

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

**MATRICULATION CERTIFICATE EXAMINATION  
INTERMEDIATE LEVEL  
MAY 2012**

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<b>SUBJECT:</b>	BIOLOGY
<b>DATE:</b>	12 <sup>th</sup> May 2012
<b>TIME:</b>	9.00 a.m. to 12.00 noon

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**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	10	7	10	5	8	25	25	25	25	25	100

DO NOT WRITE ABOVE THIS LINE

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

1. Figure 1 shows a diagrammatic representation of the fluid mosaic model of the eukaryotic cell membrane. The structure of the cell membrane is maintained by the hydrophilic and hydrophobic properties of the phospholipids from which it is composed. The labels A and B in the diagram refer to the different parts of phospholipid molecules.

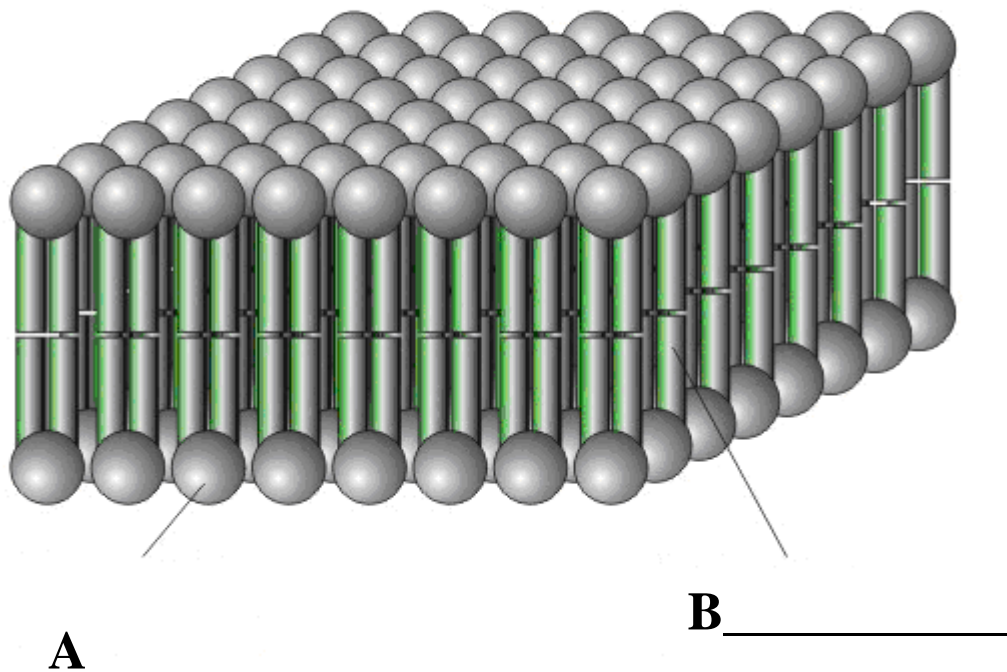


Figure 1: Eukaryotic cell membrane (adapted from <http://www2.fz-juelich.de>)

1.1 Define the following terms:

a) Phospholipid:

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[one mark]

b) Hydrophobic:

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[one mark]

DO NOT WRITE ABOVE THIS LINE

c) Hydrophilic:

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[one mark]

1.2 Indicate whether the structures labeled A and B in Figure 1 are hydrophobic or hydrophilic. Write your answer next to the label, in the space provided.

[two marks]

1.3 List THREE functions of the eukaryotic cell membrane.

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[three marks]

1.4 List TWO other components of cell membranes that are not shown in Figure 1.

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[two marks]

[Total: ten marks]

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2. The graph in Figure 2 shows the rate of digestion of starch by an enzyme at different temperatures.

