



HWA CHONG INSTITUTION
JC2 Preliminary Examinations
Higher 1

CANDIDATE NAME

CT GROUP

CENTRE NUMBER

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INDEX NUMBER

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BIOLOGY

8875/02

Paper 2

2 September 2014

2 hours

INSTRUCTIONS TO CANDIDATES

Write your **name**, **CT group**, **centre number** and **index number** in the spaces provided at the top of this cover page.

SECTION A

This section contains **four** questions. Answer **ALL** questions.

Write your answers on the lines / in the spaces provided.

SECTION B

This section contains **two** questions. Answer any **ONE** question.

Your answers must be in continuous prose, where appropriate.

Write your answers on the writing paper provided.

Begin each part on a **fresh sheet of writing paper**.

A **NIL RETURN** is required.

INFORMATION FOR CANDIDATES

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

You may use a calculator.

You are reminded of the need for good English and clear presentation in your answers.

For Examiners' Use	
1	/ 10
2	/ 10
3	/ 10
4	/ 10
5 / 6	/ 20
Total	/ 60

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SECTION A: STRUCTURED QUESTIONS

QUESTION 1

Fig. 1.1 shows the electron micrograph of part of a plasma cell with organelles **A**, **B** and **C** labelled. Plasma cells secrete proteins that are involved in immune responses.

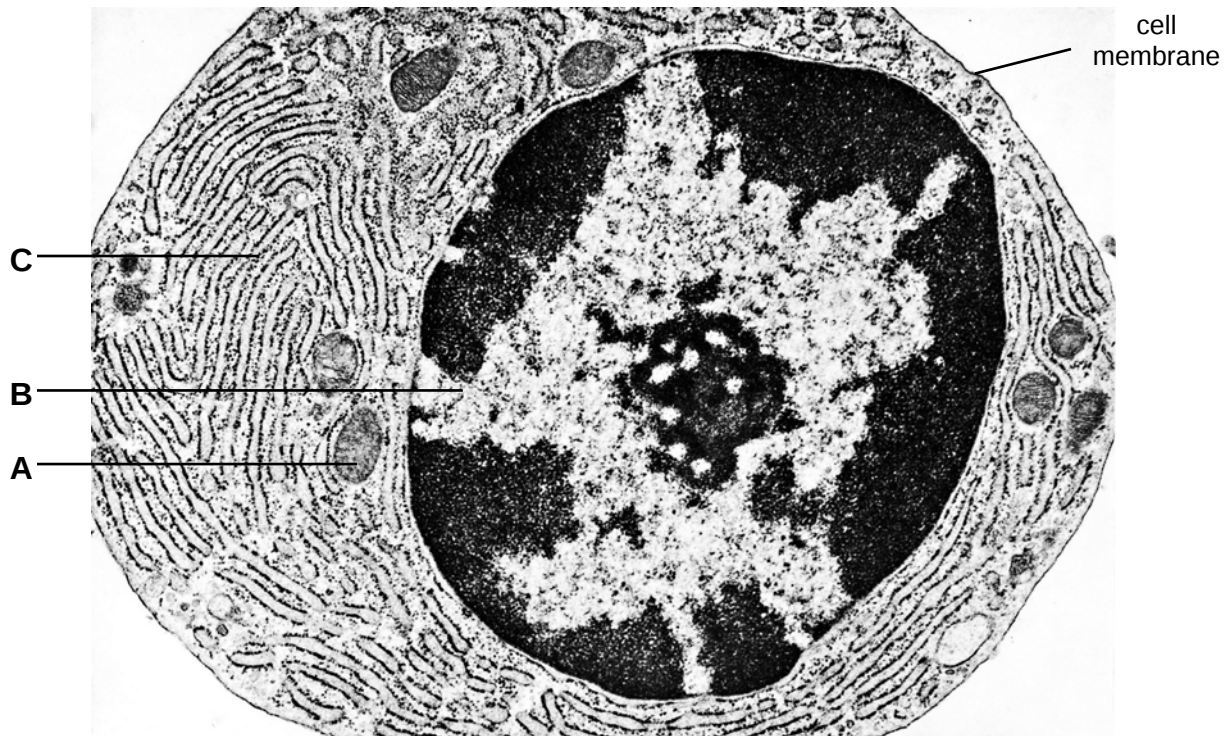


Fig. 1.1

- (a) (i) Name and state the function of organelles **A** and **B**. [2]

