



ADVANCED GCE

BIOLOGY

Communication, Homeostasis and Energy

F214

Friday 25 June 2010

Afternoon

Duration: 1 hour

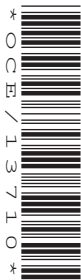
Candidates answer on the Question Paper

OCR Supplied Materials:

None

Other Materials Required:

- Electronic Calculator
- Ruler (cm/mm)



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are indicated.

(b) Fig. 1.2 is an electron micrograph of a mitochondrion from an animal cell.

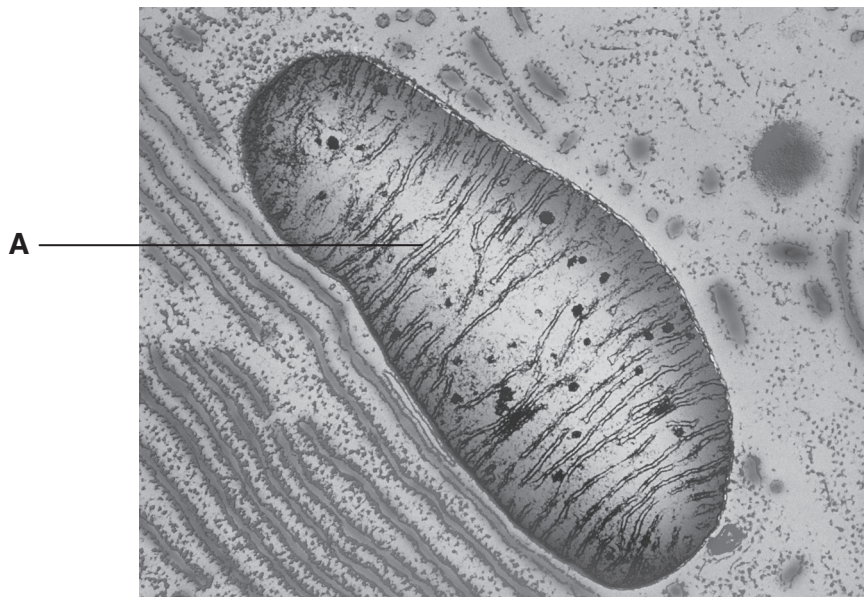


Fig. 1.2

(i) Name the structure labelled **A**.

..... [1]

(ii) Name the specific process that is carried out by structure **A** in the mitochondrion.

..... [1]

2 (a) Fig. 2.1 is a photomicrograph through the centre of a lobule of a mammalian liver.

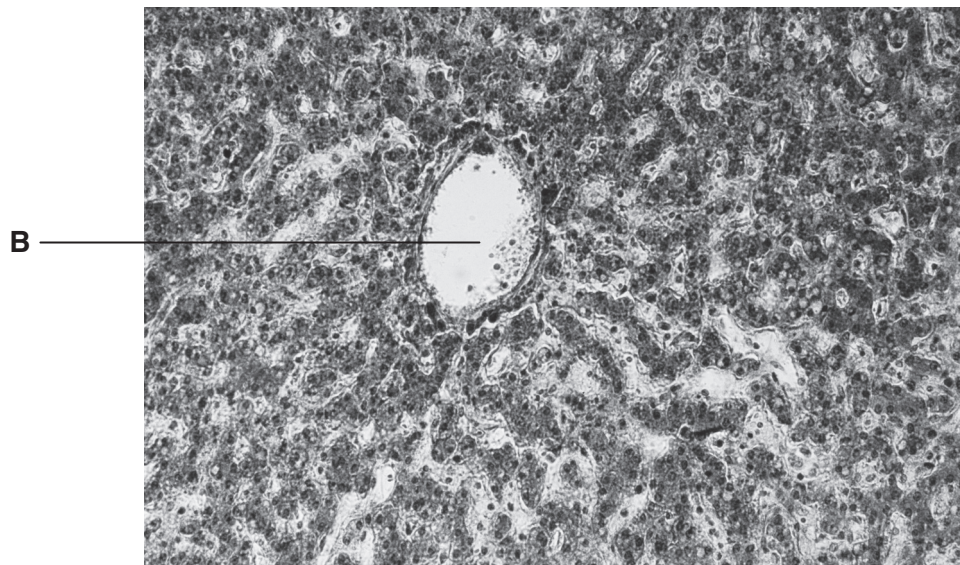


Fig. 2.1

(i) Name the type of vessel labelled B.

