

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD
UNIVERSITY OF MALTA, MSIDA
MATRICULATION EXAMINATION
INTERMEDIATE LEVEL
SEPTEMBER 2015

SUBJECT: BIOLOGY
DATE: 4th September 2015
TIME: 4.00 p.m. to 7.00 p.m.

Directions to Candidates

- Write your index number in the space at the top left-hand corner of this page.
- 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.

For examiners' use only:

Question	1	2	3	4	5	6	7	8	9	10	11	Total
Score												
Maximum	8	5	7	10	12	8	25	25	25	25	25	100

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

1. Figure 1 represents a simplified food web for a North American woodland community.

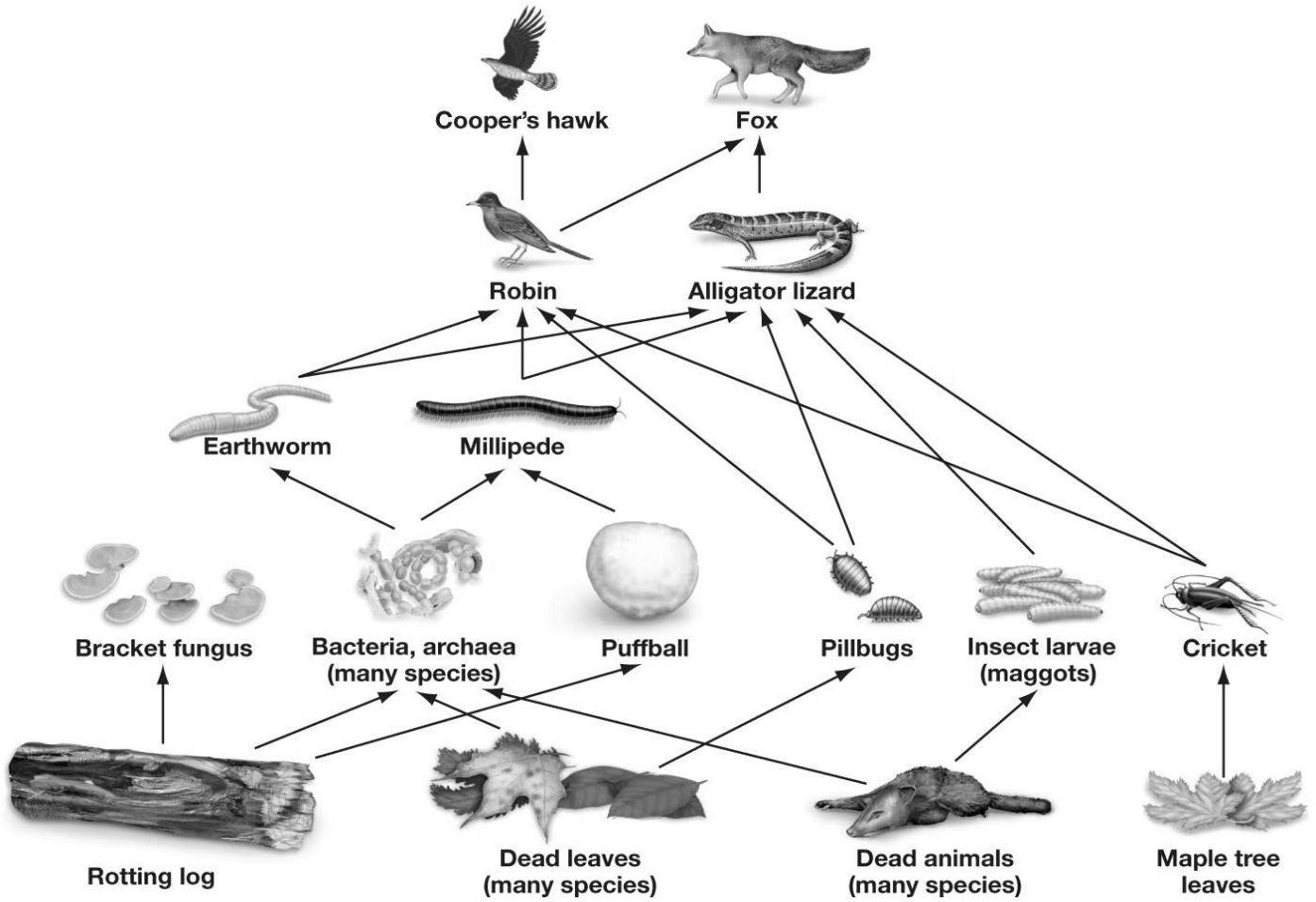


Figure 1
 (http://www.uic.edu/classes/bios/bios101/x311_files/textmostly/slide19.html)

1.1 What is meant by the term ‘community’?

[two marks]

1.2 Explain the terms below. Use examples from Figure 1 to support your answers.

a) detritivore

[two marks]

b) saprotroph (decomposer)

[two marks]

1.3 Give **TWO** effects that excessive hunting of robins would have on the community represented in Figure 1.

[two marks]

[Total: eight marks]

2. This question is about DNA structure and replication.

Read through the following account and fill in the missing terms using the list below.