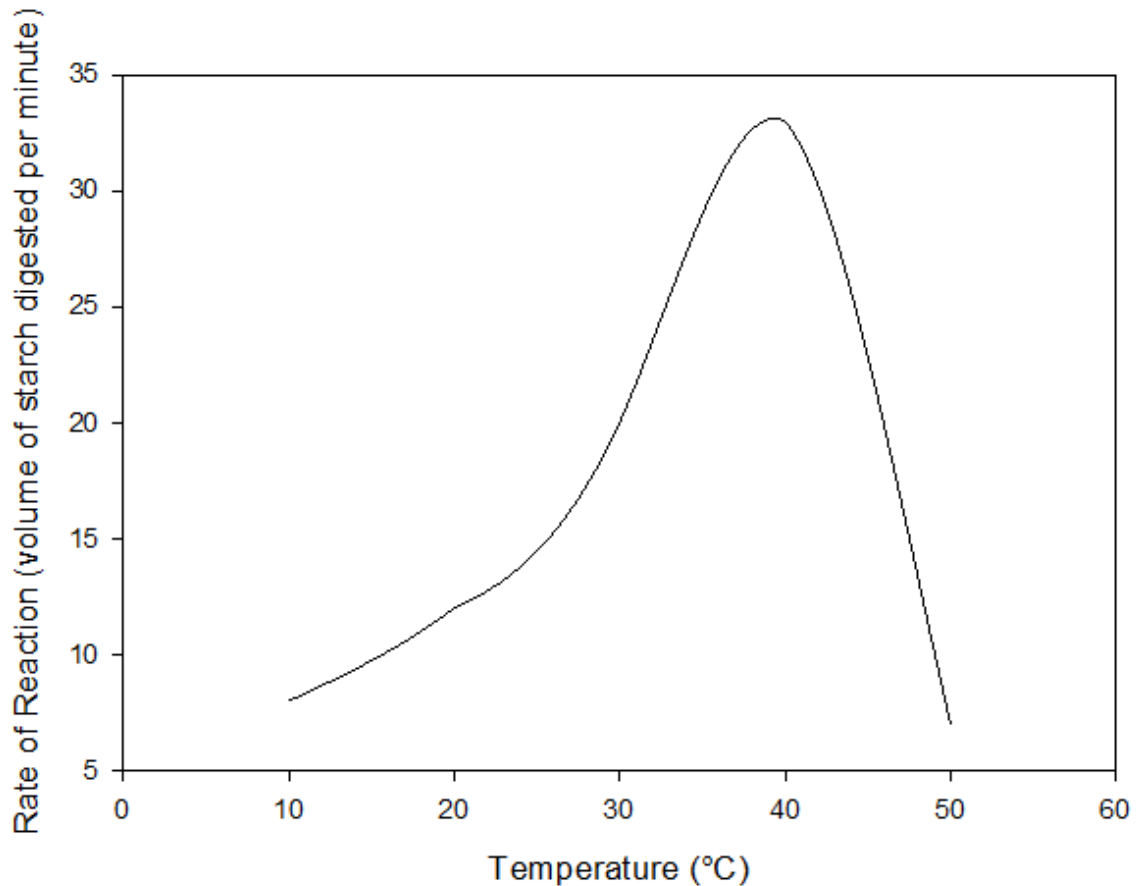


Figure 2: Rate of digestion of starch at different temperatures

- 2.1 What is an *enzyme*?

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[one mark]

- 2.2 Describe the activity of this enzyme between 10 °C and 40 °C.

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[one mark]

DO NOT WRITE ABOVE THIS LINE

2.3 Explain why enzyme activity decreases at temperatures above 40 °C.

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[two marks]

2.4 Briefly describe one hypothesis that explains how enzyme molecules interact with molecules of substrate.

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[three marks]

2.5 Suggest a possible identity for this enzyme based on the substrate being digested.

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[one mark]

2.6 List TWO other factors that may influence the rate of enzyme activity.

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[two marks]

[Total: ten marks]

3. This question is about genetic mutations.

3.1 What is a *mutation*?

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[one mark]

DO NOT WRITE ABOVE THIS LINE

3.2 Distinguish between gene mutations and chromosomal mutations.

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**[two marks]**

3.3 Which of the two types of mutation listed in Question 3.2 is likely to have the greater effect on an organism? Explain your answer.

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**[two marks]**

3.4 Name ONE condition that is a consequence of a chromosomal mutation and ONE condition that is a consequence of a gene mutation.

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**[two marks]**

**[Total: seven marks]**

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4. The diagram in Figure 3 shows a representation of part of a food web in the Antarctic Ocean.

