

OXFORD CAMBRIDGE AND RSA EXAMINATIONS Advanced GCE

BIOLOGY

2804/01

Central Concepts

Monday

17 JUNE 2002

Morning

1 hour 30 minutes

Candidates answer on the question paper. Additional materials: Electronic calculator

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 blue or black ink, in the spaces 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 EXAMINER'S USE						
Qu.	Max.	Mark				
1	15					
2	15					
3	16					
4	14					
5	16					
6	14					
TOTAL	90					

Answer all questions.

1 Fig. 1.1 shows the structure of ATP.

$$X = \begin{pmatrix} NH_2 \\ N \end{pmatrix} \begin{pmatrix} N \\ N \end{pmatrix} \begin{pmatrix} N \\ N \end{pmatrix} \begin{pmatrix} CH_2 \\ O \end{pmatrix} \begin{pmatrix} P \\ P \end{pmatrix} \begin{pmatrix} P$$

Fig. 1.1

(a)	(i)	Name the nitrogenous base labelled X on the diagram.
		[1]
	(ii)	Name the sugar labelled Y on the diagram.
		[1]
ATF	o is o	ften described as the 'universal energy currency of cells'.
(b)	Exp	plain what is meant by the term 'universal energy currency of cells'.
	••••	
		[4]
(c)	Lis	t three roles of ATP in plant cells.
		· [3]

Most of the ATP is produced by a process known as oxidative phosphorylation within the mitochondrion.

(d)

(i)	State the exact location, within the mitochondrion, of this process.
	[1]
ii)	Describe the main features of this process.
•	······································
	[5]
	[Total : 15]

2 Fig. 2.1 shows an apparatus used to investigate the effect of light intensity on photosynthesis.

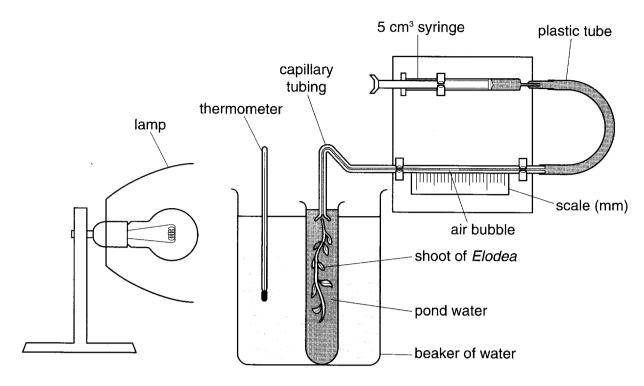
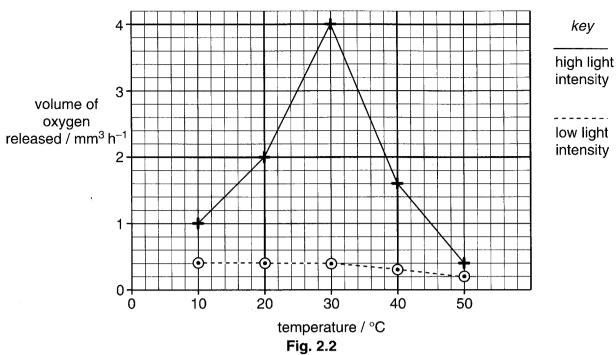


Fig. 2.1

Describe now the investigation would be carried out.
[6]

A student using apparatus similar to the above investigated the effect of two environmental factors on the rate of photosynthesis. Fig. 2.2 shows the results from one of the experiments.



(b) With reference to Fig. 2.2,

	(1)	describe the results obtained for the two different light intensities,
		high light intensity
		[2]
		low light intensity
		[2]
	(ii)	explain the differences in the results.
	(,	
		[4]
(c)	Sug	ggest why the volume of oxygen released does not give the true rate of photosynthesis.
		[1]
		[Total : 15]
		[10141: 10]

3 (a)	Explai	n the te	rm <i>pri</i>	imary	succes	ssion.								
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			••••••				• • • • • • • • • • • • • • • • • • • •		*********						[2]
F	ig. (3.1 shc	ws a pr	imary	succ	ession	in a t	empera	te clima	ate.					
X	(rep	resent	s an ex	ample	of de	eflected	d succ	cession.							
											gras	sland			
									X	/					
co (bar	re ro	itial ions ock or une)	•	7	nens, osses		r	grasse: nerbaced plants	ous	•	>	nali rubs			nixed odland
			•				Fic	j. 3.1							
(b) E	Explain	the role	e of pi	oneer	· plants		ıccessio	n on a	hare	rock	or sa	nd di	ıne	
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(c)		··········	t bourd	nfl n = 4.							•••••	• • • • • • • • • • • • • • • • • • • •	•••••	••••••	[3]
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	••												•••••		[2]
(d)) E	xplain	how bio	mass	chan	ges du	ring a	a primar	y succe	essio	n.				
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(e)	Using timber production in temperate countries as an example, explain how ecosystems can be managed in a sustainable way. (In this question, 1 mark is available for the quality of written communication.)
	[6]