The terms can be used once, more than once or none at all.

nucleic acids
nucleotides
covalent

thymine
deoxyribose
ionic

hydrogen
ribose
glucose

Uracil
Bases
Thyroxine

DNA is composed of a double helix, that is two complementary DNA strands held together by _____ bonds. Each individual strand is composed of a sequence of _____ which are the monomers of DNA. Each of these monomers has three main components, which are a 5-carbon sugar known as _____, a phosphate group and a base. The latter three components are bound together by _____ bonds.

In DNA the four bases are adenine, cytosine, guanine and _____. The sequence of these four bases is very important as it provides the genetic instructions required for the proper functioning of living organisms.

[one mark each]

[Total: five marks]

3.1 Give ONE difference between a prokaryotic and eukaryotic cell.

[one mark]

3.2 List **two** structures found in both prokaryotic and eukaryotic cells.

[two marks]

3.3 Mention **two** organelles which are bounded by a single membrane.

1: _____

2: _____

[two marks]

3.4 List two organelles which are bounded by a double membrane.

1: _____

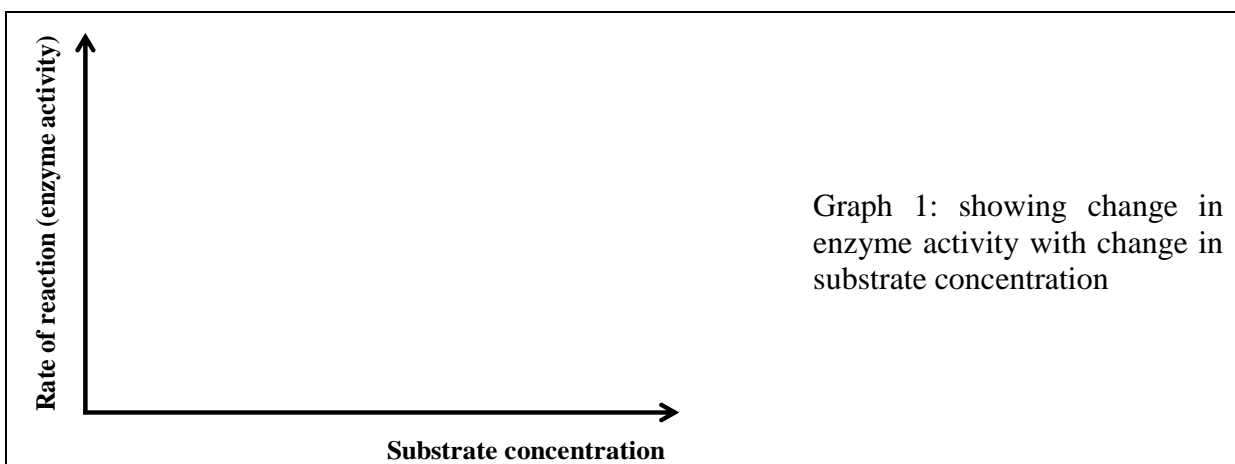
