



TEST CODE **02107020**

FORM TP 2009147

MAY/JUNE 2009

CARIBBEAN EXAMINATIONS COUNCIL

ADVANCED PROFICIENCY EXAMINATION

BIOLOGY

UNIT 1 – PAPER 02

2 $\frac{1}{2}$ hours

Candidates are advised to use the first 15 minutes for reading through this paper carefully.

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions.
2. Section A consists of THREE questions. Candidates must answer ALL questions in this section. Answers to this section MUST be written in this answer booklet.
3. Section B consists of THREE questions. Candidates must answer ALL questions in this section. Answers to this section MUST be written in the separate answer booklet provided.
4. The use of silent non-programmable calculators is allowed.

SECTION A

Answer ALL questions. You must write your answers in the spaces provided in this answer booklet.

1. (a) **Figure 1** below is an electron micrograph of an animal cell.
- (i) **On the figure**, identify the structures labelled A,B,C and D

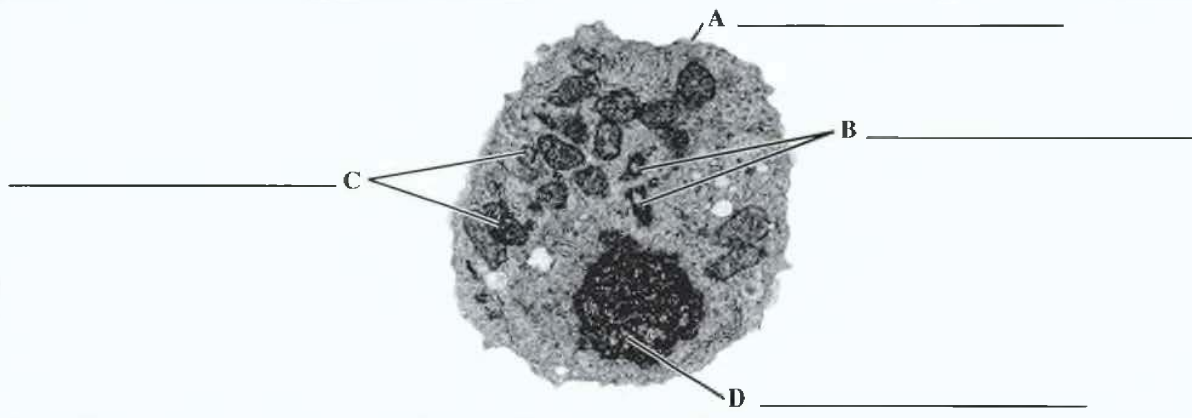


Figure 1. Electron micrograph of an animal cell

[2 marks]

- (ii) With reference to the structures labelled in **Figure 1**, which structure is present only in animal cells and NOT in plant cells?

[1 mark]

- (iii) In addition to the structures labelled in **Figure 1**, there are **other** structures that work together to make lipids available to the cell. Name TWO of these structures.

[1 mark]

- (iv) Explain how the two structures named in (a) (iii) work together and make lipids available to the cell.

[3 marks]

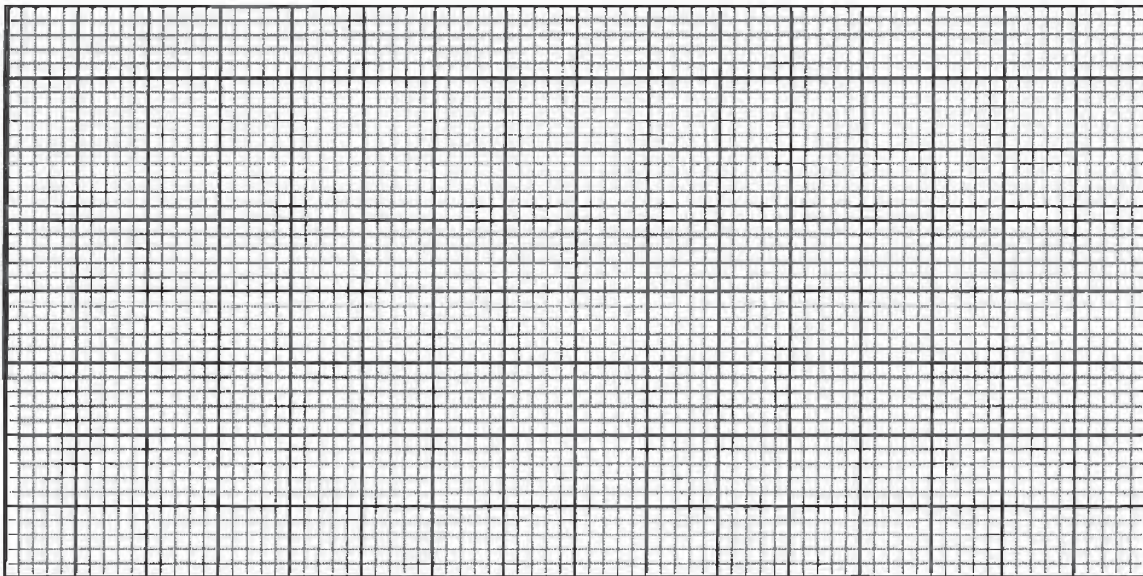
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- (b) An experiment is conducted to investigate the effect of temperature on the rate of an enzyme catalysed reaction. In this experiment all other variables are kept constant. The results of this experiment are shown in Table 1.

