

ADVANCED GCE

BIOLOGY F214

Communication, Homeostasis and Energy



Candidates answer on the Question Paper

OCR Supplied Materials:

None

Other Materials Required:

- Electronic Calculator
- Ruler (cm/mm)

Friday 25 June 2010 Afternoon

Duration: 1 hour



Candidate Forename				Candidate Surname			
Centre Number				Candidate N	umber		

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.

Answer all the questions.

1 (a) Fig. 1.1 represents a molecule of ATP.

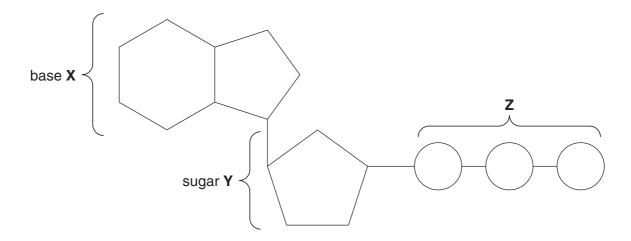


Fig. 1.1

(i)	Name the parts of the ATP molecule labelled X, Y and Z.	
	X	
	Υ	
	z	[3]
(ii)	With reference to Fig. 1.1, describe and explain the role of ATP in the cell.	
		[0]

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

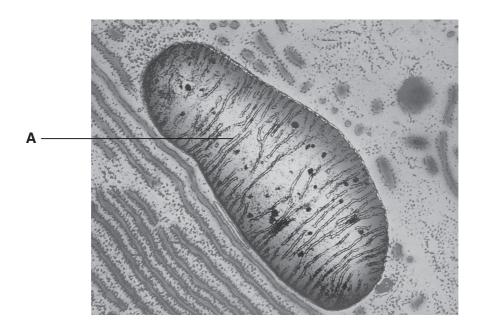


Fig. 1.2

(i)	Name the structure labelled A .	
		[1]
(ii)	Name the specific process that is carried out by structure A in the mitochondrion.	
		[1]

(c) Some animals conserve energy by entering a state of torpor (a short period of dormancy), in which they allow their body temperature to fall below normal for a number of hours.

In an investigation into torpor in the Siberian hamster, *Phodopus sungorus*, the animal's respiratory quotient (RQ) was measured before and during the period of torpor.

The respiratory quotient is determined by the following equation:

$$RQ = \frac{\text{volume of carbon dioxide produced}}{\text{volume of oxygen consumed in the same time}}$$

RQ values for different respiratory substrates have been determined and are shown in Table 1.1.

Table 1.1

substrate	RQ
carbohydrate	1.0
lipid	0.7
protein	0.9

(1)	progressed, its RQ value decreased to 0.75.
	What do these values suggest about the substrates being respired by the hamster during the period of the investigation?
	131

(ii)	Describe the way in which an endothermic animal, such as a mammal, normally prevents its body temperature from decreasing when the external temperature decreases.
	In your answer, you should use appropriate technical terms, spelt correctly.
	[5]
	[Total: 16]

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

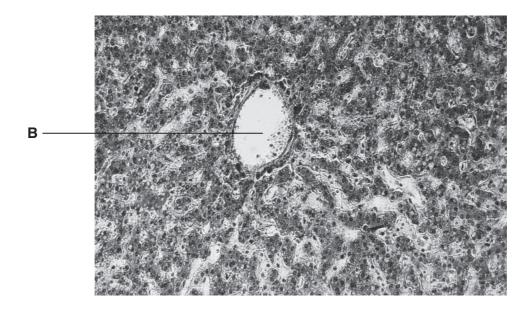


Fig. 2.1

(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.

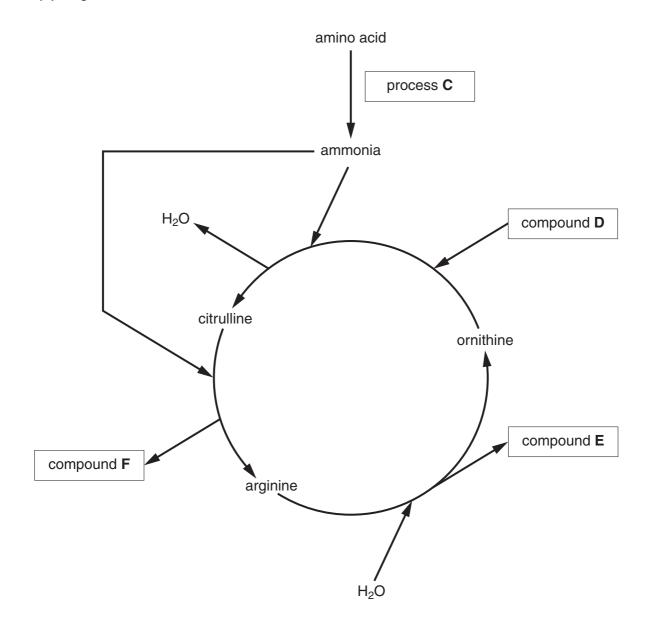


Fig. 2.2

Using Fig. 2.2, identify:

compound **D**compound **E**compound **F**[4]

