

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS General Certificate of Education Advanced Level

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CANDIDATE NAME							
CENTRE NUMBER				CANDIDATE IUMBER			

BIOLOGY 9700/43

Paper 4 A2 Structured Questions

October/November 2011

2 hours

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces provided at the top of this page. Write in dark blue or black ink.

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

DO NOT WRITE IN ANY BARCODES.

Section A

Answer all questions.

Section B

Answer **one** question

Circle the number of the Section B question you have answered in the grid below.

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.

For Examiner's Use					
Section A					
1					
2					
3					
4					
5					
6					
7					
8					
9					
Section B					
10 or 11					
Total					

This document consists of 21 printed pages, 2 lined pages and 1 blank page.



Section A

Answer all the questions.

1 The Bengal Tiger, *Panthera tigris tigris*, is an endangered mammalian species of Southern Asia. It lives mostly in a forest habitat.

Fig. 1.1 shows a Bengal Tiger.



Fig. 1.1

(a) Table 1.1 shows the relationship between available forest habitat and Bengal Tiger numbers between 1970 and 2010.

Table 1.1

year	forest habitat remaining compared to 1970 (%)	Bengal Tiger numbers
1970	100	37 000
1980	79	27 000
1990	42	12 000
2000	26	3 600
2010	18	1 400

www.PapaCambridge.com Calculate the percentage decrease in the number of Bengal Tigers between 19 2010.

Give your answer to the **nearest whole number**.

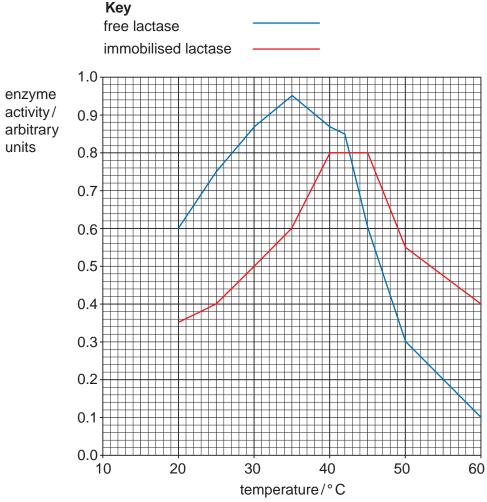
	answer % [2]
(b)	Suggest methods to conserve the Bengal Tiger.
	[4]
(c)	The Bengal Tiger belongs to the kingdom Animalia. State two differences between members of the kingdom Animalia and the kingdom Plantae.
	[2]
	[Total: 8]

www.PapaCambridge.com 2 (a) In the small intestine, the enzyme lactase hydrolyses the disaccharide lactose monosaccharides glucose and galactose. A deficiency of lactase can lead to a conknown as lactose intolerance. The lactose passes undigested into the large intestin resulting in diarrhoea. Some babies are born with congenital lactase deficiency, which is an inherited condition, and require lactose-free milk from birth.

Suggest no lactase defi	iciency.	parents,	wno c	an dige	st lactose	, can	nave	a child	with	congen	ıtaı
											[-]

(b) The enzyme lactase can be produced by biotechnology and then used to produce lactose-free dairy products. Lactase is frequently used immobilised in alginate beads.

Fig. 2.1 shows a comparison between the activity of lactase free in solution and lactase immobilised in alginate beads, over a range of temperatures. Equal concentrations of free lactase and immobilised lactase were used.



	5	1
١	h reference to Fig. 2.1:	SC3
(i	describe the effect of immobilisation on the activity of lactase	13
	h reference to Fig. 2.1: describe the effect of immobilisation on the activity of lactase	
		[3]
(ii	suggest explanations for the differences between the activity of immobilised lact and free lactase up to 40 $^{\circ}\text{C}.$	tase
_		[2]
S	te the advantages of using immobilised enzymes instead of free enzymes.	
		•••••
		[3]
		r-1

testes of a Randhidae Com

3 (a) Spermatogenesis, the production of male gametes, occurs in the testes of a male from the age of puberty.

Fig. 3.1 outlines the sequence of events that occur during oogenesis.