..... [1]

(ii) Name the cells that make up the lobule.

..... [1]

(b) Fig. 2.2 outlines the formation of urea in the liver.

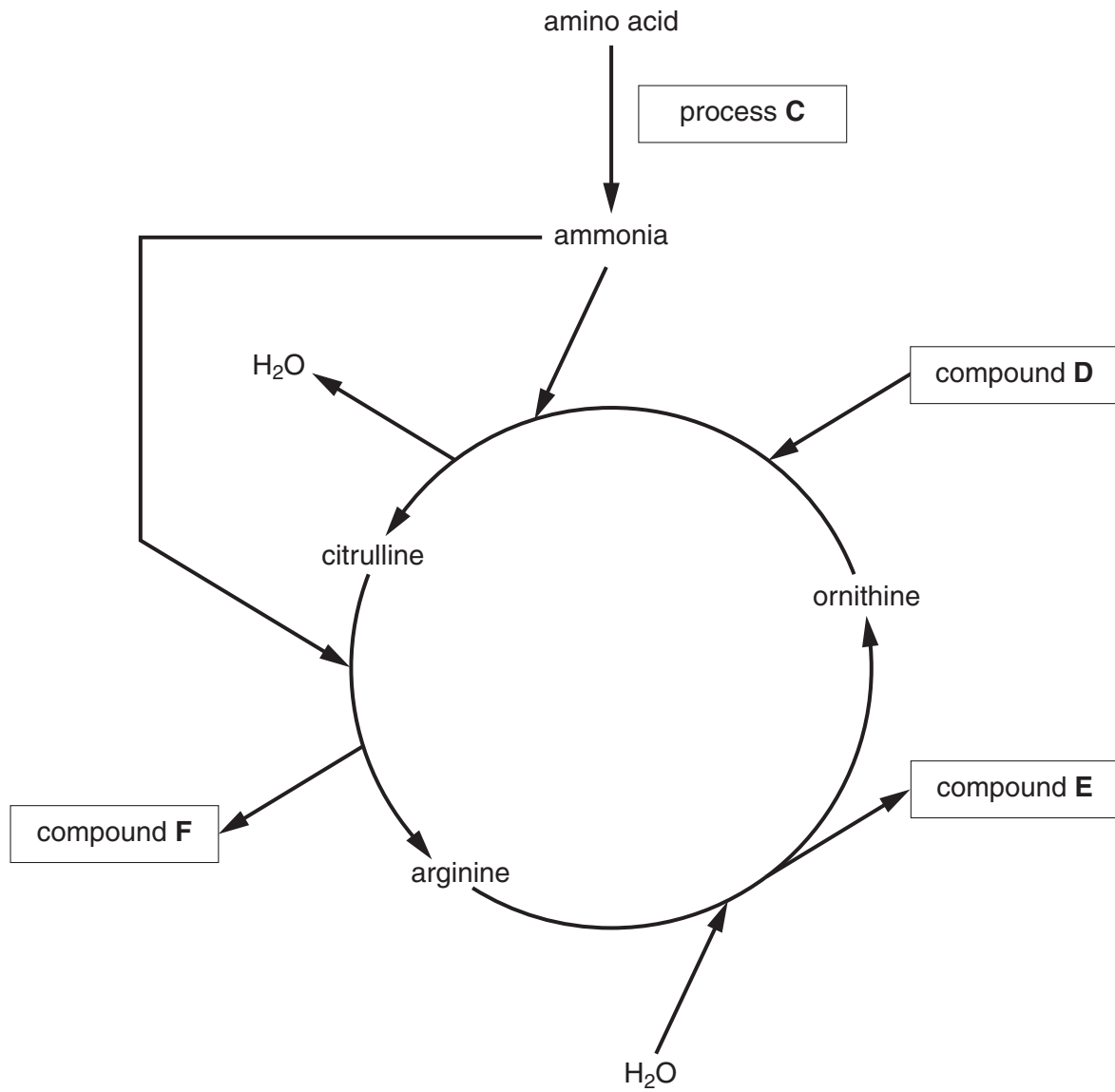


Fig. 2.2

Using Fig. 2.2, identify:

process C

compound D

compound E

compound F [4]

3 (a) The Calvin cycle is the stage of photosynthesis during which carbon dioxide is fixed. The Calvin cycle uses the products of the light dependent stage.

