

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced GCE

HUMAN BIOLOGY 2866

Energy, Control and Reproduction

Tuesday 21 JUNE 2005 Morning 1 hour 30 minutes

Candidates answer on the question paper.
Additional materials:
Electronic calculator
Ruler (cm/mm)

Candidate Name	Centre Number	Candidate Number	

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer all the questions.
- Write your answers, in black or blue ink, in the spaces provided on the question paper.
- Read each question carefully before starting your answer.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.

FOR EX	FOR EXAMINER'S USE	
Qu.	Max.	Mark
1	11	
2	19	
3	20	
4	12	
5	16	
6	12	
TOTAL	90	

This question paper consists of 17 printed pages and 3 blank pages.

Answer all the questions.

1	(a)	The health of the eye is a convenient indication of the health of the body.
		Fig. 1.1 shows a longitudinal section through the human eye.
		An image has been removed due to third party copyright restrictions Details: An image showing a longitudinal section through the human eye
		Fig. 1.1
		(i) Name the structures labelled A and B. A
		В[2]
		(ii) Describe the function of the choroid layer.
		[2]

	Sug	gest the likely effect on the	retina of	
	(i)	severe long-term hypertens	sion (high blood pressure);	
				•••••
				•••••
				••••••
				[2]
	(ii)	vitamin A deficiency.		
				••••••
				••••••
(c)		ight light was shone into a s ore and after this occurred.	tudent's eye. Fig. 1.2 shows the appearance of the	eye
		2 images have been	removed due to third party copyright	
			ractrictions	
	į		restrictions	
		2 images of	an eye, one with a dilated pupil	
		2 images of before		
	1		an eye, one with a dilated pupil	
	Exp		an eye, one with a dilated pupil	
	Exp		an eye, one with a dilated pupil	
	Expl		an eye, one with a dilated pupil	
	Exp		an eye, one with a dilated pupil	
	Exp		an eye, one with a dilated pupil	
	Expl	before ain how the eye responds to	an eye, one with a dilated pupil	[3]

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[Turn over

		4
2	A complete	outerised axial tomography (CT) scan can help with the diagnosis and treatment of ijuries.
	Fig. 2.1	shows a CT scan of the human brain.
		An image has been removed due to third party copyright restrictions
		Details:
		An image of a computerised axial tomography (CT) scan
		Fig. 2.1
	(a) (i)	Name the structures A to C. A B
		C[3]
	(ii)	Outline how a CT scan works and how it could be used in the assessment of brain damage.

(b)	Describe how brain activity may be modified by diamorphine (heroin), in order to relieve severe pain in cancer patients.
	[3]

Question 2 is continued on page 6

[Total: 19]

I	Explain, with reference to heroin and alcohol, the difference between psychological
	and physical dependency.
	[8

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) Explain the ii	neaning of the	term <i>gei</i>	netic cau	ise.		
) Fig. 3.1 show	s the karyoty	oe of an i	ndividua	ıl with Tu	ırner's synd	drome.
	88	KX	XX	አለ	XΧ	
	1	2	3	4	5	
	አአ	አለ	۲X	XX	ΧX	
	6	7	8	9	10	
	XX	Х	Χŏ	ለ ለ	λĸ	
	11	12	13	14	15	
	к×	××	XX	x×	ХX	
	16	17	18	19	20	
	××	x x		X		
	21	22		X		
		F	Fig. 3.1			
(i) Explain v	why this indivi	dual has	Turner's	syndror	ne.	

Comment on the fertility of this individual giving reasons for your answer.	
	••
	••
[9	₹1

Question 3 is continued on page 10.

- (c) One of the most common causes of infertility in women is infection with genital chlamydia, caused by the bacterium Chlamydia trachomatis .
 - Chlamydia is the most common sexually transmitted disease in the United Kingdom.
 - Chlamydia may cause pelvic inflammatory disease (PID).
 - One in five women who develop PID become infertile.
 - A large proportion of infections with Chlamydia trachomatis remain undiagnosed.

Fig. 3.2 shows the number of cases of genital chlamydia, diagnosed at clinics in the United Kingdom, from 1995 – 2001.

