Centre Number	Candidate Number	Name

# UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS General Certificate of Education Advanced Level

BIOLOGY 9700/04

Paper 4 Structured Questions

For Examination from 2007

Specimen Paper

2 hours

Additional Materials: Answer Booklet/Paper

### **READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in. Write in dark blue or black pen.

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

#### **Section A**

Answer all questions.

#### **Section B**

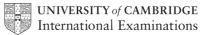
Answer **one** question.

Write your answer on the separate Answer Booklet/Paper.

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.

This document consists of 14 printed pages.

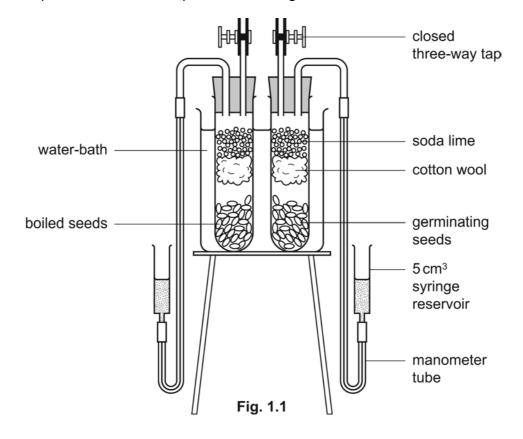


[2]

1	(a)	State what is meant by	/ the term	respiratory	quotient (	(RQ)

(a)	Ola	te what is meant by the term respiratory quotient (NQ).	
			[1]
(b)	(i)	Complete the following equation for the aerobic respiration of the respiratory substrate A.	
		C <sub>18</sub> H <sub>36</sub> O <sub>2</sub> + 26O <sub>2</sub> +	[2]
	(ii)	Calculate the respiratory quotient (RQ) of this respiratory substrate.	
			[2]
(c)	Exp	lain the significance of the different values that may be obtained of RQ.	

Two respirometers were set up as shown in Fig. 1.1.



(d) Outline how this apparatus is used to measure the rate of oxygen uptake by a known mass of germinating seeds.
[4]
(e) Explain how the apparatus could be modified to measure the RQ of the germinating seeds.
[2]
<b>(f)</b> Explain why an increase in temperature from 15 °C to 25 °C will increase the rate of oxygen uptake in germinating seeds.
[2]
[Total: 15]

**2** Fig. 2.1 shows the main stages of the Calvin cycle.

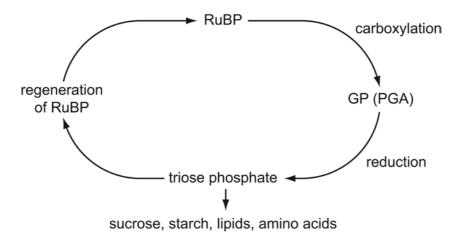


Fig. 2.1

(a)	State precisely where the Calvin cycle occurs in plant cells.	[41
(b)	Describe how carbon dioxide is fixed in the Calvin cycle.	[1]
		[2]
(c)	Explain how the products of photophosphorylation are used in the Calvin cycle.	
		•••••
		[3]
(d)	Explain what initially happens to the concentration of RuBP and GP if the supply of carbon dioxide is reduced.	
	RuBP	
		•••••
	GP	•••••
		[2]
	[Tota	l: 8]

3 Scallops, which are bivalve molluscs, are important commercially throughout the world. The marine bay scallop, *Agropecten irradians*, has three distinct shell colours, yellow, orange and black. The shell colour is controlled by a gene with three alleles, yellow, **S**<sup>y</sup>, orange, **S**°, and black, **S**<sup>b</sup>.

Scallops are hermaphrodite and are able to fertilise themselves to produce offspring.

Single mature adult specimens of yellow, orange and black scallops were collected and kept in separate tanks of seawater until they produced young. The young were then scored for shell colour. The results were as follows:

yellow scallop – 25 yellow and 8 black orange scallop – 31 orange and 9 black black scallop – 27 black

(a)	Explain the results from the orange and black scallops, using the symbols given.
	[6]
	[6]
(b)	Orange scallops are more valued for human consumption.
	Describe how a marine biologist could produce a pure-breeding line of orange scallops for commercial exploitation using the offspring from the single orange scallop.
	[2]
	ITotal: 81

[4]

4 (a) The table shows information about some organisms and their classification.

Complete the table by putting the correct kingdom for each organism described. The first one has been done for you. Each kingdom may be required once, more than once or not at all.

Features of organism	kingdom			
Body composed of single isolated cells. Heterotrophic eukaryotic cells without a cell wall.				
Organism motile.	Protoctista			
Body composed of a mass of undifferentiated cells. Heterotrophic eukaryotic cells with a chitin cell wall.  Not motile.				
Body composed of a small ball of undifferentiated cells. Autotrophic eukaryotic cells with a cellulose cell wall and flagellum. Organism motile.				
Body complex and multicellular, differentiated into a variety of tissues and organs.				
Heterotrophic eukaryotic cells with no cell wall, some cells have flagellae.  Organism motile.				
Organism motile.				
Body a string of tiny undifferentiated cells. Heterotrophic prokaryotic cells with a peptidoglycan (murein) cell wall. Not motile.				
Body complex and multicellular, differentiated into a variety of tissues				
and organs. Autotrophic eukaryotic cells with a cellulose cell wall. Not motile.				
NOUTHOUSE.				
	[5]			
(b) In traditional classification there were considered to be only to were in one kingdom, and all other organisms were in the other.	wo kingdoms; animals			
Suggest the advantages and disadvantages of such a two-compared to the five kingdom classification often used today.	kingdom classification			

(c)	A student stated that 'maintaining biodiversity is not important because there are already hundreds of sorts of different animals and anyway, you just can't protect these protected species properly.'				
	Discuss the extent to which this statement,				
	(i) defines biodiversity				
	(ii) addresses the need to maintain biodiversity				
	(iii) evaluates the available methods of protecting endangered species.				
	[6]				
	[Total: 15]				

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**5** Fig. 5.1 outlines the way in which the gene for human insulin is incorporated into plasmid DNA and inserted into a bacterium.

