Index Number:_____ IM05.18s

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

INTERMEDIATE MATRICULATION LEVEL
2018 SECOND SESSION

SUBJECT:	**Biology**
DATE:	6th September 2018
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	**6**	**6**	**10**	**10**	**12**	**6**	**25**	**25**	**25**	**25**	**25**	**100**

SECTION A: Answer ALL questions in this section.

1. This question is about biological molecules.
Use a tick (✓) to match the carbohydrate to the correct statement. Each statement may be ticked once or more than once.

Statement	Glucose	Cellulose	Starch	Sucrose
A major component of cell walls.				
Several of these monosaccharides form the polysaccharide glycogen.				
A disaccharide.				
A storage molecule in plants.				
Once broken down provides energy for cell function.				

(Total: 6 marks)

2. This question is about biological populations.

The graph below shows a Sigmoid growth of a population.

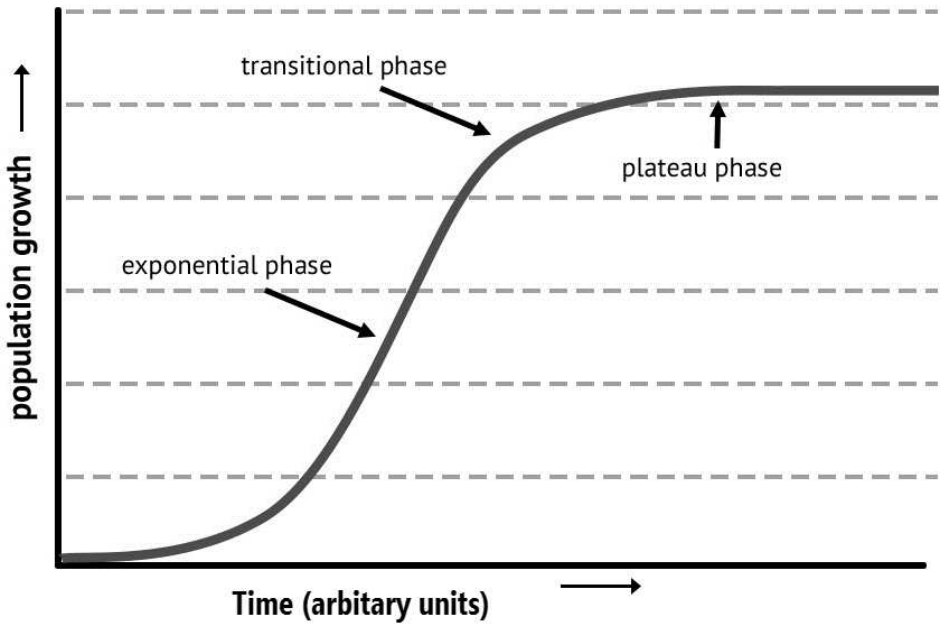

Figure 2.1: Sigmoid Growth Curve
(https://www.philpoteducation.com/mod/book/view.php?id=908&chapterid=1325#/)

a. State **ONE** environmental condition that brings about sigmoid growth in a population. (1)

b. Describe how the population size varies during:

i. the exponential phase; (2)

ii. the transitional phase. (2)

c. During which stage is the carrying capacity of an ecosystem reached? (1)

(Total: 6 marks)

3. This question concerns cell division.

a. Name the **THREE** phases that make up the cell cycle.

i. _____

ii. _____

iii. _____ (3)

b. State in which phase the following occur:

i.	DNA replication	
ii.	Crossing over	
iii.	Chromosomes move to opposite poles	
iv.	Nuclei split into two daughter nuclei	
v.	Cell splits into two daughter cells	
vi.	Biochemical reactions occur	
vii.	Cell plate formation	

(7)

(Total: 10 marks)

DO NOT WRITE ABOVE THIS LINE

4. This question is about cells and organelles.

a. What is an organelle?

