



TEST CODE **02107020**

FORM TP 2010140

MAY/JUNE 2010

C A R I B B E A N E X A M I N A T I O N S C O U N C I L

ADVANCED PROFICIENCY EXAMINATION

BIOLOGY

UNIT 1 – PAPER 02

2 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions in two sections. Answer ALL questions.
2. For Section A, write your answers in the spaces provided in this booklet.
3. For Section B, write your answers in the spaces provided at the end of each question in this booklet.
4. The use of silent non-programmable calculators is allowed.

SECTION A

Answer ALL questions in this section. Write your answers in the spaces provided in this answer booklet.

1. (a) (i) List FOUR main functions of proteins in living organisms.

[2 marks]

- (ii) Figure 1 represents the general structural formula of a peptide.

Circle a peptide bond in the structure in Figure 1.

[1 mark]

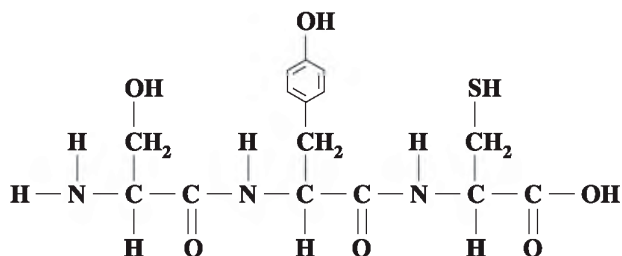
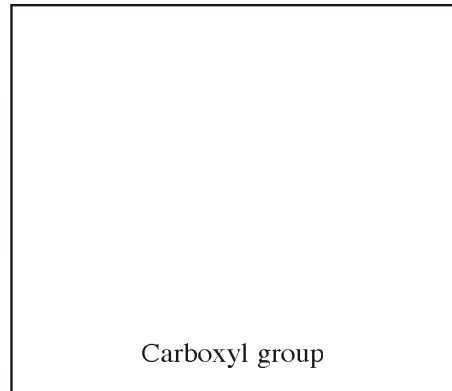
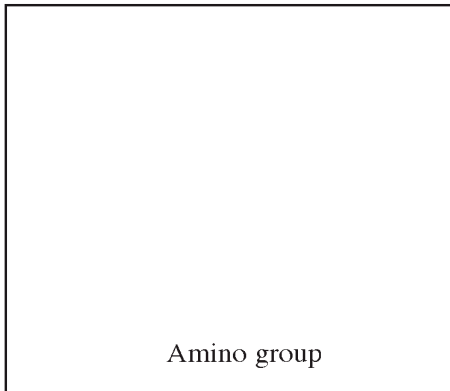


Figure 1. General structure of a peptide

(iii) In the boxes below, draw the structure of

- a) an amino group
- b) a carboxyl group.



[2 marks]

- (b) (i) Enzymes have many properties. State ONE property of enzymes that relates to their structure and ONE property that relates to their MAIN function in the cell.

[2 marks]

- (ii) On the graph in Figure 2, sketch TWO curves to represent the progress of a reaction with and without the presence of an enzyme.

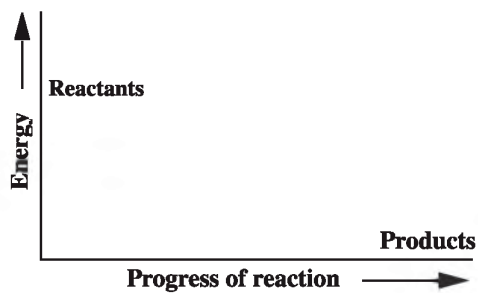


Figure 2. Reaction curves

[2 marks]

(c) The graphs in Figure 3 represent data from enzyme-controlled reactions in which an inhibitor is present.