TABLE 1 : EFFECT OF TEMPERATURE ON THE RATE OF AN ENZYME CATALYSED REACTION

Temperature (°C)	Quantity of product produced per unit of time
20	1.5
25	2.3
30	3.0
35	3.5
40	3.4
45	2.3

- (i) Complete the graph below to show the results given in Table 1.



[4 marks]

- (ii) Suggest an explanation for the shape of the curve.

[2 marks]

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(iii) List TWO other variables that should be kept constant during this experiment.

[2 marks]

Total 15 marks

2. (a) Hair colour in mice is controlled by two genes. For one gene the dominant allele, B, results in mice with black hairs. The homozygous recessive condition, bb, gives a brown colour.

The second gene determines whether or not pigment will be deposited in the hair. The dominant allele, A, results in the deposition of either black or brown pigment. The homozygous recessive condition, aa, results in the hair being white (albino) regardless of the genotype at the black/brown locus.

(i) State the term used to describe the interaction of the two genes described above, and give an explanation of the nature of the interaction.

Term: _____

Explanation of the nature of the interaction:

[3 marks]

(ii) Crosses between black mice, all heterozygous for both genes, produced offspring with black, brown and white coat colour.

Determine the ratio of the phenotypes and for EACH phenotype suggest ONE genotype.

Ratio _____

Genotypes Black _____

Brown _____

White _____

[5 marks]

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(b) Figure 2 is a diagrammatic representation of three stages in Meiosis I.

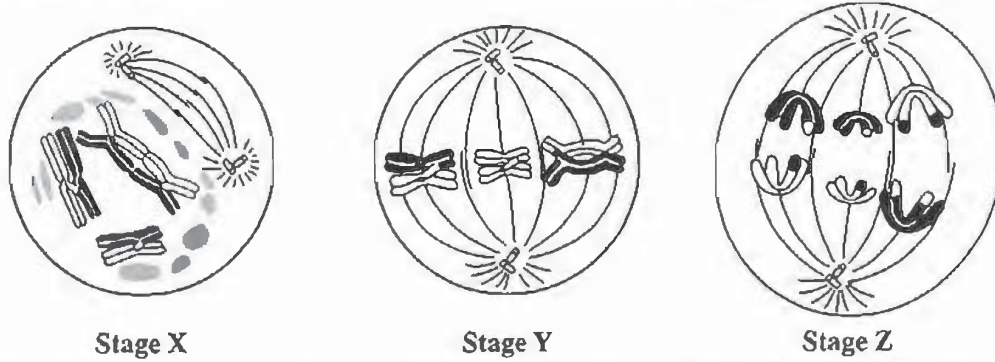


Figure 2. Three stages of Meiosis I

(i) Identify the stages labelled as X, Y and Z.

X : _____

Y : _____

Z : _____

[3 marks]

(ii) State TWO features of the stage in Meiosis I which comes **after** Stage Z.

[2 marks]

(iii) Explain how the events shown in Stage X of Meiosis I contribute to heritable variation.

[2 marks]

Total 15 marks

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3. (a) (i) Define the terms 'asexual reproduction' and 'vegetative propagation'.

Asexual reproduction

Vegetative propagation

[2 marks]

- (ii) Structures such as bulbs, corms and tubers are suitable for use in vegetative propagation. State ONE characteristic of the tissue of these structures, which facilitates this function (vegetative propagation).

[1 mark]

- (iii) State ONE function, other than vegetative propagation, that is often carried out by bulbs, corms and tubers.

[1 mark]

- (b) Figure 3 below represents a mature pollen grain.