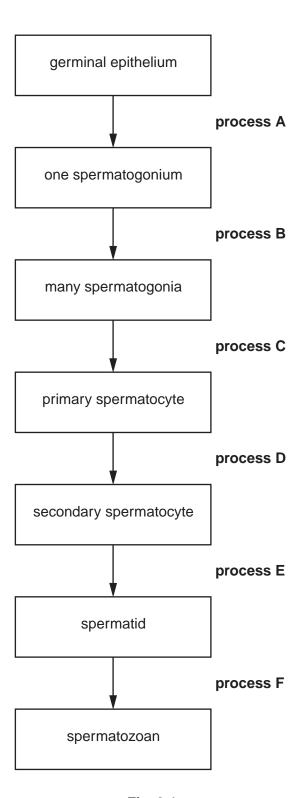


Fig. 3.1

With reference to Fig. 3.1, state what is happening to cells during:

(i)	process B
	[1]
(ii)	process D
	[1]
(iii)	process F.
	[1]

(b) Female gametes develop inside follicles.

Fig. 3.2 shows a section through a mature (Graafian) follicle in a human ovary.

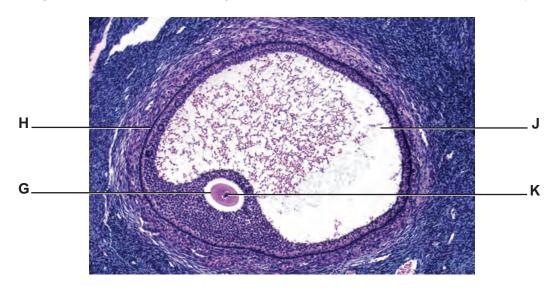


Fig. 3.2

Table 3.1 below lists a number of statements about the mature follicle. Each statement refers to one of the letters **G**, **H**, **J** and **K** shown in Fig. 3.2.

Complete the table using the letters G, H, J and K.

Table 3.1

statement	letter
contains protective fluid	
produces oestrogen	
has glycoprotein receptors	
contains 23 chromosomes	

	why was a second
	8
(c)	A man and a woman may be described as infertile if they have failed to conceive after 12 months of trying. They may opt for in-vitro fertilisation (IVF) if the woman producing some normal eggs. Outline the technique of IVF.
	Outline the technique of IVF.
	[5]
(d)	Not all pregnancies due to IVF treatment result in live births. In the USA in 2008 the figures were:
	 85% of these pregnancies result in live births for women under 35 years old 66% of these pregnancies result in live births for women between 38–40 years old.
	Suggest reasons for the difference in percentage for the two groups of women.
	[0]

[Total: 14]

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Question 4 starts on page 10

4 (a) Fig. 4.1 shows the male and female flowers of maize.





Fig. 4.1

(i)	With reference to Fig. 4.1 suggest how the flowering habit of maize encourages wind pollination.
	[3]
	[0]
(ii)	In a maize plant, the anthers normally ripen and release pollen before the stigmas are mature and ready to receive pollen. This encourages cross-pollination.
	Explain two potential advantages of cross-pollination to a plant species.
	[2]

(b) The conditions in which wheat and maize are grown affect their ability to photosyn

www.PapaCambridge.com Fig. 4.2 compares the rate of photosynthesis of wheat and maize at differen temperatures.

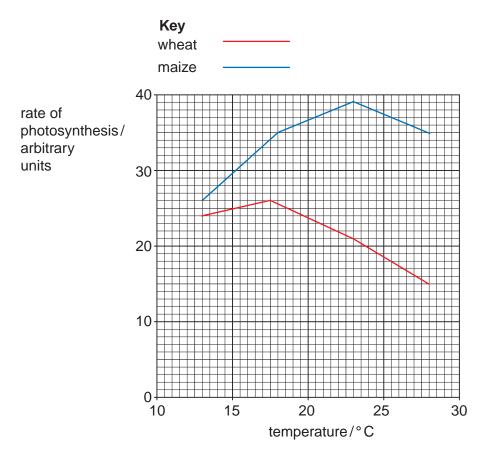


Fig. 4.2

With reference to Fig. 4.2:

(i)	compare the effect of temperature on the rates of photosynthesis of wheat ar maize	nd
		2]

			ates of photosyr			
•						
•						
•						
•						
						[3]
Carec						
JE160	al grains are a major co	omponent of	the human diet.			
		-		samples of	grains of w	vheat,
Table	al grains are a major co 4.1 shows some of the rice and maize.	-		samples of	grains of w	vheat,
Table	4.1 shows some of the	-	ontents of 100 g	samples of	grains of w	vheat,
Гablе	4.1 shows some of the	he nutrient c	ontents of 100 g	samples of	grains of w	vheat,
Гablе	4.1 shows some of the	he nutrient o	ontents of 100 g		grains of w	vheat,
Гablе	4.1 shows some of the rice and maize.	Table wheat	ontents of 100 g 4.1 white rice	maize	grains of w	vheat,
Гablе	4.1 shows some of the rice and maize.	Table wheat	ontents of 100 g 4.1 white rice 7.5	maize 8.9	grains of w	vheat,
Гablе	4.1 shows some of the rice and maize. protein / g fat / g	Table wheat 12.3 2.0	white rice 7.5 2.8	maize 8.9 4.7	grains of w	vheat,
Гablе	4.1 shows some of the rice and maize. protein / g fat / g carbohydrate / g	Table wheat 12.3 2.0 75.0	white rice 7.5 2.8 77.0	maize 8.9 4.7 74.0	grains of w	vheat,
Table	4.1 shows some of the rice and maize. protein / g fat / g carbohydrate / g fibre / g	Table wheat 12.3 2.0 75.0 2.3	vhite rice 7.5 2.8 77.0 0.9	8.9 4.7 74.0 2.0	grains of w	vheat,
Table	4.1 shows some of the rice and maize. protein / g fat / g carbohydrate / g fibre / g calcium / mg	Table wheat 12.3 2.0 75.0 2.3 34.0	vhite rice 7.5 2.8 77.0 0.9 28.0	maize 8.9 4.7 74.0 2.0 7.0	grains of w	vheat,
Table white	4.1 shows some of the rice and maize. protein / g fat / g carbohydrate / g fibre / g calcium / mg iron / mg	Table wheat 12.3 2.0 75.0 2.3 34.0 5.4 2.0	7.5 2.8 77.0 0.9 28.0 1.6 6.0	maize 8.9 4.7 74.0 2.0 7.0 2.7 35.0		

(ii)	State, giving a reason, which type of grain would be beneficial for a persanaemia.
	[2]
	•

[Total: 14]

www.PataCambridge.com 5 (a) The steps involved in a method of production of human insulin by gene technological listed in Table 5.1.

The steps are **not** listed in the correct order.

Table 5.1

step	description
Α	DNA coding for human insulin inserted into cut plasmid vector
В	genetically modified bacteria identified
С	mRNA for human insulin isolated in β cells
D	plasmid vector inserted into bacterium
E	genetically modified bacteria cloned
F	DNA for human insulin cloned
G	human insulin harvested
Н	cDNA coding for human insulin synthesised

(i) Complete Table 5.2 to show the steps in the correct order.

Two of the steps have been done for you.

Table 5.2

correct order	letter of step
1	С
2	
3	
4	
5	D
6	
7	
8	

1	[<i>1</i>]	
1	4	
-		

(")	Name the enzymes responsible for the following steps:
	step A

(b)	Explain two advantages of treating diabetes with human insulin produced by technology rather than using insulin from animals.	Bridge
		G.COM
	[2]	

(a) Fig. 6.1 outlines anaerobic respiration in yeast cells. 6

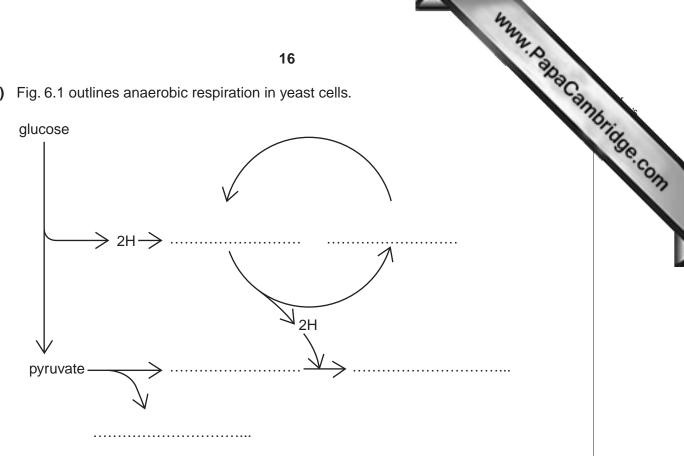


Fig. 6.1

Complete Fig. 6.1 by writing in the missing compounds.