(i) Name the products of the light dependent stage that are used in the Calvin cycle.

.....
 [2]

(ii) Discuss the fate of triose phosphate (TP) in the Calvin cycle.

.....

 [3]

(b) 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 RuBP carboxylase (Rubisco).

Fig. 3.1 (a) and Fig. 3.1 (b) outline the processes of photosynthesis and photorespiration.

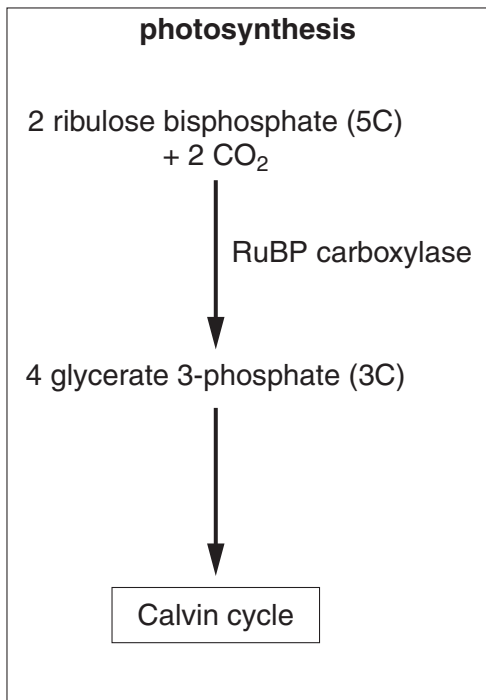


Fig. 3.1 (a)

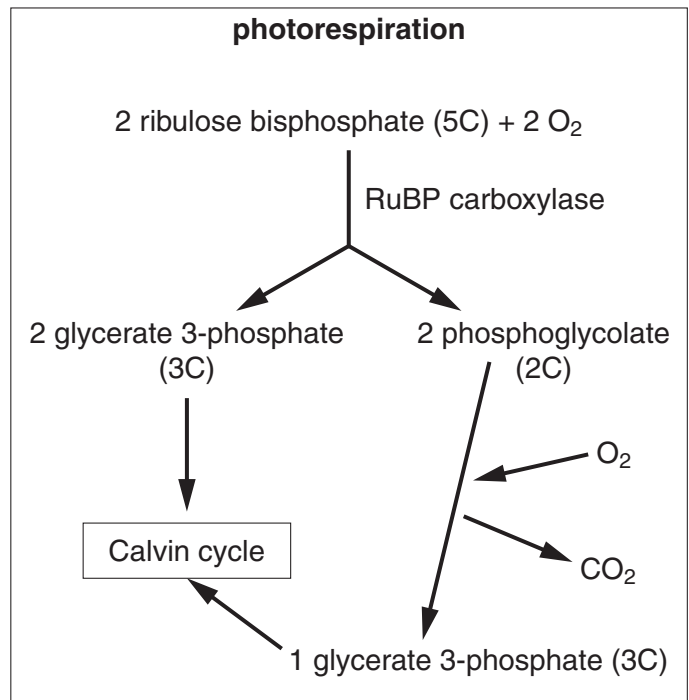


Fig. 3.1 (b)

(i) Suggest why the process outlined in Fig. 3.1 (b) is known as photorespiration.

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

(ii) Using Fig. 3.1 (a) and Fig. 3.1 (b), describe and explain the likely effect on photosynthesis of an increase in the oxygen concentration.

.....
.....
.....
.....
.....
.....
.....
..... [3]

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

Suggest why these plants do **not** show photorespiration.

.....
.....
..... [1]

[Total: 11]

- 4 As part of a study to control Type 2 diabetes by modification of the diet, an investigation was carried out into the effects of different food compounds on the blood glucose and blood insulin concentrations of patients with this type of diabetes.

The food compounds, their components and their effect on blood glucose and blood insulin concentrations are summarised in Table 4.1.