- (ii) Explain why there is an abundance of organelle **C** in the plasma cell. [2]

- (b)** Explain how the structure of the cell membrane relates to its role in maintaining the internal environment of the plasma cell. [3]

Macrophages are another important cell type in the immune system where one of their functions is to remove cellular debris.

- (c)** Describe how macrophages engulf and digest cellular debris. [3]

[Total: 10]

QUESTION 2

Fig. 2.1 outlines the processes in photosynthesis with structures **A** and **B** labelled.

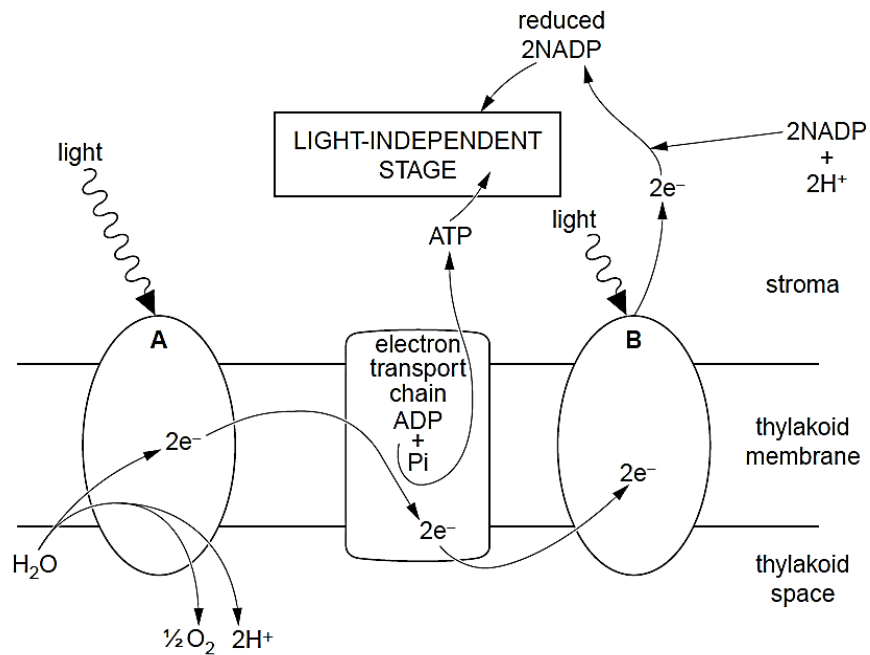


Fig. 2.1

(a) Describe how light is harvested at structures **A** and **B**.

[2]

A herbicide, triazine, acts on weeds by binding to a specific protein associated with structure **A**, blocking the movement of electrons between electron carriers in the electron transport chain.

(b) Explain the effect of triazine on photosynthesis.

[2]

A process known as photorespiration also takes place in photosynthetic cells. In this process, oxygen competes with carbon dioxide for the active site of the enzyme Rubisco.

Fig. 2.2 outlines the process of photorespiration.

