



L-Università
ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

**INTERMEDIATE MATRICULATION LEVEL
2018 FIRST SESSION**

SUBJECT: **Biology**
DATE: 7th May 2018
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 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	7	7	6	9	11	10	25	25	25	25	25	100

SECTION A: Answer ALL questions in this section.

1. This question is about the chemistry of life.

a. Distinguish between an atom and an ion. Give an example of each.

_____ (3)

b. Explain how the following functions of water are important to organisms:

i. Water as a transport medium;

_____ (2)

ii. Water as a coolant.

_____ (2)

(Total: 7 marks)

2. This question is about the human reproductive system.

a. State in which structure of the human reproductive system, do the following processes occur.

Description	Structure
Sperms are produced by meiosis	
Implantation occurs	
Sperms are ejected into the female	
Oestrogen is produced	
Fertilisation occurs	

(5)

b. Give **ONE** function of the following hormones:

i. FSH;

_____ (1)

ii. Testosterone.

(1)

(Total: 7 marks)

3. This question concerns photosynthesis in plants.

a. The following are some adaptations of a leaf for photosynthesis:

- i. Closely packed palisade cells with numerous chloroplasts;
- ii. Stomatal pores opening and closing resulting from changes in turgidity of guard cells;
- iii. A transparent waxy cuticle on the upper epidermis.

Briefly describe the function that each of the adaptations confer.

i. _____
_____ (2)

ii. _____
_____ (2)

iii. _____
_____ (2)

(Total: 6 marks)

Please turn the page.

4. This question is about response to the environment.

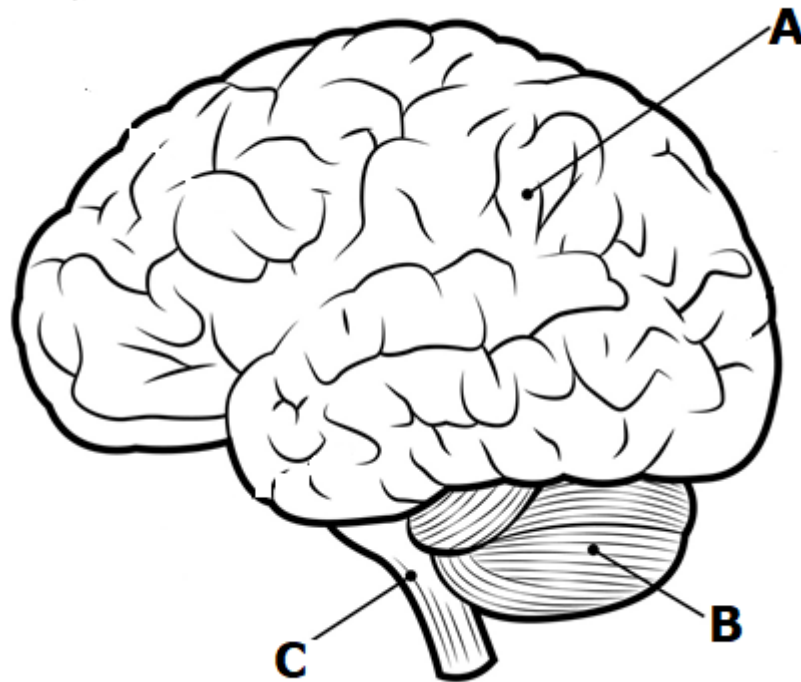


Figure 4.1

(<https://anatomybodysystem.com>)

a. Figure 4.1 above shows the human brain. The table refers to the structures labelled A, B and C on the diagram. Complete the following table.

Label	Name of structure	Function
A		
B		
C		

(6)

- b. The brain, together with the spinal cord, makes up the central nervous system. Figure 4.2 below shows a section through the spinal cord.