Table 4.1

food compound	component(s)	effect on blood glucose concentration	effect on blood insulin concentration
sucrose	glucose and fructose	moderate increase	moderate increase
lactose	glucose and galactose	moderate increase	moderate increase
starch	glucose	substantial increase	substantial increase
cellulose	glucose	no effect	no effect
protein	amino acid	no effect	moderate increase
fat	fatty acid and glycerol	no effect	moderate increase

(a) Suggest an explanation for the differences observed in **blood glucose concentration**:

(i) between starch and sucrose,

.....

.....

.....

..... [2]

(ii) between starch and cellulose.

.....

.....

.....

..... [2]

5 Fig. 5.1 is a trace that shows the changes that occur in the membrane potential of a neurone during the generation of an action potential.

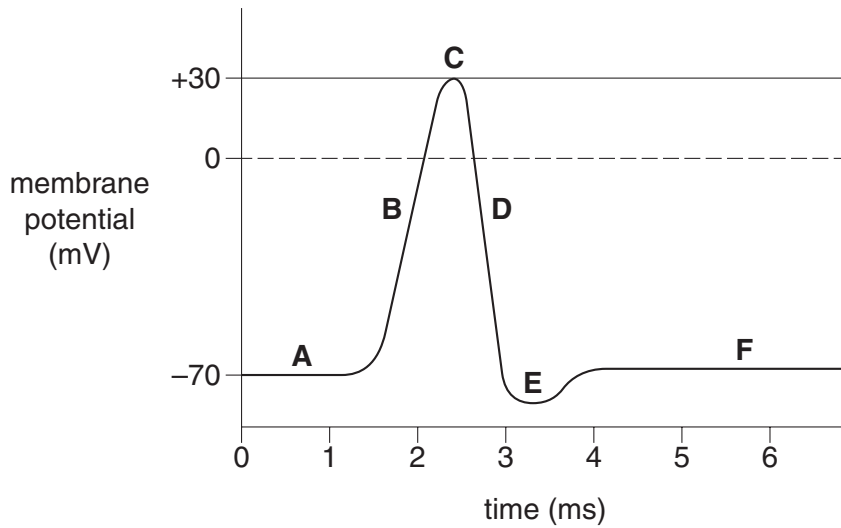


Fig. 5.1

(a) Using the letters **A** to **F**, indicate the point or points on the trace which correspond to the following:

(i) hyperpolarisation,

..... [1]

(ii) resting potential,

..... [1]

(iii) the membrane is most permeable to potassium ions,

..... [1]

(iv) depolarisation.

..... [1]

- (b) Puffer fish, *Fugu spp.*, produce a powerful poison, tetrodotoxin, and some species store it in high concentrations in their body tissues. Unless these fish are correctly prepared, eating them can be fatal.

Tetrodotoxin is poisonous to humans because it blocks **gated** sodium channels in cell membranes, preventing action potentials. This does not happen in the fish themselves.

- (i) With reference to Fig. 5.1, identify, using the appropriate letter, the part of the action potential trace that will be affected by tetrodotoxin.

..... [1]

- (ii) Suggest why tetrodotoxin is **not** toxic to the puffer fish.

.....
.....
..... [1]

QUESTION 5(c) STARTS ON PAGE 16

(c) Multiple sclerosis (MS) is an auto-immune condition in which the nervous system is damaged. This damage leads to loss of sensation. One form of damage is shown in Fig. 5.2.

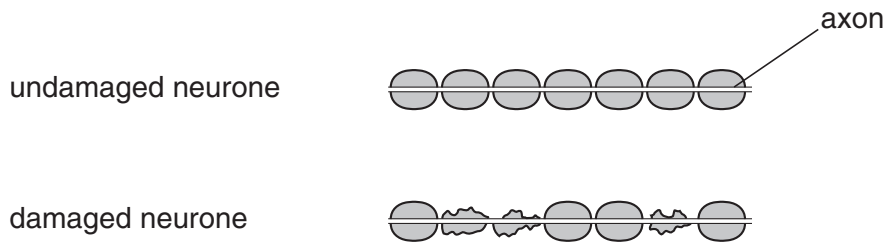


Fig. 5.2

(i) Suggest why MS is described as an auto-immune condition.

.....

.....

.....

.....

..... [2]

(ii) Explain why this damage leads to a loss of sensation.

.....

.....

.....

.....

..... [2]

[Total: 10]

END OF QUESTION PAPER



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