular organisms lack a complex respiratory system?

[two marks]

5.2 What is the role of erythrocytes in the respiratory system of humans?

[two marks]

5.3 List four features of alveoli that make them good respiratory structures.

[four marks]

[Total: eight marks]

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6. This question is concerned with organic compounds in living organisms.

6.1 What is an *organic compound*?

[one mark]

6.2 List ONE principal function of each of the following organic compounds in the human body:

Proteins:

Lipids:

Carbohydrates:

[three marks]

6.3 Draw the structural formula of a generalized amino acid.

[two marks]

6.4 Draw the structural formula of a generalized dipeptide, showing the peptide linkage.

[three marks]

[Total: nine marks]

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SECTION B:

Answer any **TWO** questions from this section; each question carries twenty-five marks. If more than two questions are attempted, only the first two answers shall be taken into consideration. Write all your answers to questions from this section in the separate answer booklet provided.

7. The cell is the basic unit of living organisms.
- 7.1 Briefly outline the differences between the cells of prokaryotes and those of eukaryotes. **[seven marks]**
- 7.2 Draw a labelled diagram of a plant cell as seen through an electron microscope. **[ten marks]**
- 7.3 Give a brief description of the structure and function of the plant cell organelle most closely associated with photosynthesis. **[eight marks]**
- [Total: twenty-five marks]**

8. Describe the role of each of the following in the carbon cycle:
- 8.1 Photosynthetic plants; **[five marks]**
- 8.2 Animals; **[five marks]**
- 8.3 Bacteria; **[five marks]**
- 8.4 Combustion of oil and coal; **[five marks]**
- 8.5 Large-scale removal of trees (deforestation) **[five marks]**
- [Total: twenty-five marks]**

Please turn the page.

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9. This question is concerned with biological evolution.

9.1 Define biological evolution.

[five marks]

9.2 Describe the role of genetic mutations in the generation of evolutionary change.

[ten marks]

9.3 Explain why high rates of evolution are often observed immediately after major environmental changes.

[ten marks]

[Total: twenty-five marks]

10. This question is concerned with the nervous system of the human body.

10.1 Describe, with the aid of a labelled diagram, the general organization of the nervous system of the human body.

[ten marks]

10.2 Describe the functions of the central nervous system and the peripheral nervous system.

[fifteen marks]

[Total: twenty-five marks]

11. Genes are indirectly responsible for the control of cellular metabolism.

11.1 How do genes control cellular metabolism?

[five marks]

11.2 Describe the process through which a gene gives rise to a polypeptide.

[twenty marks]

[Total: twenty-five marks]