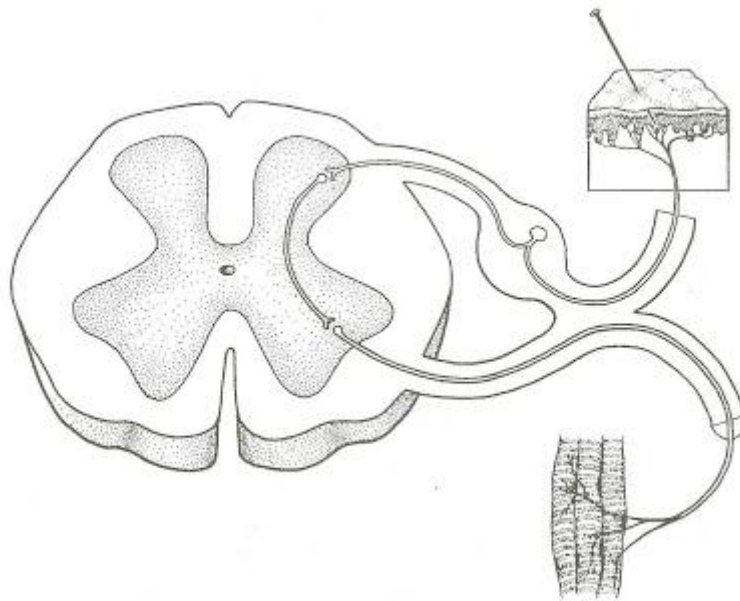


Figure 4.2

(<https://anatomybodysystem.com>)

- i. On the diagram label the following:

- Grey matter;
- White matter;
- Sensory neurone;
- Motor neurone.

(2)

- ii. On the diagram, add arrows to show the direction travelled by the nerve impulse. (1)

(Total: 9 marks)

Please turn the page.

5. This question is about gene technology.

a. What are restriction enzymes?

_____ (1)

b. What is the role of restriction enzymes in recombinant DNA technology?

_____ (2)

c. Briefly explain how the gene for the required protein can be isolated and inserted into a vector.

_____ (6)

d. The vectors are then introduced to host cells, such as bacteria. Give **TWO** reasons as to why bacteria are commonly used in this process.

_____ (2)

(Total: 11 marks)

6. This question concerns cellular respiration.

Figure 6.1 below is a flow chart showing the processes and molecules involved in cellular respiration. One of the molecules is labelled 'X'.

