

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

SUBJECT: BIOLOGY
DATE: 30th August 2016
TIME: 4:00 p.m. to 7:05 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 circumstance 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	12	7	6	10	6	9	25	25	25	25	25	100

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

1. Fill in the following table. Use an **X** if the structure is present in a prokaryotic cell, eukaryotic plant and/or eukaryotic animal cell. Also give **ONE** function of the named structure. The first one has been done for you as an example.

Structure	Prokaryotic cell	Eukaryotic animal cell	Eukaryotic plant cell	Function
Cytoplasm	X	X	X	Site of chemical reactions
Ribosomes				
Rough Endoplasmic Reticulum				
Plasmid				
Cell wall				
Slime capsule				
Golgi apparatus				

[Total: twelve marks]

2. The diagram below shows the cell plasma membrane.

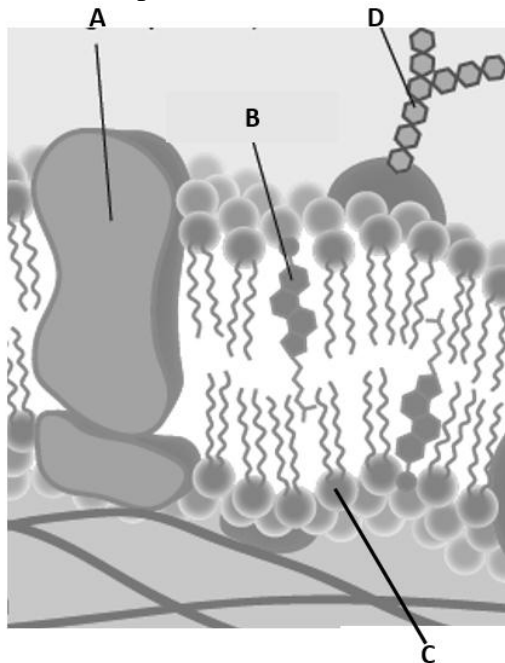


Figure 1: Adapted from: <http://rhspreib.weebly.com/cells.html>

2.1 Identify structures A – D.

Label	Name
A	
B	
C	
D	

[four marks]

2.2 Explain how **structure C** helps maintain membrane structure.

[two marks]

2.3 Give **ONE** function of structure A.

[one mark]

[Total: seven marks]

3. This question is about respiration.

3.1 List the **THREE** main processes involved in aerobic respiration and the **TWO** main processes involved in anaerobic respiration. Which process is common to both aerobic and anaerobic respiration?

[three marks]

3.2 The final product resulting from aerobic metabolism of glucose is ATP. Name and briefly describe the process in aerobic respiration that produces the highest amount of ATP.

[three marks]

[Total: six marks]

4. This question is about evolution.

4.1 What is biological evolution?

[two marks]

4.2 Explain the following statements:

4.2.1 Evolution is a result of environmental change.

[two marks]

4.2.2 Populations tend to produce more offspring than the environment can support.

[two marks]

4.2.3 Members of a species show variation.

[two marks]

4.2.4 Natural selection ensures that the best adapted will survive to breed.

[two marks]

[Total: ten marks]

5. This question is about human reproduction.

Figure 2 forms part of the female reproductive system.

