



# RIVER VALLEY HIGH SCHOOL

## YEAR 6

### PRELIMINARY EXAMINATION II

CANDIDATE  
NAME

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CENTRE  
NUMBER

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CLASS

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INDEX  
NUMBER

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**H1 BIOLOGY**

**8875/02**

Paper 2 Core Paper

**11 Sep 2017**

**2 hours**

Additional Materials: Answer Paper

#### READ THESE INSTRUCTIONS FIRST

Write your Centre number, index number and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

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

**DO NOT WRITE IN ANY BARCODES.**

#### Section A

Answer **all** questions.

#### Section B

Answer **one** question.

Circle the question attempted on the cover page.

The use of an approved scientific calculator is expected, where appropriate.

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.

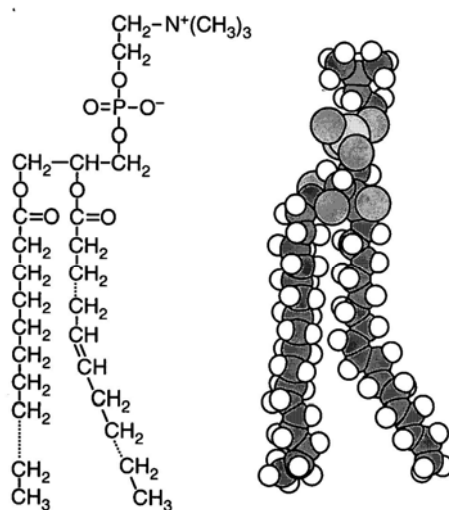
For Examiner's Use	
Section A	
1	/ 8
2	/ 12
3	/ 9
4	/ 11
Section B	
5 or 6	/ 20
Total	/ 60

This Question Paper consists of **12** printed pages.

## SECTION A

Answer **all** questions.

- 1 Fig. 1.1 represents the molecular structure of a type of phospholipid.



**Fig. 1.1**

- (a) (i) Describe the arrangement of phospholipids in cell membranes. [2]

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- (ii) Explain how the structure of phospholipids is related to this arrangement in cell membranes. [2]

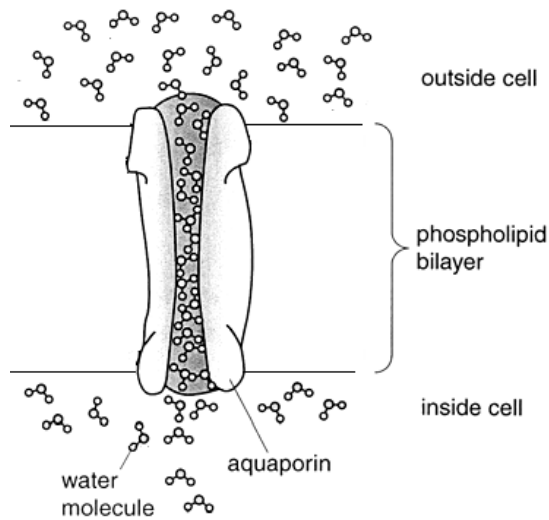
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Fig 1.2 shows a channel protein, aquaporin, which is necessary for the bulk flow of water molecules.



**Fig 1.2**

- (b) With reference to Fig. 1.2, describe how water molecules move across a membrane. [2]

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Diabetes insipidus is a condition characterised by large amounts of diluted urine. Fluid is not reabsorbed by the cells in the kidney due to changes in permeability of their surface membrane. Reduction of fluid intake by patients has little effect on the concentration of urine.

Diabetes insipidus is a result of mutation in the gene coding for aquaporin channels.

A clinician studied the surface membrane of kidney cells involved in reabsorption of fluid in individuals with diabetes insipidus and found that aquaporin channels are absent.