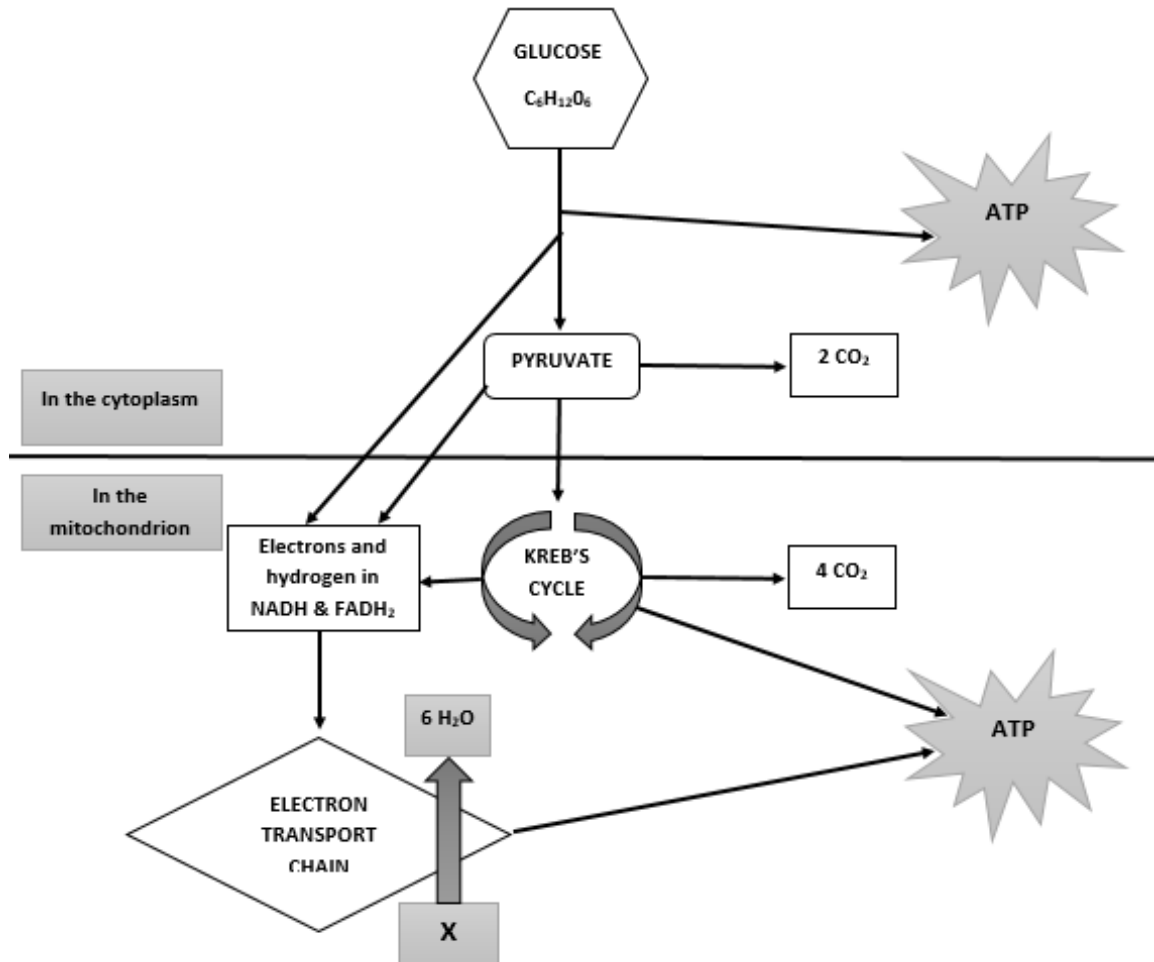


Figure 6.1: Flow chart showing the processes in cellular respiration

a. Name the process that occurs in the cytoplasm, where glucose is converted to pyruvate.

_____ (1)

b. Name molecule X.

_____ (1)

This question continues on next page.

c. State whether the processes in the mitochondrion are aerobic or anaerobic. Give **ONE** explanation for your answer.

_____ (1)

Explanation: _____

_____ (2)

d. List **ONE** characteristic of the mitochondrion that allows it to be a very efficient producer of energy.

_____ (2)

e. Explain the role of the reduced NAD and FAD when they are passed on the electron transport chain.

_____ (2)

f. Briefly describe **ONE** function of ATP in living organisms.

_____ (1)

(Total: 10 marks)

SECTION B:

Answer any TWO questions from this section; each question carries 25 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 concerns energy flow through ecosystems.

Energy flows through ecosystems in a continuous one way course. In contrast nutrients are replenished in a circular flow within ecosystems.

- a. Define the term ecosystem. (4)
- b. Describe how energy flows through ecosystems. Explain why only a fraction of the energy available at one trophic level is transferred to the next. (10)
- c. The process of decomposition allows for nutrient uptake by the producers but energy is lost not recycled. Explain this statement. (4)
- d. Nitrogen is one nutrient continuously being replenished within ecosystems.
 - i. What is the role of nitrogen in living organisms? (1)
 - ii. Describe each of the following processes in relationship to the nitrogen cycle:
 - Nitrogen fixation; (4)
 - Denitrification. (2)

(Total: 25 marks)

8. This question concerns gaseous exchange in humans.

- a. Distinguish between gaseous exchange and breathing. (2)
- b. Using a well-labelled diagram, outline the pathway taken by air from the outside environment to the respiratory surface of a human. Your answer should include a description of the structures present along this pathway. (15)
- c. Compare and contrast the processes of inhalation and exhalation. (5)
- d. Name and describe **ONE** health problem involving gas exchange. (3)

(Total: 25 marks)

Please turn the page.

9. This question concerns genetic mutations and evolution.
- a. Sickle cell anaemia is a genetic disease that results in clumped haemoglobin and sickle shaped red blood cells. It is caused by a gene mutation.
 - i. Define the term gene mutation. (4)
 - ii. Sickle cell anaemia is the result of a change in protein structure. Explain. (5)
 - b. Genetic variation is one of the sources of mutations.
 - i. Describe how members of a population show genotypic variation. (3)
 - ii. Give an account describing how evolution occurs by natural selection. Use appropriate examples to illustrate your answer. (10)
 - iii. People suffering from sickle cell anaemia do not suffer from malaria. Explain this statement. (3)

(Total: 25 marks)

10. This question is about protein structure.
- a. What are proteins? (2)
 - b. Name and draw the general structure of a protein monomer. (4)
 - c. Explain how a protein forms from its monomers. In your explanation a drawing of the structural formula to show the bond formation in this process must be included. (5)
 - d. Proteins can be classified according to their structure: fibrous proteins and globular proteins. Describe the nature of these **TWO** structural forms and list an example of each. (4)
 - e. Proteins are produced in cells by the processes of transcription and translation. Give an outline of these two processes. (10)

(Total: 25 marks)

11. This question concerns eukaryotic cells and plasma membranes.
- a. What is a eukaryotic cell? (2)
 - b. A eukaryotic cell is surrounded by a plasma membrane.
 - i. Draw a labelled diagram to show the fluid mosaic structure of this cell plasma membrane. (10)
 - ii. Explain how the structure of the cell plasma membrane is maintained. (5)
 - c. Some organelles in eukaryotic cells have more than one membrane around them. Discuss this statement. (8)

(Total: 25 marks)

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