_____ (1)

b. The questions that follow are about the following organelles: ribosomes, nucleus, mitochondrion, flagellum, rough endoplasmic reticulum and Golgi apparatus.

i. Which of the above organelle/s is/are found in a prokaryotic cell?

_____ (2)

ii. Which of the above organelle/s is/are found in a eukaryotic cell?

_____ (2)

iii. Match the following functions to the organelles listed above.

Involved in protein synthesis _____ (1)

Involved in locomotion of the cell _____ (1)

Contains the genetic material of the cell _____ (1)

Produces ATP _____ (1)

Stores and packages proteins produced in the cell _____ (1)

(Total: 10 marks)

5. This question is about the human digestive system.

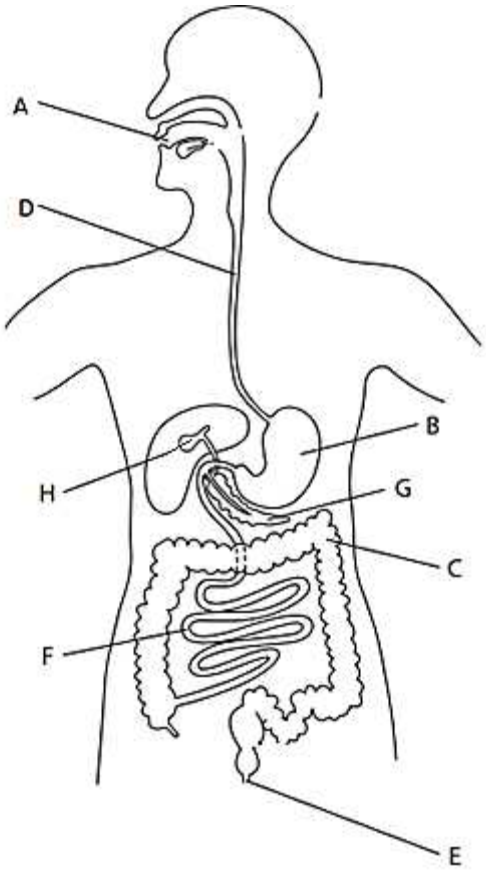

Figure 5.1: The Human Digestive System
(https://www.savemyexams.co.uk)

a. Which structures correspond to the following labels?

A	
B	
C	
D	
E	
F	
G	
H	

(4)

This question continues on the next page.

b. Use the labels in Figure 5.1 to match each statement to a structure. (5)

Stores bile	
Contains saliva	
Secretes insulin and glucagon	
Absorption of digested food takes place here	
Folded into villi	

c. Name the enzyme that:

i. converts starch into maltose _____ (1)

ii. breaks down fats _____ (1)

iii. breaks down proteins _____ (1)

(Total: 12 marks)

6. This question is about enzymes.

Figure 6.1 shows the rate of enzyme activity of the enzyme succinate dehydrogenase with increasing substrate concentration.