A graph has been removed due to third party copyright restrictions Details: A graph showing the number of cases of genital chlamydia between 1995 and 2001

Fig. 3.2

(i)	Suggest a suitable treatment for infection with C. trachomatis. Give a reason for your answer.
	[2]
ii)	Suggest why the data for men are also included in the number of diagnoses of genital chlamydia shown in Fig. 3.2.
	[1]

(iii)	Describe and suggest an explanation for the trend shown by the data in Fig. 3.2.
	[4]
(iv)	What may this trend suggest about the spread of other sexually transmitted diseases such as HIV?
	[2]
(d) (i)	Women who are infertile may choose IVF treatment. On average, only 15% of IVF treatment cycles for female infertility are successful.
	Describe two ethical problems arising from this statistic.
	1
	2
	[2]
(ii)	State two other infertility treatments available to women.
	1
	2[2]
	[Total: 20]

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 	An image has been removed due to third party copyright restrictions	
 	Details:	
į	An electron micrograph of a mitochondrion	
i		
!		
j		
	Fig. 4.1	
(a) (i)	Name the structures A to C.	
	Α	
	В	
	C	
(ii)	Calculate the width of the mitochondrion between the points marked Show your working.	X and

Answer = μ m [2]

(b) Fig. 4.2 shows a diagram of the section of the mitochondrion marked ${\bf Z}$ in Fig. 4.1.

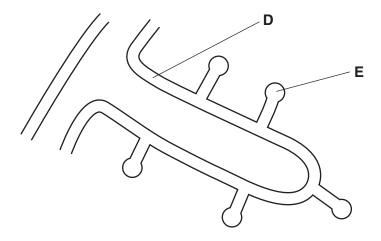


Fig. 4.2

	Describe the roles of the structures marked ${\bf D}$ and ${\bf E}$ in the formation of ATP during oxidative phosphorylation.
	[5]
)	Describe the role of oxygen in oxidative phosphorylation.
	[2]
	[Total: 12]

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- 5 The energy to maintain metabolism is carried in the cells as ATP.
 - (a) Fig. 5.1 shows the diagrammatic structure of ATP.

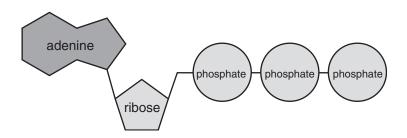


Fig. 5.1

- (i) Draw a ring on Fig. 5.1, around the part of the ATP molecule that could be described as a nucleotide. [1]
- (ii) ATP is described as the main energy carrier in the cell.

	State two metabolic processes in humans that require the use of ATP.
	1
	2
	[2]
(iii)	Explain why green plants are necessary to provide humans with enough ATP for their metabolic processes.
	[3]

- (b) (i) When one molecule of glucose is used as a respiratory substrate in aerobic respiration, it can yield 32 molecules of ATP per molecule of glucose.
 - Each molecule of ATP yields 30.6 kJ of energy when it is hydrolysed to ADP during metabolic processes.
 - When one molecule of glucose is oxidised fully, it yields 2 880 kJ of energy.

Calculate the percentage efficiency of aerobic respiration when one molecule of glucose is used as a respiratory substrate. Show your working.

		Answer =% [2]
	(ii)	Suggest what happens to the energy in the human body which is not incorporated into the ATP molecule.
		[1]
(c)		recent years, some athletes have been banned from competition for using cceptable methods to enhance performance.
	(i)	Describe two of these methods and for each, outline how it enhances performance.
		1
		2
		[4]

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(11)	enhance athletic performance.
	[3
	[Total: 16
A thoro effective	ugh understanding of human gametogenesis is necessary if advice on fertility is to be e.
	this question, one mark is available for the quality of use and organisation of scientific ms.
De	escribe the process of oogenesis in the human female.

	[8]
	Quality of Written Communication [1]
	Quality of Whiteh Communication [1]
(b)	Explain the importance of meiosis in the life cycle of a human.
(b)	

END OF QUESTION PAPER

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Copyright Acknowledgments:

- Fig. 1.1 Atlas of Histology Freeman and Bracegirdle © 1966 2nd Edition 1967 Heinemann Educational Books Ltd
- Fig. 3.2 HIV/STI Division PHLS Communicable Disease Surveillance Centre 5th June 2002
- Fig. 4.1 atropos.as.arizona.edu/aiz/teaching/ a204/lecture21.html

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