



VICTORIA JUNIOR COLLEGE
BIOLOGY DEPARTMENT
JC2 PRELIMINARY EXAMINATIONS 2016
Higher 1

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CANDIDATE NAME

CLASS

INDEX NUMBER

BIOLOGY

8875/02

Paper 2 Core Paper

14 September 2016

Additional Materials: Answer Paper

2 hours

READ THESE INSTRUCTIONS FIRST

Write your CT GP/ INDEX no. and name on all the work you hand in.

Write in dark blue or blue pen.

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

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

Section A

Answer **all** questions.

Section B

Answer any **one** question.

Write your answers on separate answer paper provided.

At the end of the examinations,

1. hand in section A and the 2 questions you attempted from section B separately;
2. fasten all your work securely;
3. enter the number of the section B questions you have answered in the grid opposite.

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

For Examiner's Use	
Section A	
1	
2	
3	
4	
Section B	
Total	

This paper consists of **8** printed pages.

Section A

- 1 **Fig. 1.1** below shows part of a eukaryotic cell viewed under the microscope.

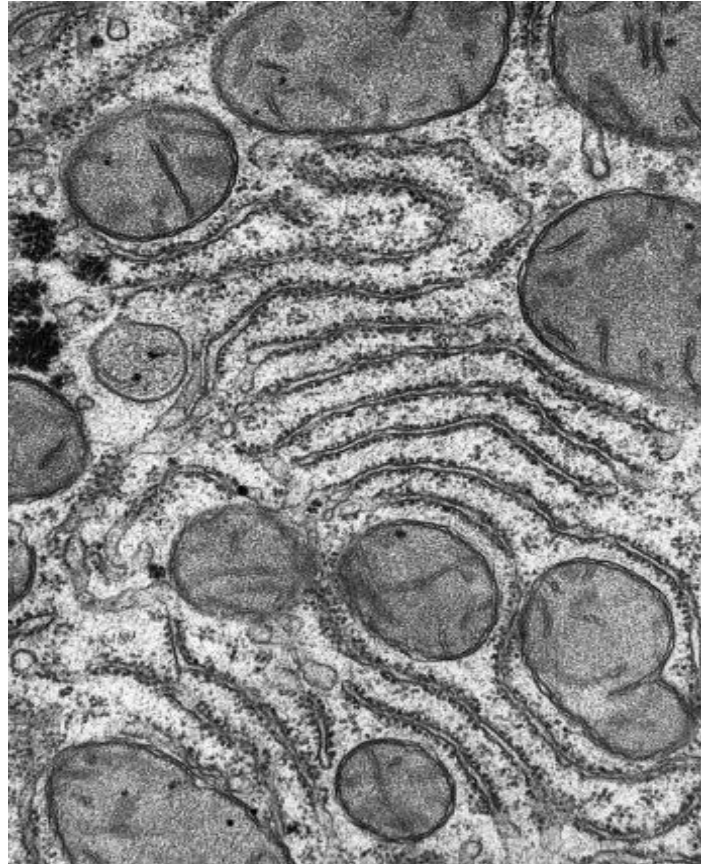


Fig. 1.1

- (a) State two membrane-bound organelles that can be identified in **Fig. 1.1** and briefly describe their functions.

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.....
.....
..... [2]

- (bi) Describe the fluid mosaic model of membrane structure.

.....
.....
.....
..... [2]

(bii) Explain the significance of the membrane in oxidative phosphorylation.

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..... [3]

(c) Outline the roles of carbohydrates on the cell surface membrane.

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..... [3]

[Total: 10]

2 There have been many breakthroughs in stem cell research in recent years. It has been discovered that stem cells are involved in the replacement of worn-out cells and repair of damaged tissues. Further research is being conducted to better understand the mechanism involved in controlling the behaviour of stem cells in order to better manipulate them to treat various diseases and disorders.

(a) State the type of stem cells involved in the replacement of worn-out cells and repair of damaged tissues, and describe the unique properties of this type of stem cells.

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..... [2]

- (b) Stem cells undergo cell division to produce genetically identical daughter cells. **Fig. 2.1** shows two cells, each at a different stage of cell division.

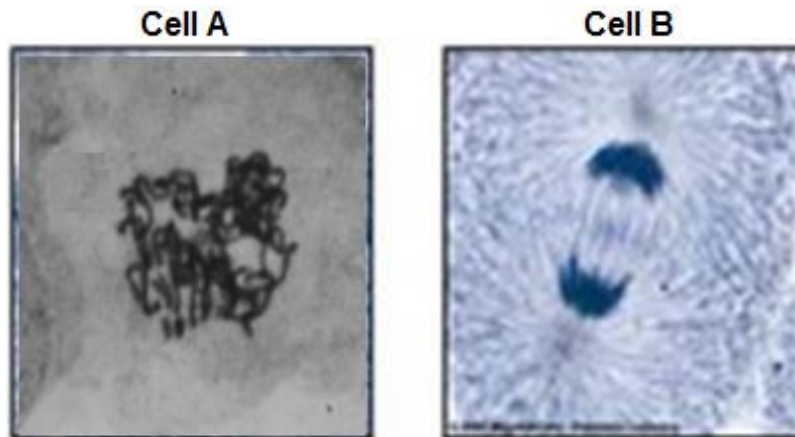


Fig. 2.1

With reference to **Fig. 2.1**,

- (i) state the stages of cell division in **Cell A** and **Cell B**.