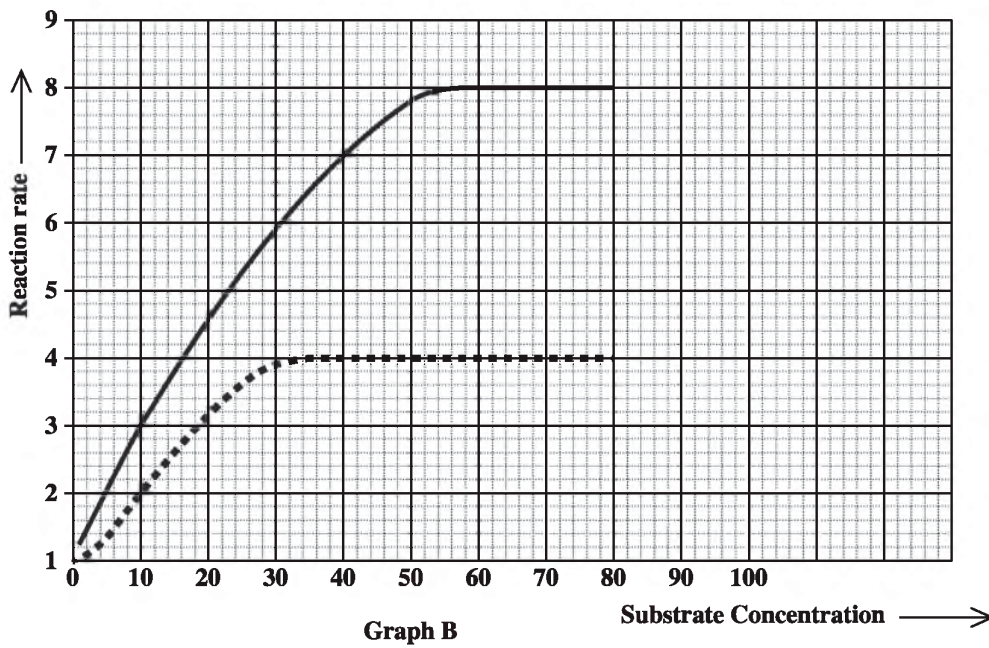
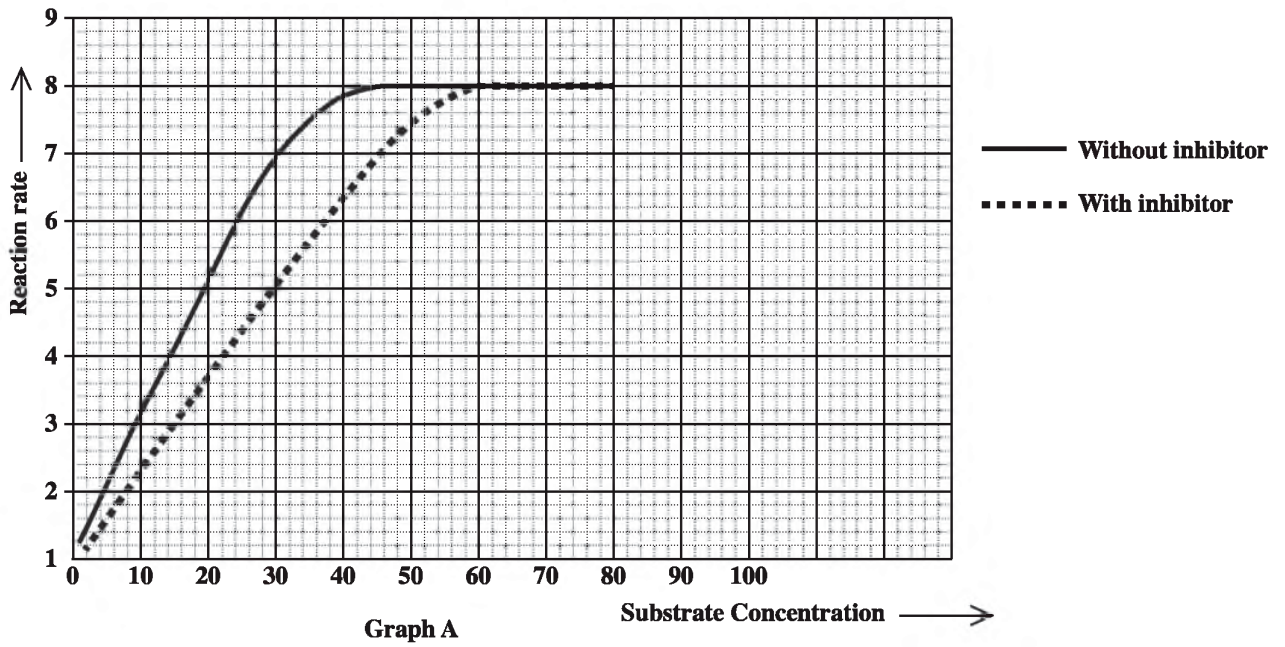


Figure 3. Graphs of enzyme-controlled reactions with and without inhibitors

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- (i) Describe the trend seen in EACH graph.

Graph A: _____

Graph B: _____

[2 marks]

- (ii) Suggest the type of inhibition represented by the data in EACH graph and state the reason for your answer.

