



L-Università
ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

**INTERMEDIATE MATRICULATION LEVEL
2019 SECOND SESSION**

SUBJECT: **Biology**
DATE: 5th September 2019
TIME: 9:00 a.m. to 12:05 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	10	6	7	9	7	11	25	25	25	25	25	100

SECTION A: Answer ALL questions in this section.

1. This question is about cells.

a. Give **ONE** difference between a prokaryotic cell and a eukaryotic cell.

_____ (1)

b. Figure 1.1 shows a eukaryotic cell.

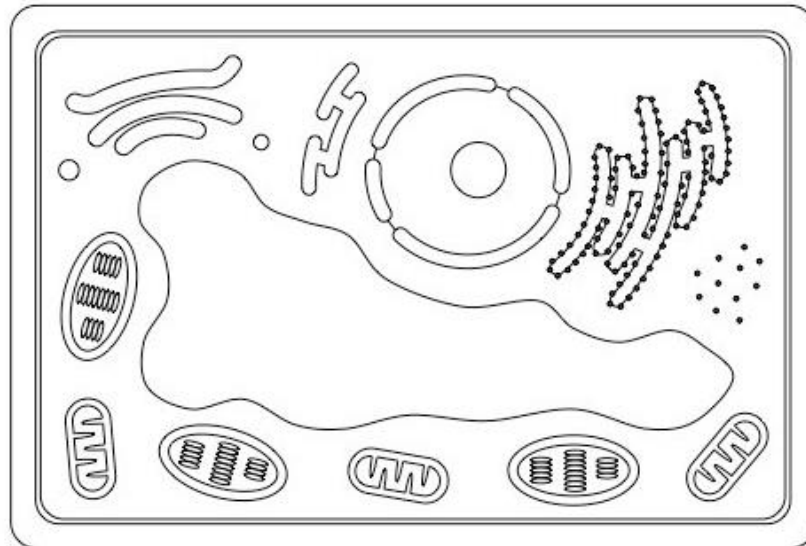


Figure 1.1: Eukaryotic cell

(<https://ib.bioninja.com.au/>)

i. Identify the type of eukaryotic cell shown in Figure 1.1.

_____ (1)

ii. On Figure 1.1, label the organelles that are only found in this type of eukaryotic cell. Give their function in brackets underneath the label. (3)

iii. From Figure 1.1, identify an organelle present in both prokaryotic and eukaryotic cells. Label this organelle with the letter A and give its function below.

_____ (2)

iv. Certain organelles found in eukaryotic cells are said to have originated from prokaryotic cells. Name **TWO** such organelles visible in Figure 1.1 and name the theory that supports the previous statement.

Name of two organelles: _____ (2)

Name of theory: _____ (1)

(Total: 10 marks)

2. This question is about the human circulatory system.

Figure 2.1 shows a cross-section of the heart. The letters A to E are indicating various parts of the heart.

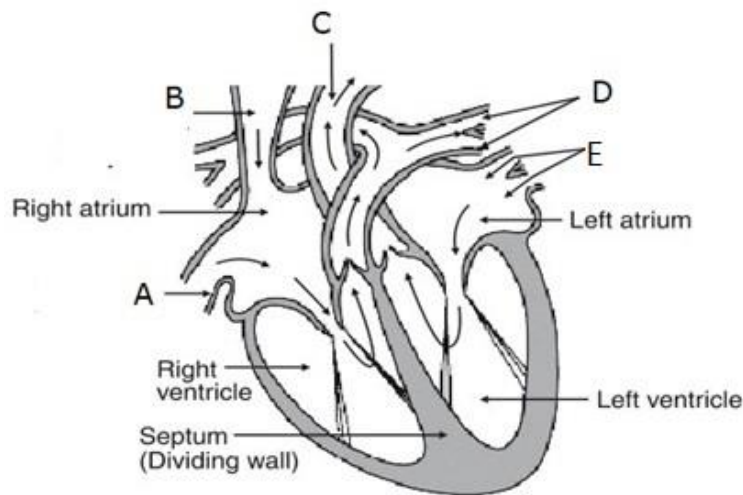


Figure 2.1: Cross-section of human heart.

(<https://brainly.in/>)

a. State which letter corresponds to:

• The blood vessel that removes oxygenated blood from the heart. _____ (1)

• The blood vessel that accepts deoxygenated blood into the heart. _____ (1)

b. Explain why the wall of the left ventricle is much thicker than the wall of the right ventricle.

 _____ (2)

This question continues on next page.

c. Label **ONE** valve on Figure 2.1 and explain the function of that specific valve.

_____ (2)

(Total: 6 marks)

3. This question is about defence against infectious disease in the human body.

a. State the correct biological term for each of the statements below:

A suspension of dead, inactivated or harmless microbes, which when introduced into the body will make the body immune to attack from certain germs.	
A disease causing microbe.	
White blood cells that destroy invading bacteria by engulfing and digesting them.	
Chemicals which stimulate the body to produce an appropriate response against the invading microbe.	
The virus that weakens the body's immune system by reducing the number T-lymphocytes.	

(5)

b. B-lymphocytes produce antibodies. Explain the role of these proteins in defence against disease.