(c) The urea formed in the ornithine cycle will be excreted from the body in urine. Urine also contains other chemicals.

Procedures have been developed to test for the presence of some of these chemicals, such as hormones.

(i)	A pregnancy testing kit contains a testing 'stick' to detect a hormone in the urine
	Explain how the stick detects this pregnancy hormone.

In your answer, you should use appropriate technical terms, spelt correctly.
[4]

high levels of banned steroids or their metabolites.

(ii) The urine of some high profile athletes has been tested and found to contain abnormally

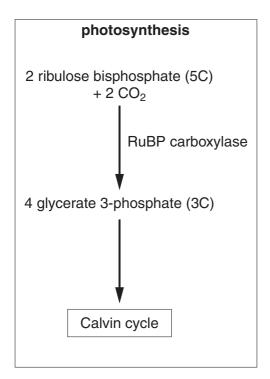
The pressure on elite athletes to succeed in their sport leads some of them to resort to the use of these performance-enhancing steroids.
Comment on whether the use of steroids should be permitted in sport.
[3]
[Total: 13]

3	(a)	The Calvin	cycle is	the stage	of	photosynthesis	during	which	carbon	dioxide	is	fixed.	The
		Calvin cycle	uses th	ne products	of	the light depend	ent sta	ge.					

(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.
	101

(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.



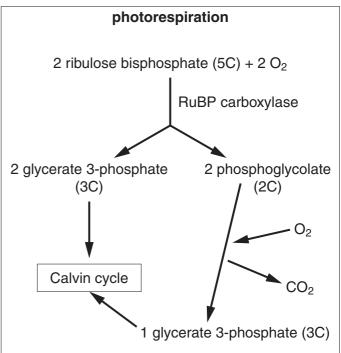


Fig. 3.1 (a) Fig. 3.1 (b)

(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 C_4 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)	Sug	gest an explanation for the differences observed in blood glucose concentration :	
	(i)	between starch and sucrose,	
	(ii)	between starch and cellulose.	
			1

(b)		the food compounds in Table 4.1, ex condition by modifying their diet.	plain how a person with Type 2 diabetes
			[3]
(c)	concentration.		volved in the control of blood glucose
		glycogen	glucagon
typ	e of compound		
role	e of compound		
site	e of production		
			[3]

- -

[Total: 10]

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.

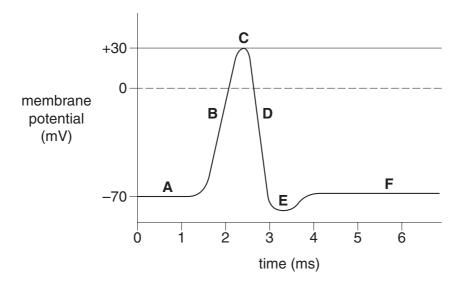


Fig. 5.1

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

(i)	hyperpolarisation,	
(ii)	resting potential,	[1]
		[1]
(iii)	the membrane is most permeable to potassium ions,	
		[1]
(iv)	depolarisation.	

(b)	in h	er fish, <i>Fugu spp.</i> , produce a powerful poison, tetradotoxin, and some species store it gh concentrations in their body tissues. Unless these fish are correctly prepared, eating n can be fatal.
		adotoxin is poisonous to humans because it blocks gated sodium channels in cell nbranes, 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 tetradotoxin.
		[1]
	(ii)	Suggest why tetradotoxin 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.

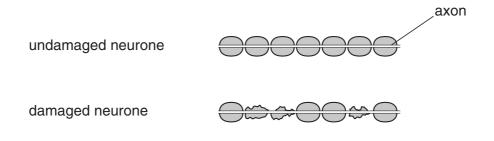


Fig. 5.2

	Suggest why MS is described as an auto-immune condition.	(i)
[2]		
[=]		/::\
		(ii)
[2]		
[Total: 10]		

END OF QUESTION PAPER



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