..... [1]

- (ii) describe how DNA is packaged in **Cell A**.

.....

 [3]

- (iii) explain how a **named** protein allows for the process in **Cell B**.

.....

 [2]

- (c) Outline how checkpoints allow the normal mitotic cell cycle to be regulated, preventing cancer.

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.....

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..... [2]

[Total: 10]

- 3 (a) Explain why variation is important in selection.

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.....

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..... [2]

- (b) Calvin cycle is an enzymatic process that occurs as part of photosynthesis. One of the enzymes involved is ribulose biphosphate carboxylase (Rubisco). It was discovered that the gene coding for Rubisco has many different alleles, each coding for an enzyme with slight variations in the 3D structure. This gives rise to different rates of Calvin cycle in different conditions.

Explain how different alleles give rise to variations in Rubisco structure.

.....

.....

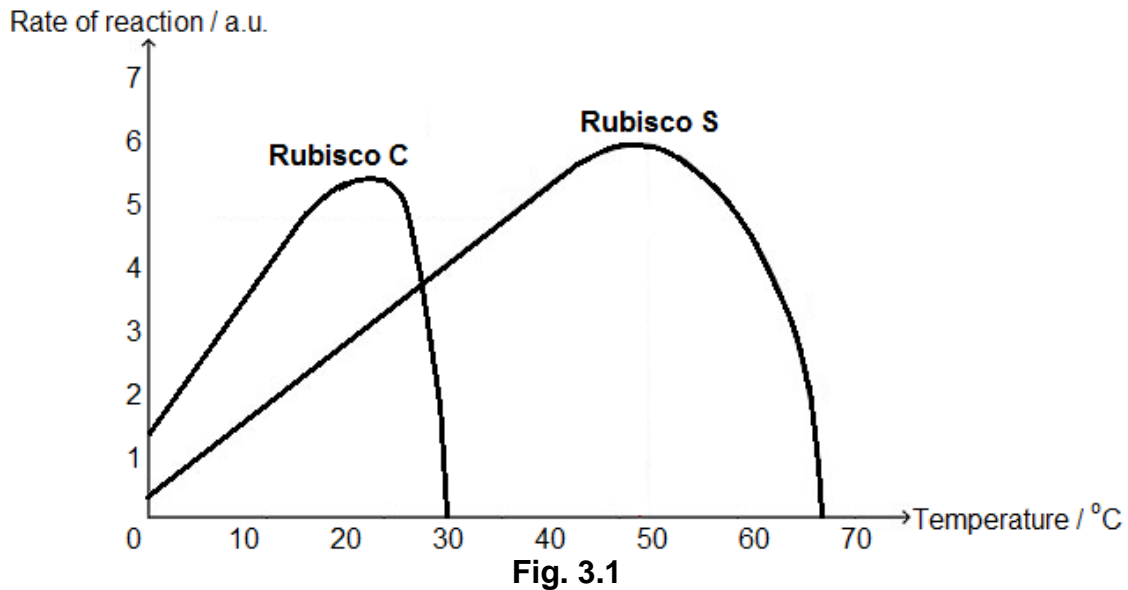
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..... [3]

- (c) **Fig. 3.1** shows the effect of increasing temperature on the activity of two variations of Rubisco. **Rubisco C** is obtained from a species of coniferous tree found in Canada, while **Rubisco S** is obtained from a species of cactus found in the Sahara Desert.



- (i) With reference to **Fig. 3.1**, compare the effect of temperature on the two enzymes.

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..... [3]

- (ii) Suggest how genetic engineering can be carried out to produce coniferous trees that can adapt to rising temperatures due to global warming.

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..... [2]

[Total: 10]

- 4 A male mouse with long tail was mated with a female mouse with no tail. All the male offspring had no tail but all the female offspring had bent tail.

Another male mouse with no tail was then mated with a female mouse with long tail. All the male offspring had long tail but all the female offspring had bent tail.

A male offspring from the first cross was mated with a female offspring from the second cross. The proportion of different offspring is listed below.

Male F2 with long tail	23
Male F2 with no tail	27
Female F2 with bent tail	21
Female F2 with no tail	25

- (i) Draw a genetic diagram to deduce the expected phenotypic ratio of the above cross.

[4]

- (ii) Is it possible for a male mouse to have a bent tail? Explain your answer.

.....

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..... [2]

- (iii) Explain why the observed F2 numbers do not match the expected phenotypic ratio exactly.

.....
 [1]

- (b) The gene involved in the above study was obtained from mice and cloned into a bacterial plasmid, which is then used to transform viable *E. coli* cells.

Compare between two **named** methods of selecting transformed bacteria with recombinant plasmid.

.....

 [3]

[Total: 10]

Section B

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.
 Begin each of sections **(a)**, **(b)** etc. on a **FRESH SHEET** of answer paper.

Either

- 5 (a) Describe the process of DNA replication. [10]
 (b) Explain the mode of action of pyruvate decarboxylase. [6]
 (c) Discuss the social implications of genetically modified animals. [4]

Or

- 6 (a) Outline the process of Calvin cycle. [10]
 (b) Explain the mode of action of RNA polymerase. [6]
 (c) Discuss the ethical implications of genetically modified plants. [4]

[Total: 20]