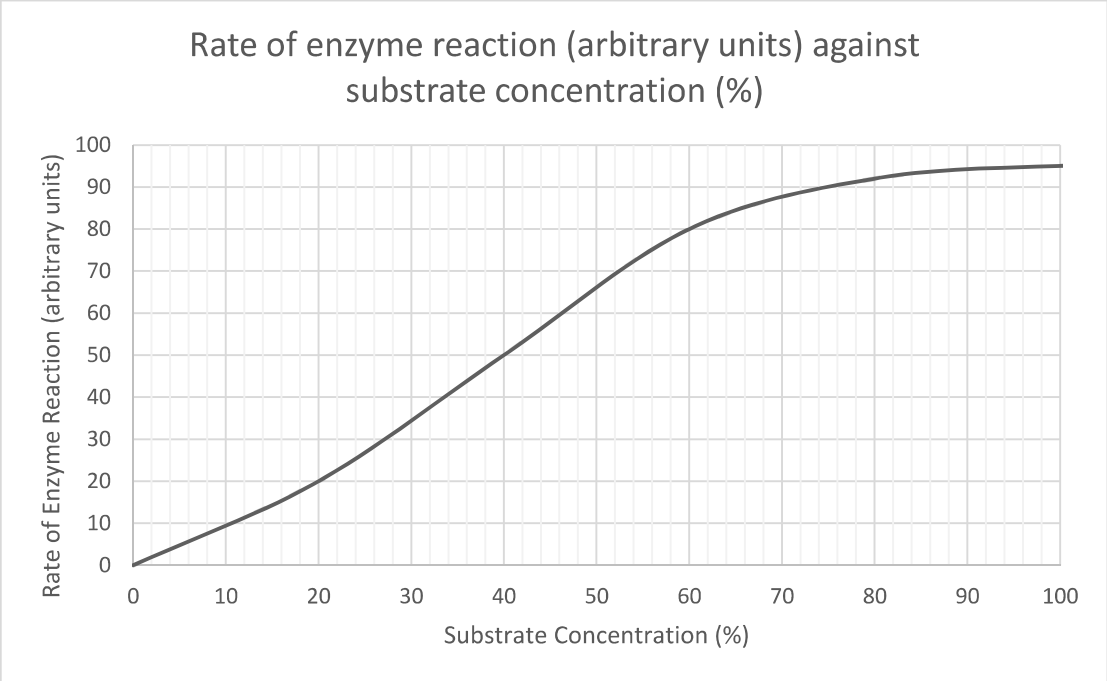

Figure 6.1: Graph of the rate of enzyme activity upon changing substrate concentration.

a. Malonate is a competitive inhibitor of succinate dehydrogenase.

On Figure 6.1, draw another graph to represent the effect of adding a fixed concentration of malonate on the rate of succinate dehydrogenase activity over the whole range of substrate concentrations. (2)

b. What can you conclude about the structure of malonate if it acts as a competitive inhibitor to succinate dehydrogenase?

_____

_____ (2)

c. List another **TWO** factors that can affect the rate of the enzyme reaction.

_____

_____ (2)

(Total: 6 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. ATP is the energy currency in a cell as it plays a key role in metabolism.
   a. Define the term metabolic rate. (2)
   b. List **TWO** factors that affect the metabolic rate of a human. Give an account of how these two factors affect the metabolic rate. (8)
   c. Explain the role of ATP in metabolism. (4)
   d. Describe the processes through which large amounts of ATP are produced by aerobic cellular respiration. (11)

(Total: 25 marks)

8. This question concerns photosynthesis in plants.
   a. Explain how leaves and chloroplasts are adapted for photosynthesis. (12)
   b. Describe the role of the:
      i. light dependent reactions; (4)
      ii. light independent reactions. (4)
   c. List **ONE** external factor that affects the rate of photosynthesis and explain how this factor may limit the rate of photosynthesis. (5)

(Total: 25 marks)

Please turn the page.

9. This question concerns the human immune system.
   a. Skin and mucous membranes are considered as defences against microbes. Explain. (7)
   b. Compare and contrast the role of phagocytes and lymphocytes in the immune system. (10)
   c. Explain why vaccines are used to prevent infections while antibiotics are given when a person is already infected. (8)

(Total: 25 marks)

10. This question is about the human circulatory system.
   a. Using a diagram, describe the structure of the heart together with its associated blood vessels and valves. (15)
   b. On the diagram you have drawn, include arrows to show the direction of movement of blood through the heart. Also indicate which part of the heart has oxygenated blood and which part has deoxygenated blood. (4)
   c. Briefly explain how the heart:
      i. beats; (2)
      ii. can increase the heart beats; (2)
      iii. can decrease the heart beats. (2)

(Total: 25 marks)

11. This question concerns DNA replication.
   a. Describe the process of DNA replication. (16)
   b. DNA replication is described as semi conservative. Explain this statement. (4)
   c. Explain the significance of complementary base pairing in the conservation of the base sequence of a DNA strand. (5)

(Total: 25 marks)