- (c) Suggest how mutant aquaporin channels leads to diluted urine in individuals with diabetes insipidus. [2]

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**[Total: 8]**

2 Fig. 2.1 is an electron micrograph of a mitochondrion.

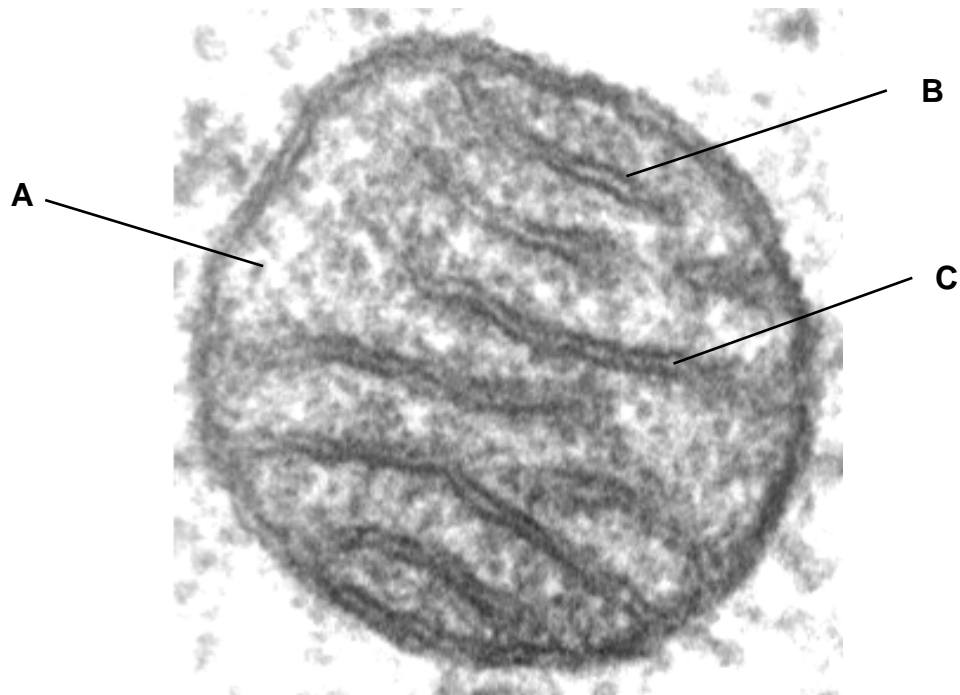


Fig. 2.1

(a) (i) Identify structures **A** and **B**. [2]

**A** \_\_\_\_\_  
**B** \_\_\_\_\_

(ii) Describe how structure **A** is adapted to its function. [1]

\_\_\_\_\_  
\_\_\_\_\_

(b) (i) State the role of high concentration of protons at **C**. [1]

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- (ii) Explain how the high concentration of protons is generated at **C**. [3]

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In an investigation to determine the effect of chemical **M** on respiration, mitochondria were incubated in four ways:

1. with glucose
2. with pyruvate
3. with glucose and chemical **M**
4. with pyruvate and chemical **M**

After incubation, the results are summarised in Table 1.1.

**Table 1.1**

	CO <sub>2</sub> evolution	O <sub>2</sub> consumption	ATP production by oxidative phosphorylation
Glucose	x	x	x
Pyruvate	✓	✓	✓
Glucose + chemical <b>M</b>	x	x	x
Pyruvate + chemical <b>M</b>	✓	✓	x

- (c) (i) Explain why carbon dioxide is produced when mitochondria are incubated with pyruvate but not when incubated with glucose. [3]

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- (ii) Suggest why when mitochondria are incubated with chemical **M**, oxygen consumption occurs but not ATP production. [2]

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**[Total: 12]**

- 3** In lizard, a recessive mutant allele leads to black body colour as opposed to the normal brown body colour. A second recessive mutant allele at a separate locus leads to grey spots as opposed to normal white spots on the body.

A test cross was conducted for these loci. This test cross took F1 females from a standard dihybrid cross and crossed them with a male pure breeding for black body with grey spots. The following offspring were produced:

Brown body with white spots	160
Brown body with grey spots	155
Black body with white spots	156
Black body with grey spots	162

- (a)** Define the term *locus*. [1]

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- (b)** Draw a genetic diagram to explain the observed results of this test cross. [4]

- (b) A mutation occurs to the gene locus determining body colour and a new body colour red appeared in the population of lizards.

