OCR
RECOGNISING ACHIEVEMENT

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	

This question paper consists of 14 printed page and 2 blank pages.

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For Examiner's Use

Answer **all** questions.

1 Fig. 1.1 shows the structure of ATP.

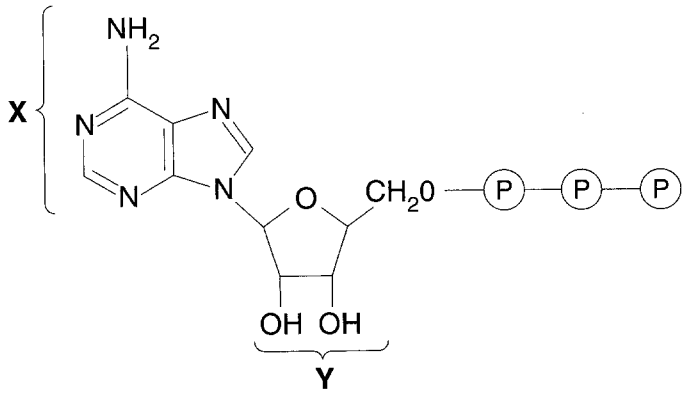

Fig. 1.1

(a) (i) Name the nitrogenous base labelled **X** on the diagram.

.....[1]

(ii) Name the sugar labelled **Y** on the diagram.

.....[1]

ATP is often described as the 'universal energy currency of cells'.

(b) Explain what is meant by the term 'universal energy currency of cells'.

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.....[4]

(c) List **three** roles of ATP in **plant cells**.

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.....[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.

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[Total : 15]

[Turn over

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

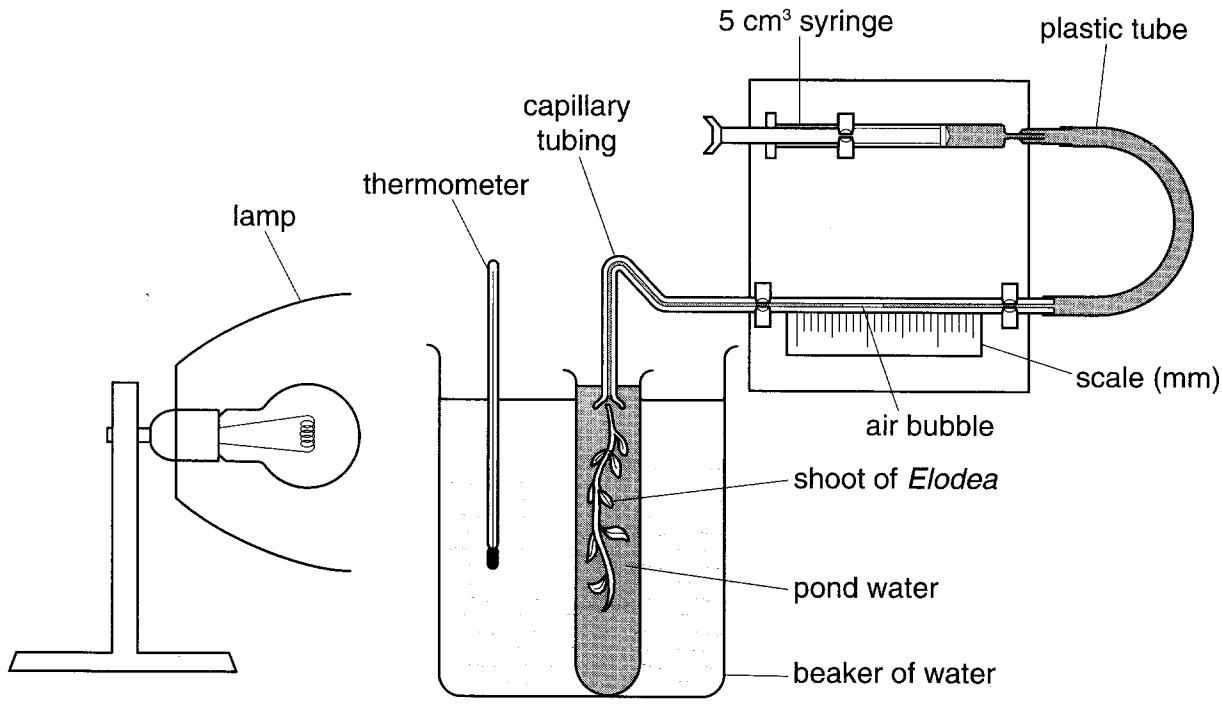

Fig. 2.1

(a) Describe how the investigation would be carried out.

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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.