QWC [1]

[Total : 16]

[Turn over

			8	
4		ain breeds of domestic fowl dominant. The allele C^B wh omozygous produces white	the gene determining feather conen homozygous produces blace feathers.	olour has two alleles that ck feathers; the allele C^w
	The go homozy feathers	rgodo produces straight lea	so has two codominant allele thers; the allele A ^F when homo	es. The allele A ^s when zygous produces frizzled
	The he	terozygote for feather coloui . The two genes involved are	r is grey and the heterozygote for not sex linked.	or feather shape is mildly
	(a) (i)	State what is meant by ea	ch of the following terms:	
		codominant		
	(ii)	Draw a genetic diagram t frizzled hen and a white, fr	to show the results of a cross izzled cockerel.	between a grey, mildly
		parental phenotypes	grey, mildly frizzled hen	white, frizzled cockerel
		parental genotypes		
		gametes		

offspring genotypes	
offspring phenotypes	
phenotypic ratio	[5]

9 A breeder wishes to obtain domestic fowls which are all grey in colour and mildly frizzled. (b) List the two crosses that will produce such a population.[2] (c) Fig. 4.1 shows a diploid cell with two pairs of chromosomes. Complete the diagram to show the possible combinations of these chromosomes in the four gametes produced by meiosis. diploid cell (2n=4)gametes (n=2)Fig. 4.1 (d) List three sources of variation in the process of meiosis.

[Total: 14]

3.

5 (a) Explain what is meant by the terms:

natural selection
· · · · · · · · · · · · · · · · · · ·
[5]
species
[2]

An example of natural selection is shown by plant species that can grow on contaminated soil around old mine workings. A species of wind pollinated grass, *Agrostis capillaris*, has a copper tolerant form which is abundant on soils from old mine workings.

A study of this grass was made along a transect which crossed a copper mine. Fig. 5.1 is a profile of the area around the old mine workings showing where samples were taken along the transect.

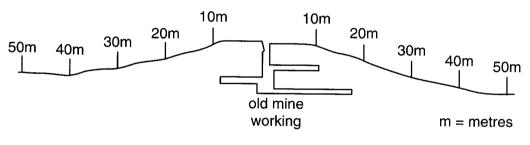


Fig. 5.1

Seeds were collected from plants at 10 metre intervals and germinated under laboratory conditions. From each batch, two groups of twenty seedlings were selected. The seedlings were planted in a medium containing all the minerals required for healthy growth. Batch **A** was watered with a dilute solution of copper ions and batch **B** with distilled water. After two weeks the mean height of each batch of surviving seedlings was determined. Table 5.1 shows the results.

Table 5.1

distance from mine working that seeds were collected/m	mean height of surviving seedlings/cm					
	bate	ch A	batch B			
10	3.9	(20)	4.0	(20)		
20	3.8	(20)	4.1	(20)		
30	4.0	(12)	4.9	(20)		
40	3.7	(4)	4.8	(20)		
50	3.8	(2)	4.9	(20)		

figures in brackets () indicate the numbers of seedlings that survived after two weeks

(b)	(i)	Describe the results shown in Table 5.1.
		[4]
,	(ii)	Explain why seedlings collected closer to the mine grow successfully in a dilute solution of copper ions.
		[3]
(iii)	Suggest why some copper tolerant plants exist at least 50 metres away from the mine area.
		[2]

[Total : 16]

One example of chemical communication in flowering plants is the mobilisation of food reserves in the germination of cereal grains, such as wheat and barley. Fig. 6.1 shows some of the principal features associated with food reserve mobilisation in a cereal grain.

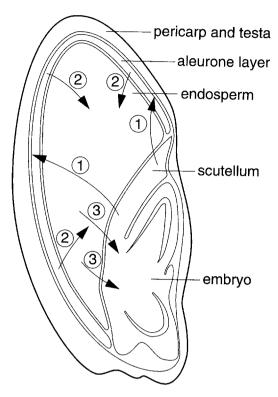


Fig. 6.1

(a)	With reference to Fig. 6.1, describe the processes indicated by the numbered arrows on the diagram.
	1
	2
	3
	[6]

Mammals also use chemical communication systems. These systems allow them to respond to changes in the internal and external environment.

(b)	Compare, using named examples, the features of the chemical communication systems of flowering plants and mammals. (In this question, 1 mark is available for the quality of written communication.)
	· · · · · · · · · · · · · · · · · · ·
	·
	[7]

QWC [1]

[Total: 14]

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