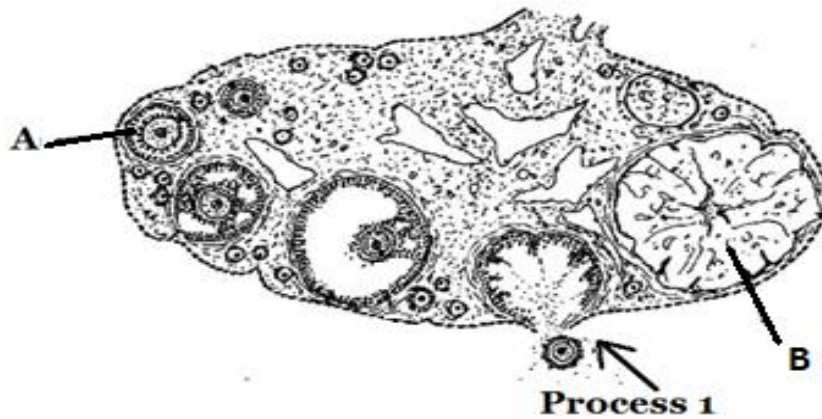


Figure 2: Part of female reproductive system.
Adapted from: http://animalsciences.missouri.edu/courses/4314/microscope_slides/ovary.htm

5.1 Identify structures A and B.

Structure A: _____

Structure B: _____

[one mark]

5.2 Identify **Process 1** and indicate which hormone induces this process.

Process 1: _____

Hormone: _____

[two marks]

5.3 In which part of the female reproductive system does fertilisation occur?

[one mark]

5.4 What hormone allows the male body to start producing sperm?

[one mark]

5.5 Upon fertilisation, how will the zygote formed differ from the sperm cell that fertilised it?

[one mark]

[Total: six marks]

6. This question is about photosynthesis.

6.1 Three products of photosynthesis (labelled A, B, C) are missing in the following flow diagram.

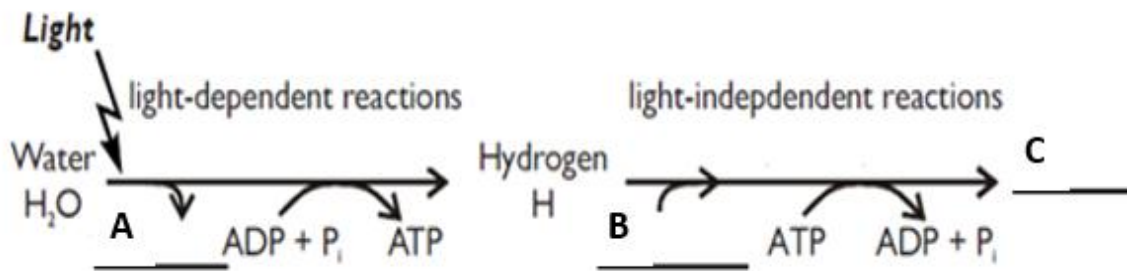


Figure 3: Photosynthesis flow diagram

Write the name of the missing products below:

A: _____

B: _____

C: _____

[three marks]

Light-dependent (LD) and light-independent (LI) reactions occur in the organelle shown in photomicrograph below:

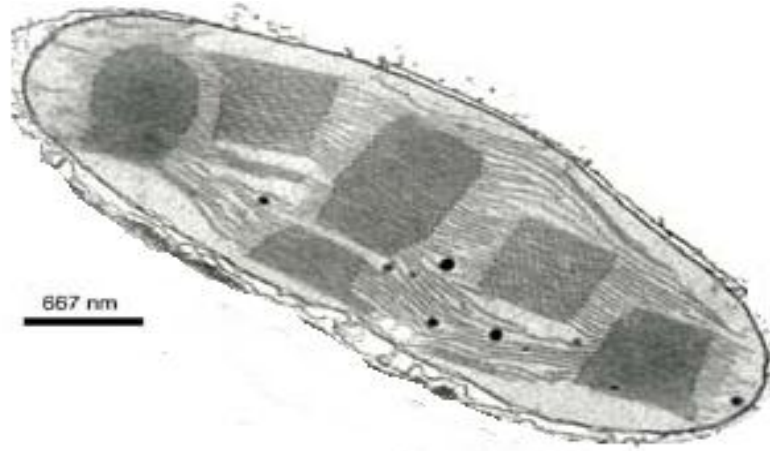


Figure 4: Adapted from: <http://www.oardc.ohio-state.edu/mcic/>

6.2 Identify the organelle shown in Figure 4.

[one mark]

6.3. On Figure 4, mark the site of the light dependent (LD) and light independent reactions (LI).

[two marks]

6.4 The black circles in the diagram are starch granules. How would the amount of starch present in this organelle vary if the light intensity shining on this plant is increased?
Give a reason for your answer.