Graph A: _____

Graph B: _____

[4 marks]

Total 15 marks

2. Figure 4 is a diagrammatic representation of cells undergoing mitosis.

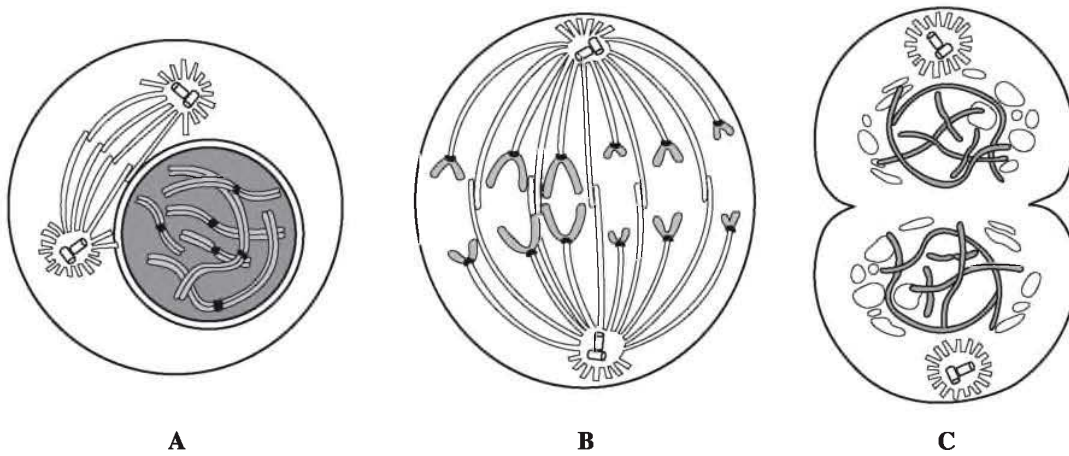


Figure 4. Cells undergoing mitosis

(a) Identify the stage of mitosis seen in the diagrammatic representation of the cells labelled A, B and C. State ONE characteristic feature of EACH of the stages identified.

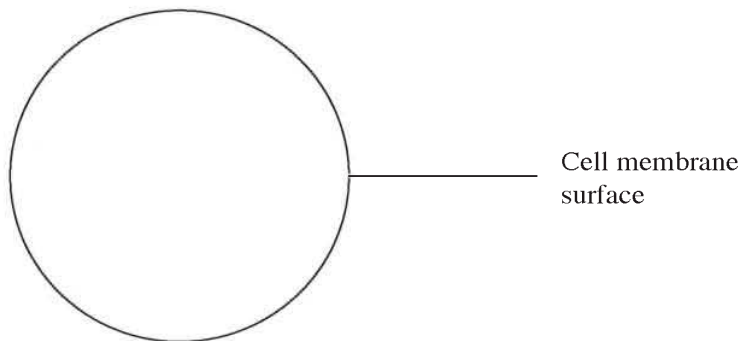
A _____

B _____

C _____

[6 marks]

(b) In the cell outline below, draw the arrangement of the chromosomes of a cell with a diploid chromosome number of 4 during metaphase 1 of meiosis.



[3 marks]

- (c) Complete Table 1 to identify the key differences between the processes mitosis and meiosis.

TABLE 1: COMPARISON OF MITOSIS AND MEIOSIS

Features	Mitosis	Meiosis
Number of daughter cells produced		
Ploidy of daughter cells		
Genetic similarity of daughter cells to parent cell and to each other		

[3 marks]

- (d) (i) Name the process which chromosomes must undergo prior to nuclear division and state at what stage of the cell cycle this takes place.

Process _____

Stage _____

[2 marks]

- (ii) State ONE reason why the process named in (d) (i) is necessary.

[1 mark]

Total 15 marks

3. (a) Figure 5 is a diagram of a human sperm cell.

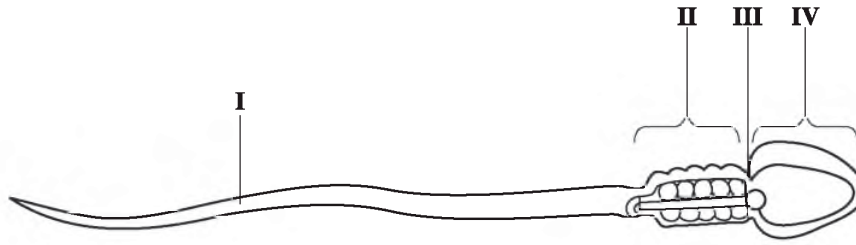


Figure 5. Diagrammatic representation of a mature human sperm cell

- (i) Identify the structures labelled I, II, III and IV.