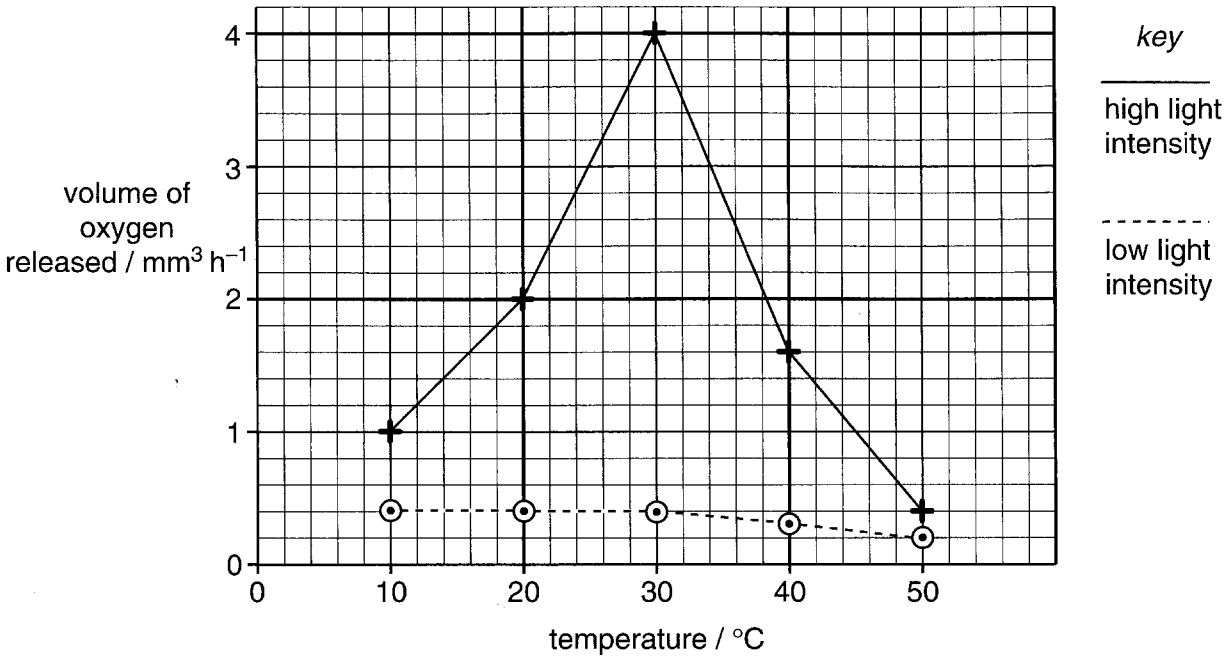

Fig. 2.2

(b) With reference to Fig. 2.2,

(i) 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.

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.....[4]

(c) Suggest why the volume of oxygen released does not give the true rate of photosynthesis.

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.....[1]

[Total : 15]

[Turn over

For Examiner's Use

3 **(a)** Explain the term *primary succession*.

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.....[2]

Fig. 3.1 shows a primary succession in a temperate climate.

X represents an example of deflected succession.

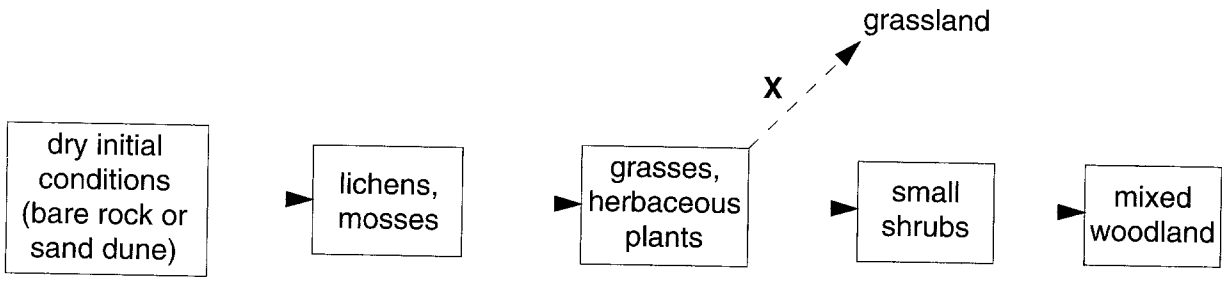

Fig. 3.1

(b) Explain the role of pioneer plants in succession on a bare rock or sand dune.

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.....[3]

(c) Suggest how deflected succession **X** could be caused.

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.....[2]

(d) Explain how biomass changes during a primary succession.

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.....[2]

For Examiner's Use

(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.)*

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QWC [1]

[Total : 16]

[Turn over

For Examiner's Use

4 In certain breeds of domestic fowl the gene determining feather colour has two alleles that are codominant. The allele $\mathbf{C^B}$ when homozygous produces black feathers; the allele $\mathbf{C^W}$ when homozygous produces white feathers.

The gene for feather shape also has two codominant alleles. The allele $\mathbf{A^S}$ when homozygous produces straight feathers; the allele $\mathbf{A^F}$ when homozygous produces frizzled feathers.

The heterozygote for feather colour is grey and the heterozygote for feather shape is mildly frizzled. The two genes involved are **not** sex linked.

(a) (i) State what is meant by each of the following terms:

codominant .....

.....

heterozygote .....

.....[2]

(ii) Draw a genetic diagram to show the results of a cross between a grey, mildly frizzled hen and a white, frizzled cockerel.

parental phenotypes	grey, mildly frizzled hen	white, frizzled cockerel
parental genotypes	.....	.....
gametes	.....	.....

offspring genotypes .....

offspring phenotypes .....

phenotypic ratio .....[5]

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.