Table 3.1 shows the change in the frequency of the three different phenotypes.

**Table 3.1**

	Initial Population	Generation 10	Generation 20	Generation 30
<b>Brown colour</b>	 80%	 80%	 70%	 40%
<b>Red colour</b>	 10%	0%	0%	0%
<b>Black colour</b>	 10%	 20%	 30%	 60%

Using Table 3.1 and your knowledge of natural selection, explains the results. [4]

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**[Total: 9]**



- 4 Genetically modified maize was widely grown in the maize-growing areas of the USA. One of the genetically modified varieties of maize contains a gene (*Bt*) from a bacterium, *Bacillus thuringiensis*. The gene codes for a toxin, which is expressed in the leaves and acts as an insecticide.

In USA, milkweed frequently grows around the edge of maize fields and is fed upon by caterpillars of the Monarch butterfly. In an investigation on the environmental effects of *Bt* maize, leaves of milkweed were divided into three groups, **A**, **B** and **C**, and treated as shown in Table 4.1.

Table 4.1

Treatment group	Treatment
<b>A</b>	dusted with pollen from genetically modified maize carrying the <i>Bt</i> gene;
<b>B</b>	dusted with pollen from maize that had not been genetically modified;
<b>C</b>	not dusted with pollen.

Monarch caterpillars were then placed on the leaves and the survival of the caterpillars was measured over four days. The results of the experiment are shown in Fig. 4.1.

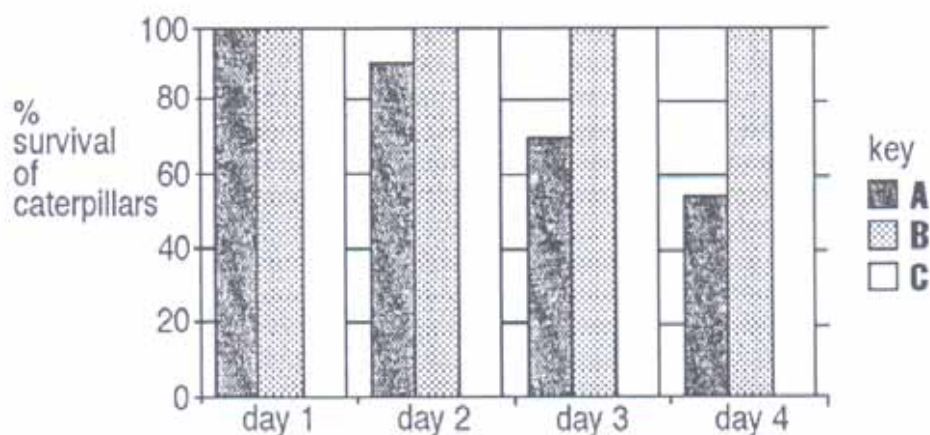


Fig. 4.1

- (a) Explain why farmers in the USA grow maize carrying the *Bt* gene. [2]

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- (b) With reference to Fig. 4.1, comment on the effect of eating pollen from different maize plants on the survival of Monarch butterfly caterpillars. [2]

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Plasmids are small circles of DNA, found in many bacteria, which can be used for genetic engineering of crop plants such as *Bt* corn.

- (c) State and explain which **one** feature of plasmids means that they may be used for intermediate steps in gene cloning involving **any** species of organism. [2]

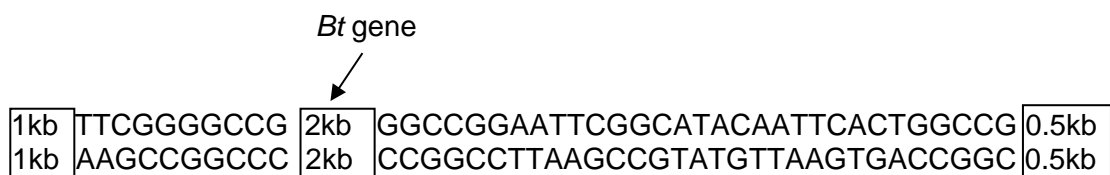
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Fig. 4.2 shows a length of DNA from *Bt* maize. The DNA is cut with restriction enzyme, *Hae*III.