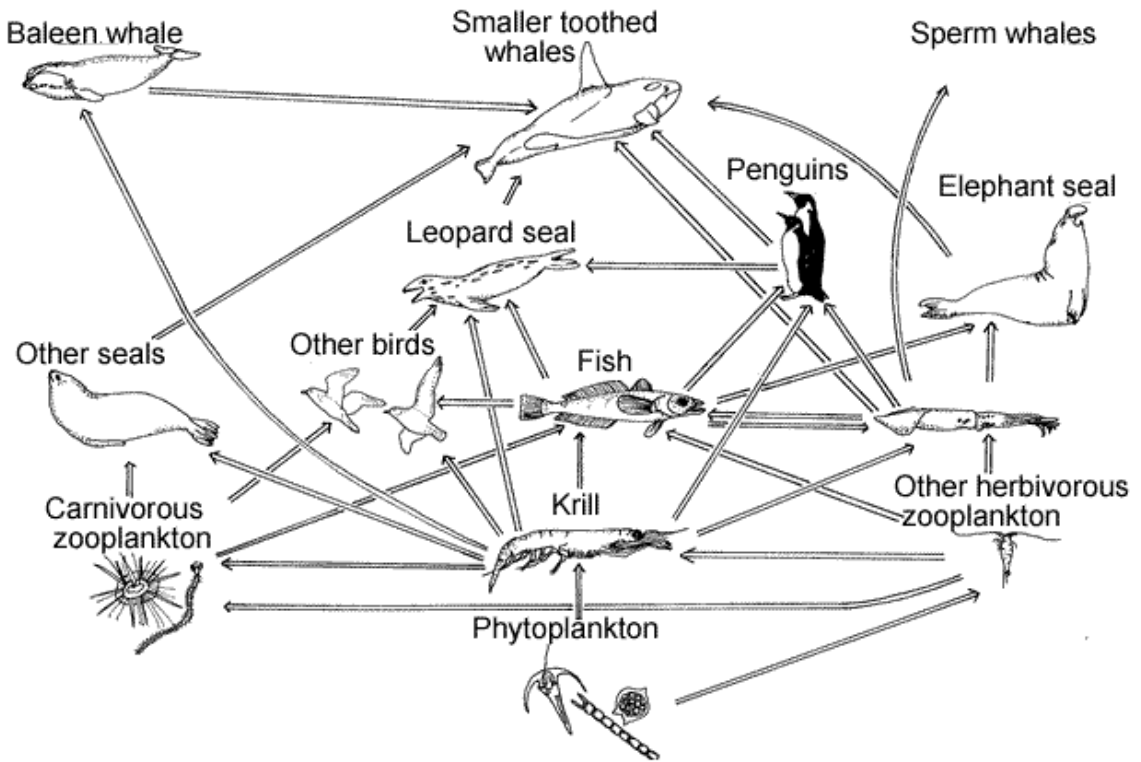


Figure 3: Antarctic Ocean food web (from <http://www.coolantarctica.com>)

4.1 What is a *food web*?

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[one mark]

4.2 Which organism is likely to be a producer in this food web?

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[one mark]

DO NOT WRITE ABOVE THIS LINE

4.3 Name ONE organism in the:

a) Second trophic level: \_\_\_\_\_

b) Third trophic level: \_\_\_\_\_

c) Fourth trophic level: \_\_\_\_\_

**[three marks]**

4.4 Krill are small invertebrates that are very important in the Antarctic food web. What effect would the removal of krill have on:

a) Phytoplankton? \_\_\_\_\_

b) Leopard Seals? \_\_\_\_\_

c) Elephant Seals? \_\_\_\_\_

**[three marks]**

4.5 Why is the energy content of higher trophic levels lower than that of lower trophic levels?

**[two marks]**

**[Total: ten marks]**



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5. Describe the role of each of the following in the circulatory system of the human body.

5.1 Erythrocytes;

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[one mark]

5.2 Leucocytes;

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[one mark]

5.3 Tissue fluid;

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[one mark]

5.4 Platelets;

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[one mark]

5.5 Plasma.

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[one mark]

[Total: five marks]

DO NOT WRITE ABOVE THIS LINE

6. Name the site of secretion and list ONE function of each of the following hormones of the human body:

6.1 Follicle stimulating hormone (FSH);

Site of secretion:

Function:

[two marks]

6.2 Luteinising hormone (LH);

Site of secretion:

Function:

[two marks]

6.3 Progesterone;

Site of secretion:

Function:

[two marks]

6.4 Testosterone.

Site of secretion:

Function:

[two marks]

[Total: eight marks]

DO NOT WRITE ABOVE THIS LINE

**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. This question is about cells.

7.1 Draw labelled diagram of a generalized prokaryotic cell.

**[ten marks]**

7.2 Give the function of five of the structures labelled in the diagram drawn in the answer to Question 7.1.

**[five marks]**

7.3 Name FIVE organelles which are not found in prokaryotic cells and are found in eukaryotic cells; give ONE function for each named organelle.

**[ten marks]**

**[Total: twenty-five marks]**

8. This question is about biological evolution.

8.1 What is *evolution*?

**[five marks]**

8.2 Explain each of the following:

- (a) Small organisms with a short lifespan evolve more rapidly than larger, longer-lived organisms.
- (b) A beneficial mutation will spread through a population until all individuals carry the mutated gene.
- (c) Overuse of antibiotics will give rise to bacteria that are resistant to antibiotics.
- (d) Many species generally produce more offspring than their habitat can support.
- (e) Rates of evolutionary change are often linked to rates of environmental change.

**[twenty marks]**

**[Total: twenty-five marks]**

DO NOT WRITE ABOVE THIS LINE

9. Homeostasis is the maintenance of a stable internal environment inside the body.

9.1 What is the role of negative feedback mechanisms in homeostasis?

**[five marks]**

9.2 Describe the processes involved in regulation of blood glucose level in the human body.

**[twenty marks]**

**[Total: twenty-five marks]**

10. The brain is a fundamental component of the nervous system of the human body.

10.1 What is the role of the brain in the nervous system?

**[five marks]**

10.2 Draw a labelled diagram showing a cross-section through the brain. Your diagram should indicate the location of the medulla, cerebellum, hypothalamus, cerebral hemispheres, motor areas, sensory areas and association areas.

**[ten marks]**

10.3 Describe how the nervous system can produce a very rapid response to a painful stimulus.

**[ten marks]**

**[Total: twenty-five marks]**

11. Replication of DNA is a semi-conservative process.

11.1 Why is DNA replication considered to be *semi-conservative*?

**[two marks]**

11.2 Why is it necessary for cells to replicate their DNA prior to cell division?

**[three marks]**

11.3 Give an illustrated account of the processes involved in semi-conservative DNA replication.

**[twenty marks]**

**[Total: twenty-five marks]**