I _____

II _____

III _____

IV _____

[2 marks]

- (ii) State the ploidy of the nucleus of the cell shown in Figure 5.

[1 mark]

- (iii) State TWO reasons why a large number of mitochondria is present in the sperm cell.

[2 marks]

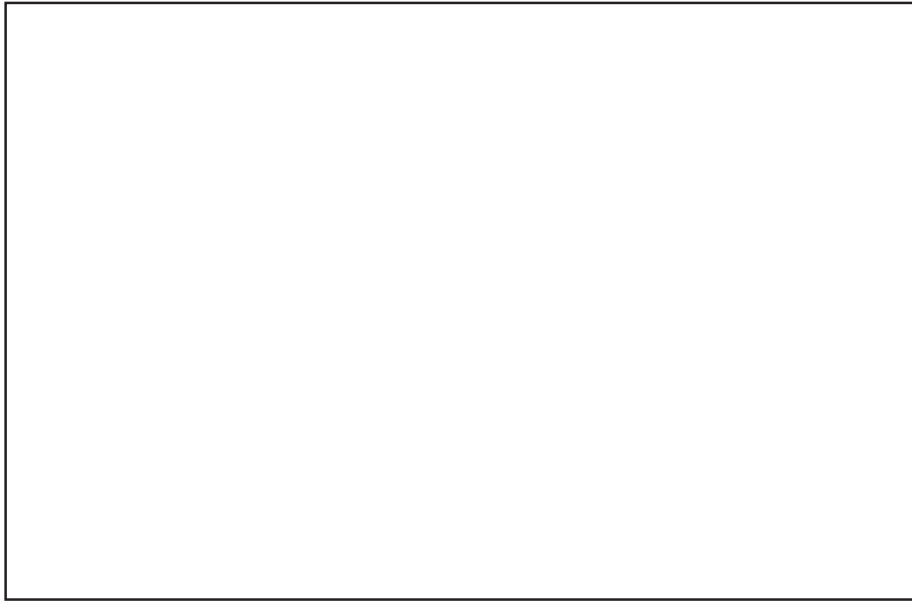
- (iv) In Figure 5, the acrosome of the male sperm is an organelle. Name the type of organelle and describe its function.

[2 marks]

- (v) Figure 5 represents the sperm as it is released from the male. State the name given to the ovum as it is released from the ovary.

[1 mark]

- (vi) In the box below, draw and annotate the structure of the ovum as it is released from the ovary.



[4 marks]

- (b) Complete Table 2 by inserting yes or no, to identify the key differences between the ovum and the sperm.

TABLE 2: COMPARISON OF SPERM AND OVUM

Feature/Function	Ovum	Sperm
Contains extra nuclear DNA		
Has larger food reserve		

[2 marks]

- (c) State ONE similarity between the ovum and the sperm.

[1 mark]

Total 15 marks

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SECTION B

Answer ALL questions in this section. Write your answers in the spaces provided at the end of each question.

4. (a) (i) Name FIVE chemical components in the structure of cell membranes and state the function of EACH component named. [5 marks]
- (ii) Identify the chemical component of cell membranes that enables facilitated diffusion to occur, and explain how this occurs. [2 marks]
- (b) (i) Distinguish between the terms ‘prokaryotic’ and ‘eukaryotic’. [2 marks]
- (ii) Explain how prokaryotes and eukaryotes differ with respect to genetic material, protein synthesis and photosynthetic structures. [6 marks]

Total 15 marks

Write your answer to Question 4 here.

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5. (a) (i) Sexual reproduction greatly increases the genetic variation in a population. Define 'genetic variation' and describe TWO sources of variation in sexually reproducing organisms. [3 marks]
- (ii) Define 'mutation' and state in which cells of the organism mutations occur. [2 marks]
- (iii) "A gene mutation which is the result of a deletion may be more harmful than a mutation resulting from the substitution of one base." Discuss this statement using relevant facts and information. [4 marks]
- (b) (i) Explain the role of 'restriction enzymes' in bacterial cells. [2 marks]
- (ii) Genetic variation in organisms may also involve genetic engineering techniques. Comment on the role of restriction enzymes in genetic engineering. [4 marks]

Total 15 marks

Write your answer to Question 5 here.

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6. (a) Define the term 'pollination' and describe the sequence of events from pollination to fertilization. [6 marks]
- (b) Explain the term 'double fertilization' and briefly discuss the significance of the process. [3 marks]
- (c) Discuss the importance of the changes which occur following fertilization, making reference to changes in the zygote, endosperm, the ovule and ovary. [6 marks]

Total 15 marks

Write your answer to Question 6 here.

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