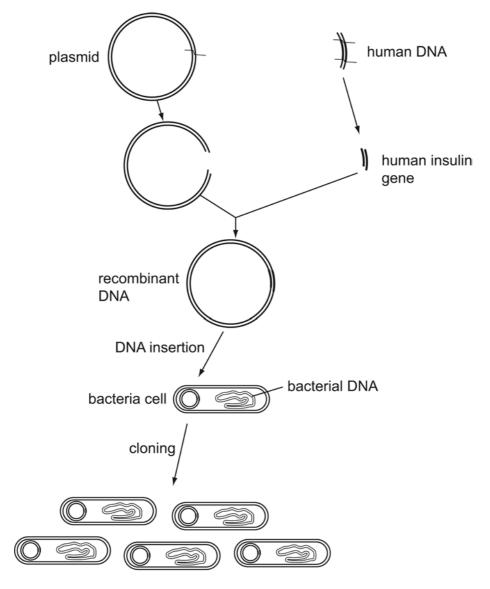


Fig. 5.1

(a)	Describe how the plasmid DNA is cut.
	[3]
(b)	Explain how the human insulin gene is joined to the plasmid DNA.
	[2]
	[3]
(c)	List <b>two</b> advantages of treating diabetics with human insulin produced by genetic engineering.
	1
	2
	[2]
	[Total: 8]

(a)	Des	scribe the	roles of barley	and yeast enzymes	in beer production.	
						[3]
(b)	moi of ii (i)	re popula mmobilise Explain	r. Light beers ed fungal amyla the advantage	have a low starch coase after the mashing of using immobilised ent types of immobilise	ers of low energy content. This is achieved process.  enzymes in this proces  sed fungal amylase on ions, starch is not a lim	d by the addition ss.  [3] the hydrolysis of
				Table 6.1		
			time/b	mass of malto	ose produced/g	
			time/h	α amylase	β amylase	
			0	0	0	
			1	0.05	0.05	
			2	0.20	0.10	
			3	0.60	0.20	
				e 6.1, explain which	of these enzymes woul	d be used in the
						[2]
						[Total: 8]

(a)	Describe the structural features of wind pollinated plants such as grasses.
	[4]
(b)	State two advantages of self pollination and two advantages of cross pollination.
	self pollination
	1
	2
	cross pollination
	1
	2
	[4]
	[Total: 8]

7

[3]

8 (a) Name the precise sites of production in the human male of the following hormones:

(i) follicle stimulating hormone (FSH);

(ii) luteinising hormone (LH) or interstital cell stimulating hormone (ICSH);

(iii) testosterone.

**(b)** Fig. 8.1 shows the concentration of the hormones FSH, LH (ICSH) and testosterone in the blood of a human male at different ages.

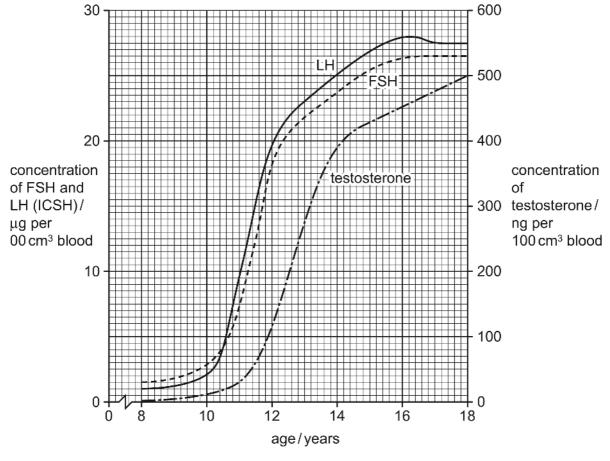


Fig. 8.1

With reference to Fig. 8.1, describe and explain the changes in concentration of:

(i)	FSH and LH (ICSH);	
•••••		

			. [4]
(ii)	testosterone.		
			[4]
Table	e 8.1 shows the mean mass	of the human testis at different ages.	
		Table 8.1	
	age/years	mean mass of human testis/g	
	10	2.0	
	12	3.0	
	14	8.0	
	16	18.0	
	18	28.0	
• i Rela	blute growth rate may be defined as a line of the contract of	e. ned as:	
	reference to Table 8.1 and case,	these definitions, calculate, showing your worki	ng in
(i) t	he <b>absolute</b> growth rate of t	he testis between ages 14 and 18 years;	
			···········
11			
			[2]
(ii) †	he <b>relative</b> growth rate of the	e testis hetween ages 14 and 18 years	

[Total: 15]

[2]

(c)

## Section B Answer one question

9	(a)	Explain how a synapse functions.	[9]
	(b)	Describe the role of glucagon in regulating blood glucose.	[6]
			[Total: 15]
10	(a)	Describe why variation is important in natural selection.	[6]
	(b)	Explain the role of isolating mechanisms in the evolution of new species.	[9]
			[Total: 15]

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