[two marks]

6.5 Name **ONE** internal factor that could reduce the photosynthetic rate.

[one mark]

[Total: nine 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 the transport system.

7.1 Describe how the heart collects blood, pumps blood and opens and closes its valves.

[twelve marks]

7.2 Explain the relationship between the structure and function of arteries, capillaries and veins.

[ten marks]

7.3 What is tissue fluid?

[three marks]

[Total: twenty-five marks]

8. This question is about proteins and their synthesis.

8.1 What are proteins?

[two marks]

8.2 Name and draw a simple diagram to show the general structure of a protein monomer.

[four marks]

8.3 Proteins are constantly being formed inside cells. The synthesis of proteins consists of two main steps. Name these **TWO** steps, mention where these two steps occur in the cell and briefly explain what happens in each step.

[fourteen marks]

8.4 Discuss the relationship between a gene and a polypeptide.

[five marks]

[Total: twenty-five marks]

9. This question is about energy relationships.

Faeces from horses contain large amounts of dead plant material. Larva of flies feed on the horse dung. A female parasitic wasp *Muscidifurax raptorellus*, lays its eggs in the pupa of the fly. When the parasitic wasp egg hatches into a larva, it feeds on the pupa. Eventually the parasitic wasp turns into an adult that emerges from the remains of the pupa.

9.1 Draw a labelled pyramid of energy for the food chain above.

[four marks]

9.2 Give reasons for the following statements:

9.2.1 An increase in population size of fly larva may result in an increase in the mortality rate of the fly population itself.

[four marks]

9.2.2 Fluctuations in the population size of the fly larva are tightly linked to the fluctuations in the parasitic wasp population.

[four marks]

9.3 Fungi can be observed growing on older horse dung. Fungi are saprophytes. Describe how fungi feed.

[five marks]

9.4 Various bacteria help to make some of the nitrogen in horse dung available to the grass for growth. Describe the Nitrogen Cycle. You may make use of a flow chart/ diagram.

[eight marks]

[Total: twenty-five marks]

10. This question is about nutrition.

“Cholesterol itself is a steroid with a bad reputation. Many products now advertise themselves as *cholesterol free* or *low in cholesterol*. Although cholesterol is crucial to life, doctors have found that individuals with excessively high levels of cholesterol in their blood are much more likely to suffer from health problems than other individuals.”

10.1 What are the health problems caused by cholesterol that the above passage is referring to?

[five marks]

Health problems can also occur due to malnutrition arising from lack of minerals and vitamins.

10.2 Discuss the importance of vitamins in the human body. Include any **TWO** sources and **ONE** named example in your answer.

[six marks]

10.3 Minerals must be obtained through diet because the body cannot manufacture them.

Discuss the importance of minerals in the diet. Include any **TWO** sources and at least **ONE** named example in your answer.

[six marks]

10.4 A person living a healthy life should follow a balanced diet. Mention and explain why other nutrients should be present in a balanced diet to avoid malnutrition.

[eight marks]

[Total: twenty-five marks]

11. This question is on enzymes.

11.1 Enzymes are also known as biological catalysts. Explain this statement and briefly describe how an enzyme helps in making a chemical reaction occur spontaneously.

[five marks]

11.2 Using diagrams, describe the “lock and key” model of enzyme action.

[seven marks]

Enzyme reactions can be affected by several factors including pH, temperature and substrate concentration.

11.3 For each of the factors mentioned above, describe how each of these factors affect the rate of an enzyme catalysed reaction.

[nine marks]

11.4 Inhibition is another factor that affects enzyme activity. Explain how inhibitors affect an enzyme catalysed reaction.

[four marks]

[Total: twenty-five marks]

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