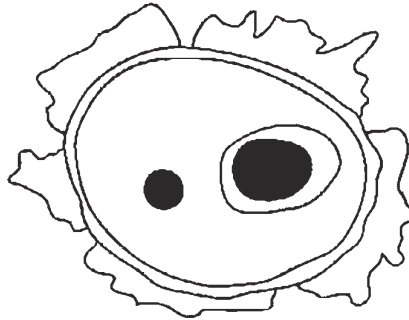


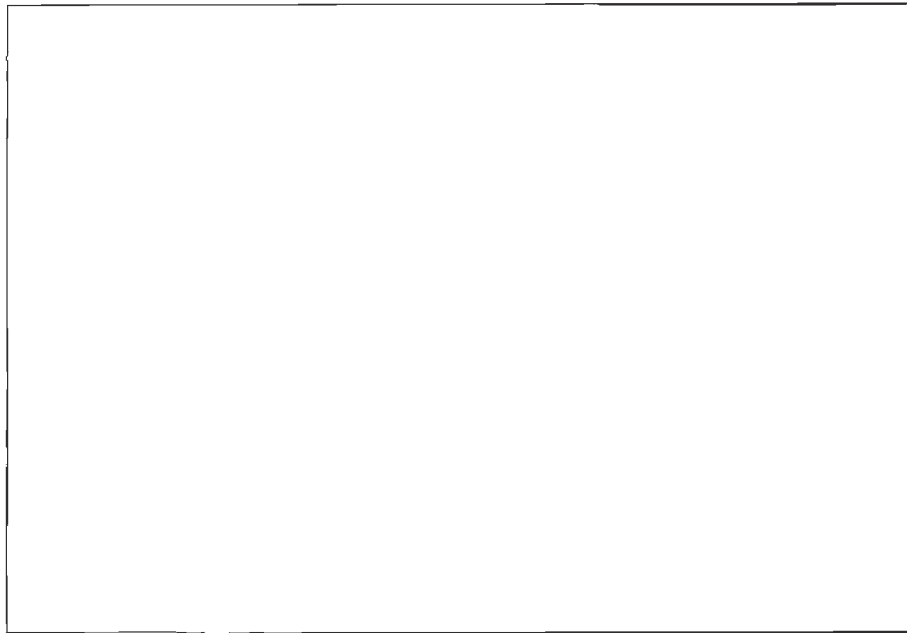
Figure 3. Mature pollen grain

- (i) Briefly describe FOUR MAIN features of the pollen grain shown in Figure 3.

[4 marks]

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- (ii) In the box below, draw and label the structure of the pollen grain at the END of germination.



[3 marks]

- (iii) State ONE **major** change that occurs when a pollen grain germinates and explain its significance.

[2 marks]

- (c) The stigma plays an important role in fertilization by providing a location for the pollen to be deposited. Explain TWO **other** ways in which the stigma plays an important role in fertilization.

[2 marks]

Total 15 marks

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SECTION B

Answer ALL questions. You must write your answers in the answer booklet provided.

4. (a) (i) With the aid of a simple diagram, describe the basic structure of a phospholipid. Detailed chemical formulae of the molecules are not required. [5 marks]
- (ii) Phospholipids are a major component of the plasma membrane of a cell and are arranged as a lipid bi-layer.
- With reference to the properties of phospholipids, explain why these lipids are arranged as a bi-layer in the plasma membrane. [4 marks]
- (b) (i) Osmosis and endocytosis are cellular processes involved in the transport of materials across the plasma membrane. Describe TWO ways in which these processes differ. [4 marks]
- (ii) Give TWO examples of the use of endocytosis for the uptake of nutrients in animal systems. [2 marks]

Total 15 marks

5. (a) (i) Explain the terms 'vector' and 'recipient' as applied to genetic engineering. [2 marks]
- (ii) Discuss the role played by *E. coli* (as a vector and recipient) in the production of insulin, utilizing genetic techniques. [4 marks]
- (b) (i) Describe the basic structure of RNA and explain how it differs from the structure of DNA. [4 marks]
- (ii) Both DNA and RNA are involved in protein synthesis but they perform different roles. Differentiate between the roles played by DNA and RNA in protein synthesis. [5 marks]

Total 15 marks

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6. (a) Briefly describe FIVE main regions which make up the human female reproductive system. [5 marks]

(b) The human male reproductive system shares some structural similarities with the female system but is designed to perform different functions.

Select TWO of the regions described in (a) above. For EACH region, explain how its function is unique to females. [4 marks]

(c) Discuss the principle of negative feedback mechanisms as applied to the secretion of follicle stimulating hormone and its role in the control of the menstrual cycle. [6 marks]

Total 15 marks

END OF TEST