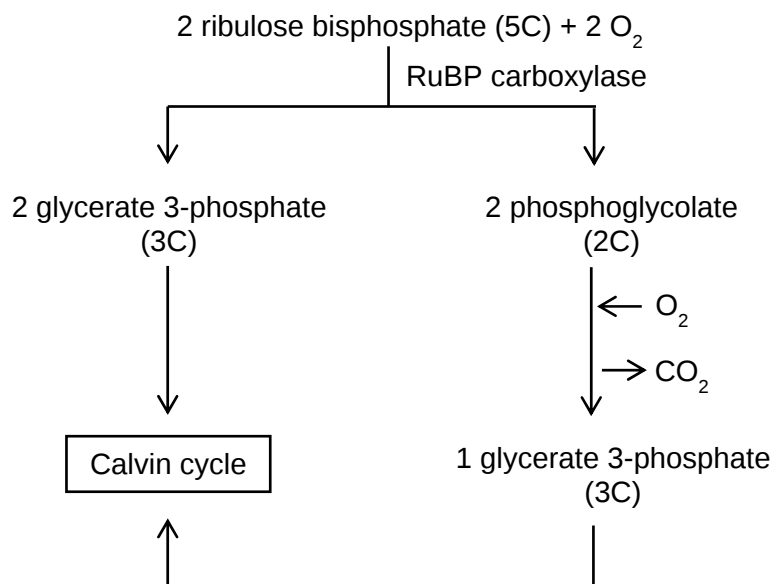


Fig. 2.2

(c) (i) Describe and explain the effects of an increase in oxygen concentration on photosynthesis. [3]

(ii) Suggest why the process outlined in Fig. 2.2 is known as photorespiration. [2]

Some plants known as C4 plants use an enzyme PEP carboxylase, instead of Rubisco, to fix carbon dioxide.

(d) Suggest why photorespiration does not occur in these plants. [1]

[Total: 10]

QUESTION 3

In his book *The Origin of Species*, Charles Darwin hypothesised a logical and well-supported explanation for evolution. It articulated descent with modification by natural selection.

(a) Outline what is meant by *descent with modification by natural selection*. [3]

The seahorse *Hippocampus* shown in Fig. 3.1 is an unusual small fish. It gives birth to live young and it is the male rather than the female that becomes pregnant.



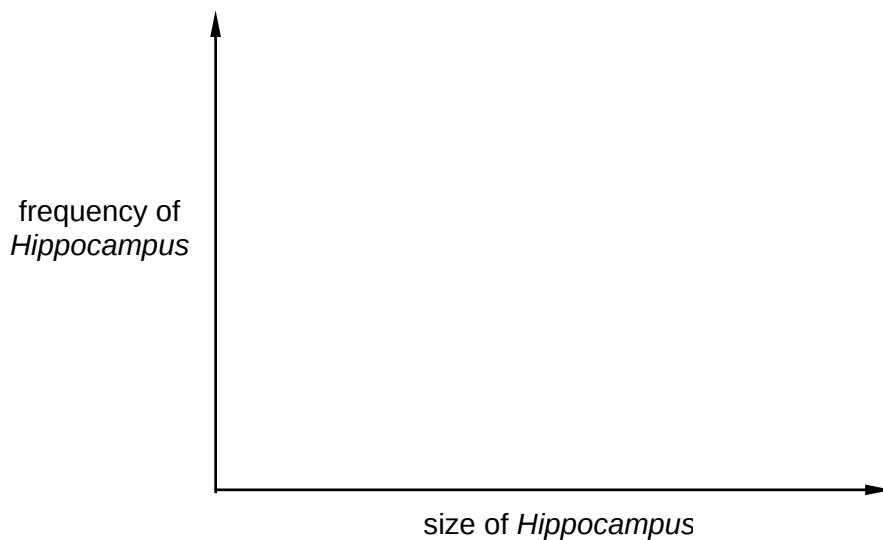
Fig. 3.1

(b) Explain why variation is important in selection.

[3]

In one species of *Hippocampus*, a type of natural selection called disruptive selection occurs.

(c) (i) Using the axes provided, sketch a graph to show the distribution in the size of *Hippocampus* as a result of disruptive selection. [1]



(ii) Explain how disruptive selection has been maintained in this species of *Hippocampus*. [3]

[Total: 10]

QUESTION 4

Fig. 4.1 shows the different developmental pathways of a human embryonic stem cell (ESC).