**Fig. 4.2**

Target site of *Hae*III

GGCC  
CCGG

- (d) Explain what is meant by a restriction enzyme. [2]

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- (e) With reference to Fig. 4.2, state how many fragments of DNA are produced after digestion with *Hae*III. [1]

Some companies claimed they have successfully introduced the *Bt* gene into the maize that they sell to the farmers. DNA from the maize plants were analysed using restriction enzymes *Hae*III and electrophoresis as shown in Fig. 4.3.

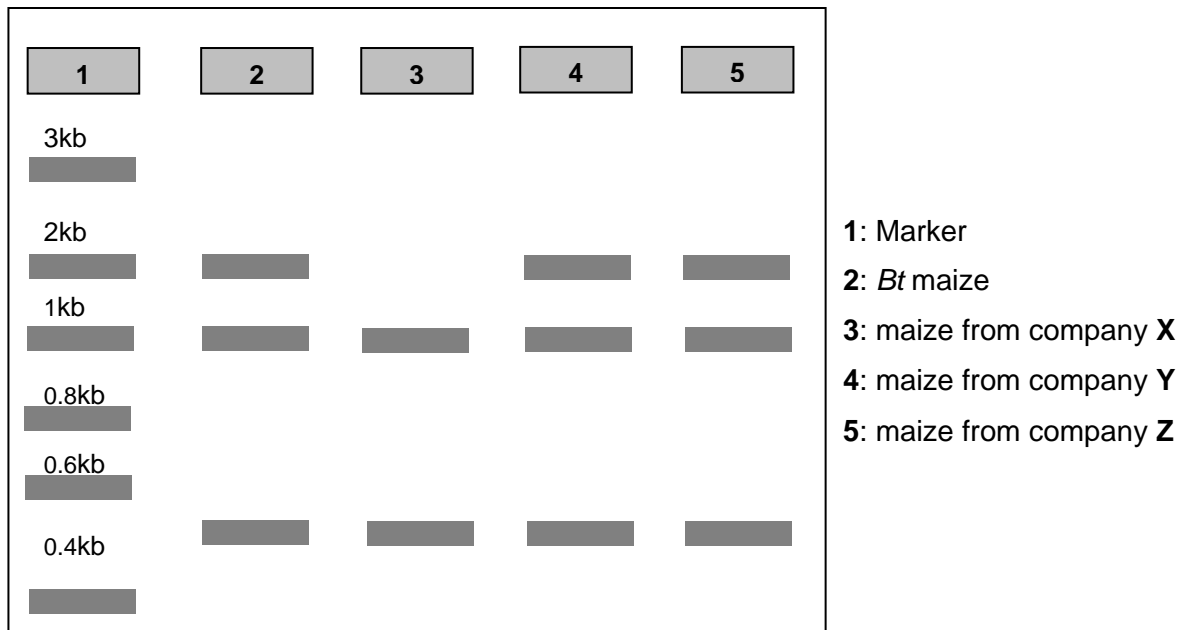


Fig. 4.3

- (f) Identify and explain which company is likely to have sold non-genetically modified maize. [2]

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[Total: 11]

## SECTION B

**Answer EITHER 5 or 6.**

Write your answers on the separate answer paper provided.

Your answers should be illustrated by large, clearly labelled diagrams, where appropriate.

Your answers must be in continuous prose, where appropriate.

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

**Either**

- 5**
- (a)** Using a named example, describe how a gene mutation can lead to a disease phenotype. [7]
  - (b)** Explain how temperature affects the rate of an enzyme-catalysed reaction. [7]
  - (c)** Describe the main ways in which an enzyme differs from DNA. [6]

**[Total: 20]**

**Or**

- 6**
- (a)** Describe how mitosis maintains genetic stability and its importance in growth, repair and asexual reproduction. [7]
  - (b)** Describe the structure of an amino acid and how a peptide bond is formed with another amino acid. [6]
  - (c)** Compare transcription and translation. [7]

**[Total: 20]**