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.....[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. [2]

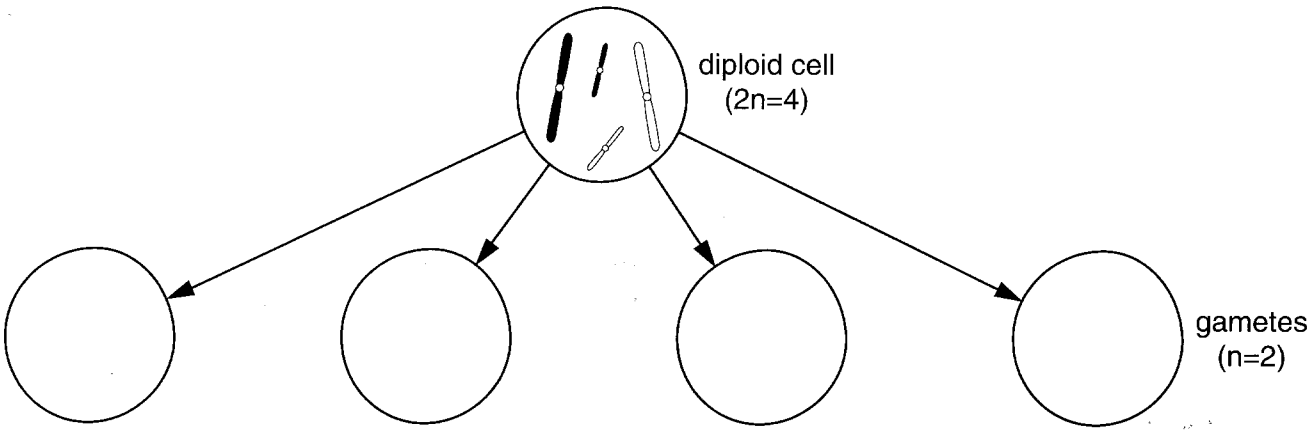

Fig. 4.1

(d) List **three** sources of variation in the process of meiosis.

1. .....

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2. .....

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3. .....

.....[3]

[Total : 14]

[Turn over

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

natural selection .....

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.....[5]

species .....

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.....[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.

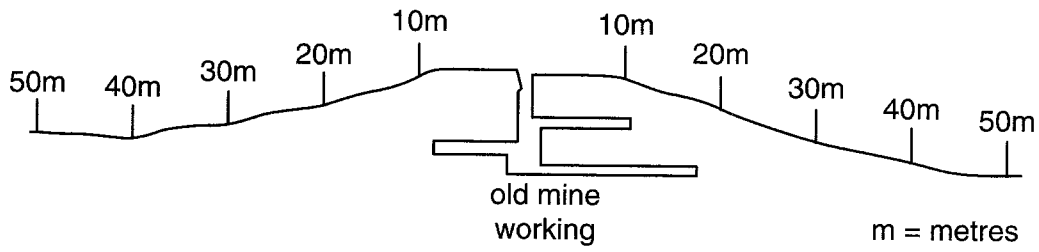

Fig. 5.1

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.

For Examiner's Use

Table 5.1

distance from mine working that seeds were collected / m	mean height of surviving seedlings / cm	
	batch **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.

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.....[4]

(ii) Explain why seedlings collected closer to the mine grow successfully in a dilute solution of copper ions.

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.....[3]

(iii) Suggest why some copper tolerant plants exist at least 50 metres away from the mine area.

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.....[2]

[Total : 16]

[Turn over

6 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.

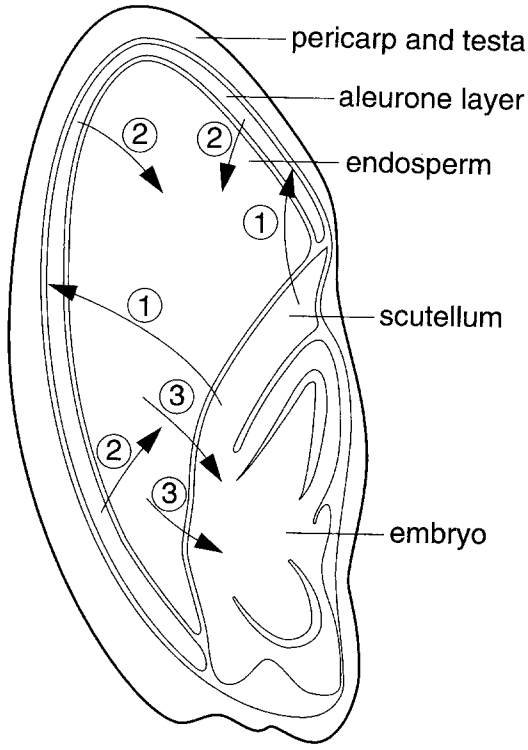

Fig. 6.1

(a) With reference to Fig. 6.1, describe the processes indicated by the numbered arrows on the diagram.

1. .....

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2. .....

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3. .....

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.....[6]

For Examiner's Use

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.)*

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QWC [1]

[Total : 14]

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