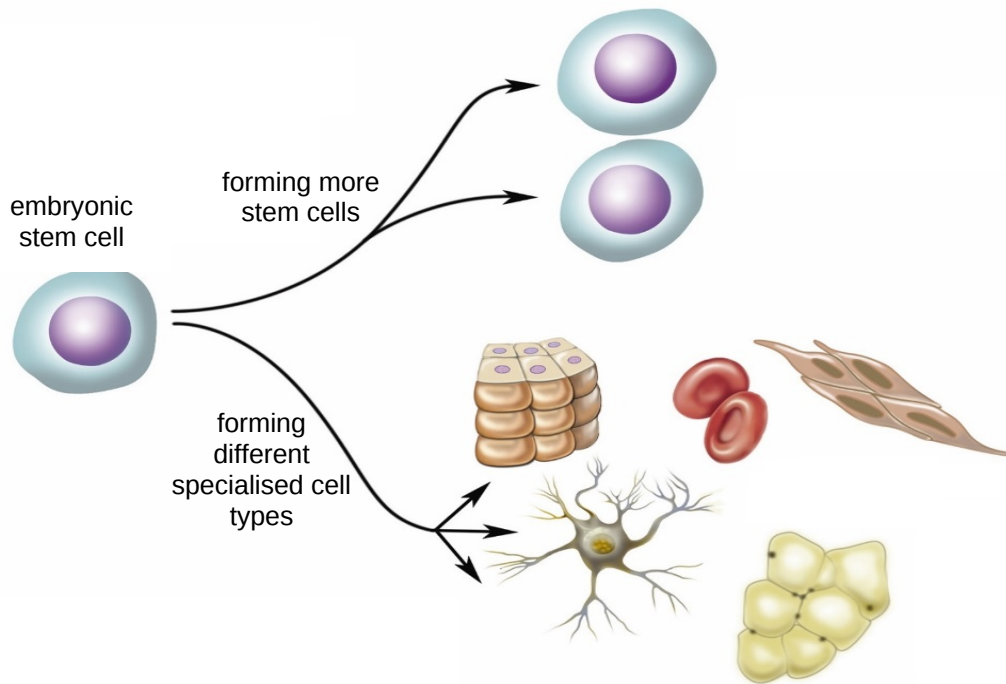


Fig. 4.1

- (a) (i)** Explain the significance of forming more stem cells from an ESC. [2]

- (ii)** Suggest how an ESC differentiates to form specialised cell types. [2]

Human ESCs have generated much interest and public debate.

(b) Suggest two ethical concerns over the use of human ESCs. [2]

When specialised cells are exposed to carcinogens, they may undergo uncontrolled cell division to form cancer.

(c) (i) Explain how uncontrolled cell division can result in cancer. [3]

(ii) State one other causative factor that can increase the chances of cancerous growth. [1]

[Total: 10]

--- END OF SECTION A ---

SECTION B: FREE RESPONSE QUESTIONS

Answer **ONE** of the following two free response questions.

Your answers must be in continuous prose, where appropriate.

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

Begin each part on a **fresh sheet of writing paper**.

A **NIL RETURN** is required.

QUESTION 5

- (a) Describe the properties of plasmids that allow them to be used as DNA cloning vectors. [6]
- (b) Explain how eukaryotic genes are cloned using *E. coli* cells to produce eukaryotic proteins to avoid the problems associated with introns. [8]
- (c) Outline how insulin can be produced by genetic engineering technique. [6]

QUESTION 6

- (a) Describe the structure of an amino acid and the formation of a peptide bond. [6]
- (b) Explain how the information on DNA is used to synthesise polypeptides in eukaryotes. [8]
- (c) Describe the causes of genetic variation in a population. [6]

[Total: 20]

--- END OF SECTION B ---

--- END OF PAPER---

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