2: _____

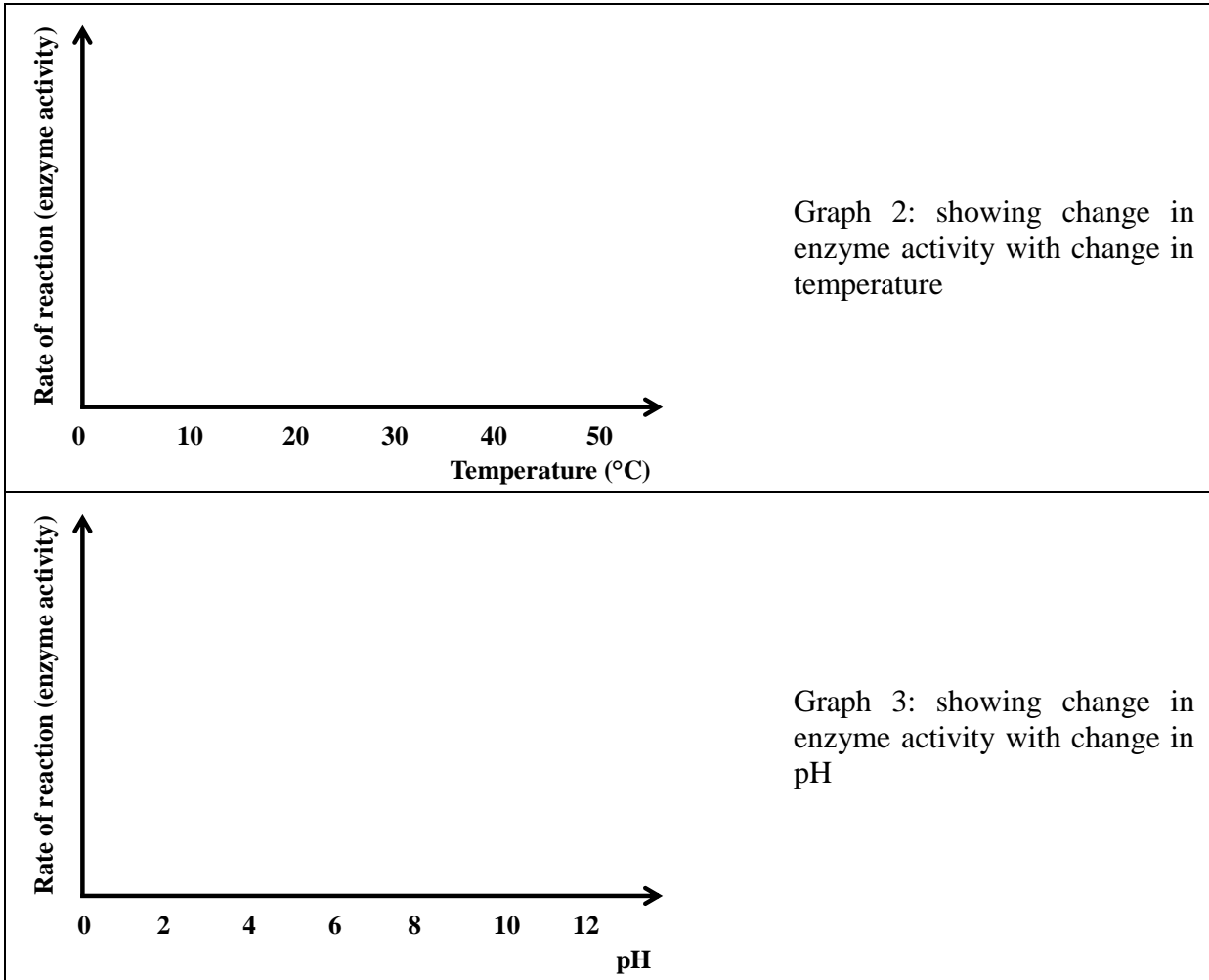
[two marks]

[Total: seven marks]

4. The enzyme pepsin, which is found in the human stomach, is responsible for the breakdown of food proteins into peptides. A student obtained some purified pepsin and tested it under various conditions to see how the enzyme's rate of reaction changes on altering the conditions in which the enzyme works.

4.1 Using the spaces below sketch the graphs the student would expect to obtain on changing the specified conditions:





[six marks]

4.2 Explain the 'lock-and-key' model of enzyme reaction using the enzyme pepsin as an example.

[four marks]

[Total: ten marks]

5. This question is about the transport system of the human body.

5.1 Why do large organisms require a bulk transport system to be able to carry nutrients and waste to and from various parts of the body?

[two marks]

5.2 Give **ONE** function for each of the four blood components.

Component	Function
Plasma	
Erythrocytes	
Leucocytes	
Platelets	

[four marks]

5.3 The diagram in figure 2 shows the human heart.

a) Identify the structures labelled A to F.

Letter	Structure Named
A	
B	
C	
D	
E	
F	

[six marks]

