

H1ANDERSON JUNIOR COLLEGE
HIGHER 1

NAME

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INDEX NUMBER

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BIOLOGY**8875/02**

Paper 2 Core Paper

13 September 2016**Tuesday****2 hours**

Additional Materials: Answer Paper

READ THESE INSTRUCTIONS FIRST

Write your name and PD group on all the work you hand in.

Write in dark blue or black pen.

You may use a soft pencil for any diagrams, graph or rough working.

Do not use paper clips, highlighters, glue or correction fluid.

Section AAnswer **all** questions.**Section B**Answer **all** questions

All working for numerical answers must be shown.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

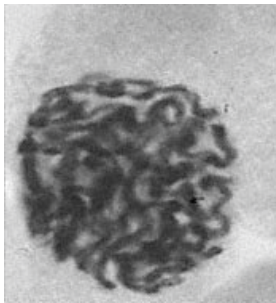
Calculators may be used

For Examiner's Use	
PAPER 1	
1-30	
	30 marks
PAPER 2	
<i>Section A</i>	<i>40 marks</i>
1	
2	
3	
4	
<i>Section B</i>	<i>20 marks</i>
5	
PAPER 2	
	60 marks
<u>TOTAL</u>	
	<u>90 marks</u>

Section A

Answer **all** the questions in this section.

- 1 Fig. 1.1 shows an electron micrograph of an actively dividing cell from *Bellevia romana*, a flowering herbaceous plant.

**A****B****C****Fig. 1.1**

- (a) Identify stages A and B, and state the visible features that enabled your identification.

[2]

- (b) Explain the change in distance between centromeres of a chromosome in stage C.

[3]

- (c) Explain why it is important that replication occurs before mitosis.

[2]

- (d) Explain how homologous chromosomes in stage A are genetically different from those in prophase II of the same plant.

[3]

[Total: 10]

- 2 Tomatoes, when ripened will get soft and are more susceptible to damage in the process of being transported to the markets to be sold. Softening of the fruit is due to the production of an enzyme polygalacturonase (**PG**) which breaks down the cell wall. Scientists have come up with an antisense technology to block the synthesis of this enzyme so that the fruits can remain firm. This involves the insertion of a promoter region into the non-template strand of the DNA shown in **Fig. 2.1**.

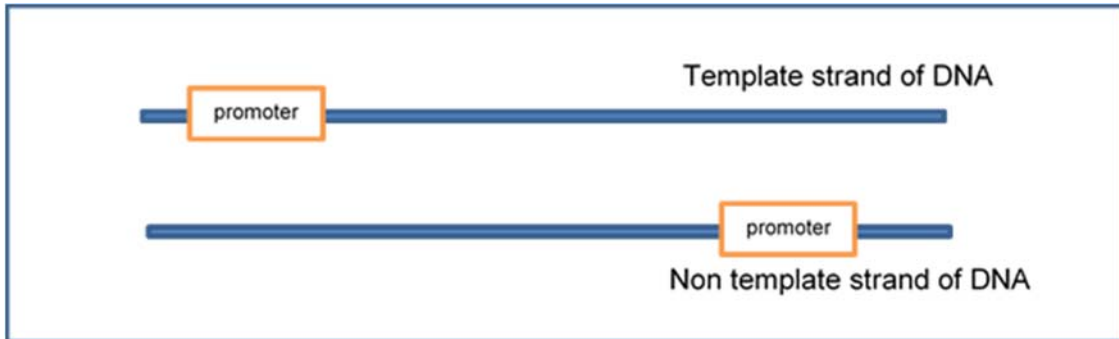


Fig. 2.1

- (a) (i) On **Fig 2.1**, label clearly the 5' and 3' ends of both strands of DNA. [1]

(ii) Explain what is meant by the term “template”.

..... [1]

- (b) Explain why the insertion of a promoter in the non-template DNA strand can block the synthesis of the PG enzyme.

..... [3]

- (c) Describe how the promoter sequence can be isolated and then inserted into the non-template DNA.

..... [3]

(d) Explain how uncontrolled cell division can result in cancer.

[2]

[Total: 10]

3 In *Drosophila*, the characteristics of wing length and body colour are controlled by one gene locus each. For each gene locus, there may be two or more alleles.

(a) Explain the meaning of the terms

(i) locus

[1]

(ii) allele

[2]

- (b) A cross was made between two fruit flies. One parent had an unknown genotype since it had the wild phenotype (normal [long] wings and normal body colour). The other parent had vestigial [undeveloped] wings and ebony body colour, so it was known to be homozygous recessive for both characteristics.

The resulting offspring were as follows:

normal wings and normal body colour	89
normal wings and ebony body colour	93
vestigial wings and normal body colour	99
vestigial wings and ebony body colour	84

Using the following symbols:

N	normal wings	n	vestigial wings
E	normal body	e	ebony body

Draw a genetic diagram in the space below showing the cross described.

[4]

- (c) The wing length of fruit flies with normal wings varies between 70 to 85 μm .

Suggest a reason for the variation in wing length within fruit flies with normal wings.

[1]

- (d) Alleles coding for mutant phenotypes in fruit flies are caused by artificially induced mutations in laboratory bred flies. Suggest why such mutants are unlikely to be found in natural populations.

[2]

[Total: 10]

- 4 Giant anteaters, armadillos and Australian numbats (*Myrmecobius fasciatus*) have many similar traits. This led some to believe that they were closely related.

Table 4.1 shows the comparison of four characteristics between the three mammals

Mammal	Characteristics			
	Diet	Body	Snout	Tongue
Armadillo	Feed on insects	Covered by bony keratinised plates	Pointy snout	Long tongues
Giant Anteater	Feed on ants and termites	Covered by hair	Elongated narrow snout	Long tongues
Numbats	Feed on termites	Covered by hair	Narrow snout	Long tongues

Table 4.1

DNA sequences of selected genes such as 18s rRNA are subsequently compared between some organisms, including the three mammals, when molecular experimental techniques advanced and the results helped clarified the evolutionary relationships of the mammals.

- (a) Using Table 4.1, explain why comparison of anatomical structures led to the incorrect conclusion about the evolutionary relationships of the three mammals.

.....

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.....

.....

[4]

- (b) Explain why the 18s rRNA gene was chosen to compare DNA sequences between organisms.

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.....

[2]

- (c) Explain how the evolution of long tongues in numbats supports Darwin's theory of natural selection.

[4]

[Total: 10]

Section B

Answer **all** questions.

Write your answers on the separate answer paper provided.

Your answer should be illustrated by large, clearly labeled diagrams, where appropriate.

Your answers must be in continuous prose, where appropriate.

Your answers must be set out in section (a), (b) etc., as indicated in the question.

- 5 (a) With reference to the levels of protein structure, explain how the specificity of an enzyme is determined by its structure. [8]
- (b) Describe how photophosphorylation differs from oxidative phosphorylation [6]
- (c) Describe the features of blood stem cells and explain their normal functions. [6]

[Total: 20]

OR

- 6 (a) Describe how the structure of phospholipids is related to the arrangement of phospholipids in cell membranes and explain the functions of cell membranes in one named cellular organelle [8]
- (b) Explain why and how eukaryotic pre-mRNA is processed. [6]
- (c) Discuss the ethical implications of genetically modifying plants. [6]

[Total: 20]