[5]

(b)	Describe respiration		respiration	in	mammalian	cells	differs	from	anaerobic

(c)	Explain why anaerobic respiration results in a small yield of ATP compared with respiration.	Bridge.com
		age
		OW
	[3]	
	[Total: 11]	

www.PapaCambridge.com 7 (a) Table 7.1 shows the effect of several events on the blood concentration of 3 insulin and glucagon in a healthy person.

Complete the table using the words increase, decrease or no effect.

The first row has been done for you.

Table 7.1

	initial effect of	event on blood c	oncentration of
event	glucose	insulin	glucagon
meal containing sucrose	increase	increase	decrease
meal containing only protein			
fasting			
exercising			
meal containing starch			

[4]

(b)	The concentration of glucose in the blood is controlled by the hormones insulin and glucagon.
	Describe the part played by glucagon in the control of glucose in the blood.
	[3]
	[Total: 7]

The following passage is a summary of the main principles of artificial selection. 8 Some of the words have been omitted.

Write the most appropriate term in each space.

www.PapaCambridge.com When humans purposefully apply selection to members of a population, the process is known as artificial selection. For example, people have tried to 'improve' their cattle for thousands of years. It is desirable for a dairy farmer to have cows with a high milk yield. The farmer will select cows with high milk yields and mate them with bulls whose have high milk yields. Some of the conferring high milk yield are passed onto their female offspring who are then chosen for breeding. This will continue for Artificial selection can have disadvantages such as depression which can lead to infertility. [5]

[Total: 5]

9	(a)	When a part of the body is damaged or injured, action potentials are sent to the at the brain responsible for the perception of pain.
		Explain how the structure of a sensory neurone can enable the action potentials to reach the brain very quickly.

 	 	[2]

(b) The pain associated with osteoarthritis can be relieved using transcutaneous electrical nerve stimulation (TENS). It uses electrical impulses to stimulate the nerve endings at, or near, the site of the pain. Self-adhesive electrodes are stuck on the skin and attached to a small, portable power unit.

Fig. 9.1 shows a TENS machine in use.



Fig. 9.1

It is thought that TENS triggers the release of natural painkillers called endorphins, which are similar in shape to painkilling drugs such as morphine.



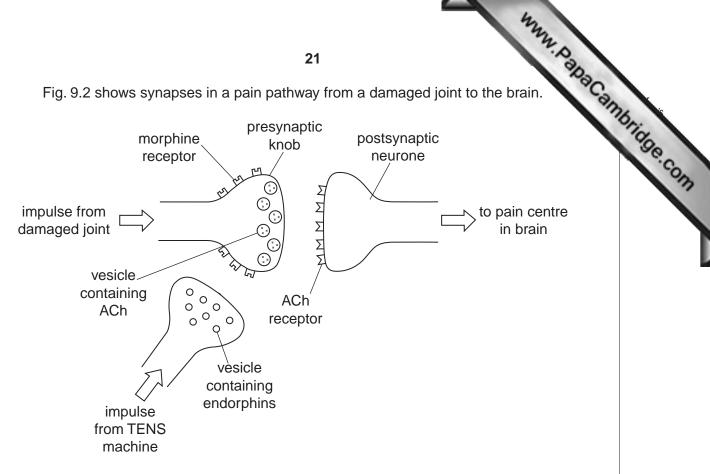


Fig. 9.2

(1)	Suggest how endorphins may act to reduce pain.
	[4]
(ii)	Suggest advantages of using TENS for pain relief instead of more conventional treatment.
	[2]

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Section B

Answer **one** question.

10	(a)	Explain how the palisade mesophyll cells of a leaf are adapted for photosynthesis. [7]
	(b)	Describe the structure of photosystems and explain how a photosystem functions in <i>cyclic</i> photophosphorylation. [8]
		[Total: 15]
11	(a)	Explain how changes in the nucleotide sequence of DNA may affect the amino acid sequence in a protein. [8]
	(b)	Explain how the allele for haemophilia may be passed from a man to his grandchildren. You may use genetic diagrams to support your answer. [7]
		[Total: 15]
•••••		

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