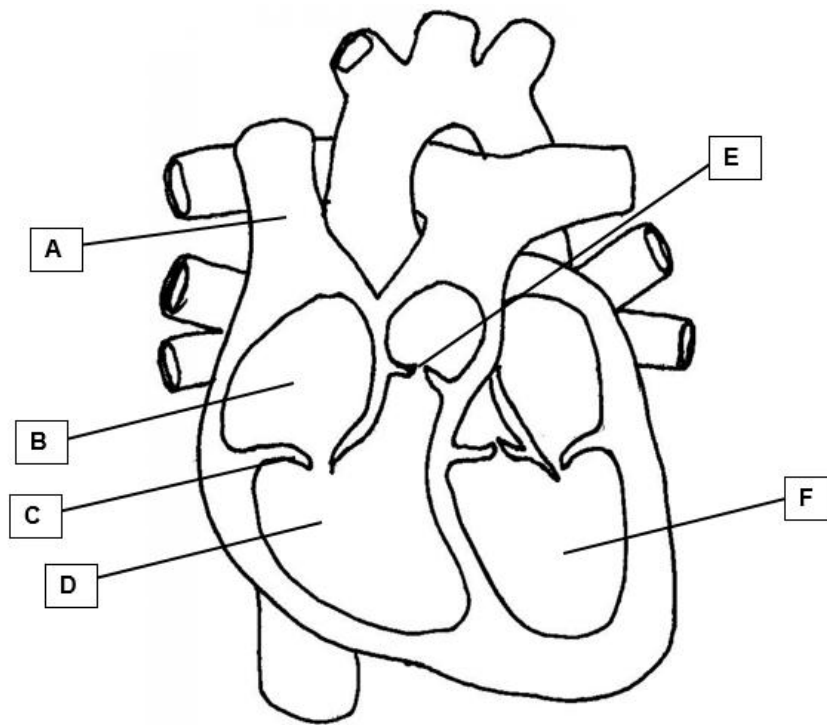


Figure 2: Human Heart

[Total: twelve marks]

6. This question is about chromosomes and mutations.

6.1 Name the two main components that make up eukaryotic chromosomes.

1: _____

2: _____

[one mark]

6.2 Distinguish between the following terms:

a) 'gene' and 'allele'

[two marks]

b) 'gene mutation' and 'chromosomal mutation'

[two marks]

6.3 Sickle cell anaemia is a condition that arises due to mutations. What type of mutation causes sickle cell anaemia? Explain how this mutation arises.

Type of mutation: _____

Explanation: _____

[three marks]

[Total: eight marks]

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 defence against infectious diseases in humans.

7.1 Why does the human body require an immune system?

[three marks]

7.2 Explain why the skin and mucous membranes act as borders against infectious diseases.

[five marks]

7.3 Briefly describe the role played by the following in the immune system of the human body:

- a) phagocytic leucocytes
- b) B-lymphocytes

[ten marks]

7.4 HIV is a virus that attacks only a few cells in the human body, yet its occurrence in the human body becomes progressively life threatening. Briefly explain this statement.

[seven marks]

[Total: twenty-five marks]

8. Use your knowledge of biology to explain the following statements related to reproduction:

8.1 Asexual reproduction produces offspring that are genetically identical to the parent.

[four marks]

8.2 Sexual reproduction increases genetic variation in a species.

[five marks]

8.3 Oestrogen and progesterone play different roles in the female reproductive systems.

[six marks]

8.4 Testosterone leads to a number of changes in males during puberty.

[four marks]

8.5 The uterus plays important roles in the female reproductive cycle.

[six marks]

[Total: twenty-five marks]

9. This question is about evolution and diversity of life.

9.1 The Arctic fox (a Northern Hemisphere species) and the Fennec fox (a North African species) are two closely related fox species. Yet, the Arctic fox has short ears and very thick white fur, while the Fennec fox has long ears and very thin brown fur. Explain this statement in terms of evolution.

[ten marks]

9.2 Living organisms are classified in the five kingdoms of life. Through the use of a suitable table, **LIST** the five kingdoms of life, including **TWO** main characteristics for each kingdom and **ONE** representative organism for each kingdom.

[fifteen marks]

[Total: twenty-five marks]

10. This question is about cellular respiration.

10.1 Draw a simple labelled diagram to show the structure of a mitochondrion.

[five marks]

10.2 Using the diagram that you have drawn in your answer to question 10.1, indicate the location where Krebs cycle and oxidative phosphorylation take place.

[two marks]

10.3 Outline the main processes and the product/s produced during:

a) Glycolysis

[five marks]

b) Krebs Cycle

[five marks]

c) Oxidative phosphorylation

[five marks]

10.4 What is the fate of the products formed during glycolysis, if anaerobic respiration is being carried out?

[three marks]

[Total: twenty-five marks]

11. This question is about cell membranes.

11.1 The fluid mosaic model is used to explain membrane structure. Draw a fully **labelled** diagram to show the structure of the plasma membrane.

[eight marks]

11.2 Give the function of each labelled structure you mentioned in question 11.1.

[five marks]

11.3 Explain how the phospholipids ensure that the structure of the cell membrane is maintained.

[three marks]

11.4 Describe how membrane structure is related to the transport of materials across a membrane by means of:

a) osmosis;

[three marks]

b) diffusion;

[three marks]

c) active transport.

[three marks]

[Total: twenty-five marks]

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