 _____ (2)

(Total: 7 marks)

4. This question is about chromosomes and mutations.

a. Sickle cell disease is caused by a base substitution mutation in a gene found on chromosome 11.

i. Distinguish between chromosome and gene.

 _____ (2)

ii. Define the term mutation.

_____ (1)

iii. What is the consequence of a base substitution mutation in the process of transcription and translation?

 _____ (2)

b. Figure 4.1 shows a diagram of a cell dividing by meiosis. The numbers 1 and 2 refer to two specific cells.

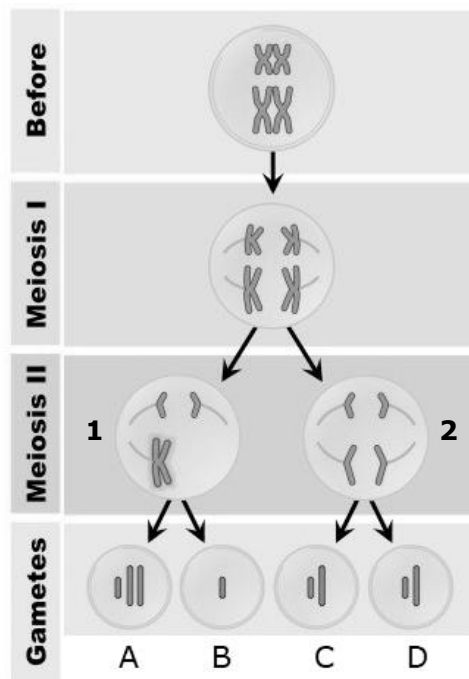


Figure 4.1: Outline of meiosis

(<https://ib.bioninja.com.au/>)

i. Explain what has happened to cell **1** during the second meiotic division.

 _____ (2)

This question continues on next page.

- ii. One of the gametes, on being fertilised by another haploid gamete, will produce a human with Down's syndrome.
Identify the gamete from A, B, C and D and give the diploid number of chromosomes of a human with Down's syndrome.

Gamete: _____ (1)

Number of chromosomes: _____ (1)

(Total: 9 marks)

5. This question is about cellular respiration and photosynthesis.

For each of the statements below identify and write whether it refers to 'respiration', 'photosynthesis' or both.

The organelle responsible is bounded by a double membrane.	
ATP is generated via a chain of electron carriers.	
Oxygen is a byproduct of the reactions in this process.	
Carbon dioxide is a byproduct of the reactions in this process.	
Oxidation of glucose to pyruvate, resulting in a net gain of reduced NAD and ATP, takes place.	
Light is needed to drive one of the stages of this process.	
The availability of oxygen determines which products are produced.	

(Total: 7 marks)

6. This question is about human impact on biodiversity.

a. Define the term biodiversity.

_____ (1)

b. Briefly explain **THREE** causes of loss of biodiversity.

c. Agriculture can have a negative impact on the environment. Briefly describe **TWO** negative effects of agriculture on the natural environment.

(Total: 11 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 is about protein synthesis.
 - a. List and describe **THREE** structural differences between deoxyribonucleic acid (DNA) and ribonucleic acid (RNA). (6)
 - b. Explain how gene expression is related to protein synthesis. (4)
 - c. Proteins are synthesised in a two step process – transcription and translation. Describe these **TWO** processes concisely. (15)

(Total: 25 marks)

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8. This question is about the female reproductive system in humans.
- a. Draw a labelled diagram of the female reproductive system. (7)
 - b. State **ONE** function of each of the following hormones:
 - i. LH in males; (2)
 - ii. LH in females; (2)
 - iii. FSH in females; (2)
 - iv. testosterone in males. (2)
 - c. Describe the roles of oestrogen and progesterone during the menstrual cycle. Include in your account the site of production and the target organ of these hormones. (8)
 - d. Explain the role of the amniotic fluid in pregnancy. (2)
- (Total: 25 marks)**
9. This question is about biological membranes and movement of molecules.
- a. Name and give the function of **FIVE** components of a biological membrane. (10)
 - b. Molecules move across membranes either passively or actively. Distinguish between active and passive transport of molecules across membranes. In your answer include an example of each type mentioning any important conditions needed for the two types of transport to occur. (15)
- (Total: 25 marks)**
10. This question concerns the human digestive system.
- a. Explain why large molecules must be digested before being utilised by the body. (4)
 - b. Enzymes play a very important role in digestion. Why are enzymes important for digestion to occur? (4)
 - c. Give **ONE** named example of an enzyme which belongs to each of the classes given below:
 - i. lipase; (1)
 - ii. protease; (1)
 - iii. amylase. (1)
 - d. For each of the enzymes mentioned in part (c), give the source, the substrate, the product/s and optimum pH required by each enzyme. (14)
- (Total: 25 marks)**
11. This question is about gene technology.
- a. Define recombinant DNA. (5)
 - b. Recombinant DNA is involved in the production of human insulin. Explain the importance and involvement of the following in the production of human insulin.
 - i. isolation of the gene; (4)
 - ii. restriction endonucleases; (4)
 - iii. ligase; (4)
 - iv. sticky ends; (4)
 - v. vectors. (4)
- (Total: 25 marks)**