OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
Advanced Subsidiary GCE

BIOLOGY
Biology Foundation

2801

Monday **5 JUNE 2006** Morning 1 hour

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

Candidate Name

Centre Number

Candidate Number

TIME 1 hour

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 provided on the question paper.
- Read the questions carefully before starting your answer.
- Pencils may be used for graph or diagrams only.
- Do not write in the bar code. Do not write in the grey area between the pages.
- **DO NOT** WRITE IN THE AREA **OUTSIDE** THE BOX BORDERING EACH PAGE. ANY WRITING IN THIS AREA WILL NOT BE MARKED.

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	9	
2	10	
3	16	
4	8	
5	8	
6	9	
TOTAL	60	

This question paper consists of 12 printed pages.

[Turn over

Answer **all** the questions.

1 **(a)** State what ecologists mean by the following terms:

(i) *habitat*

.....[1]

(ii) *niche*

.....[1]

(iii) *ecosystem*.

.....

.....[1]

(b) Two more terms commonly used by ecologists are *population* and *community*.

State the difference between a *population* and a *community*.

.....

.....[1]

(c) Fig. 1.1 shows the transfer of energy through a food chain in a wood.

The figures represent the energy in the levels of the ecosystem in MJ m^{-2} y^{-1}.

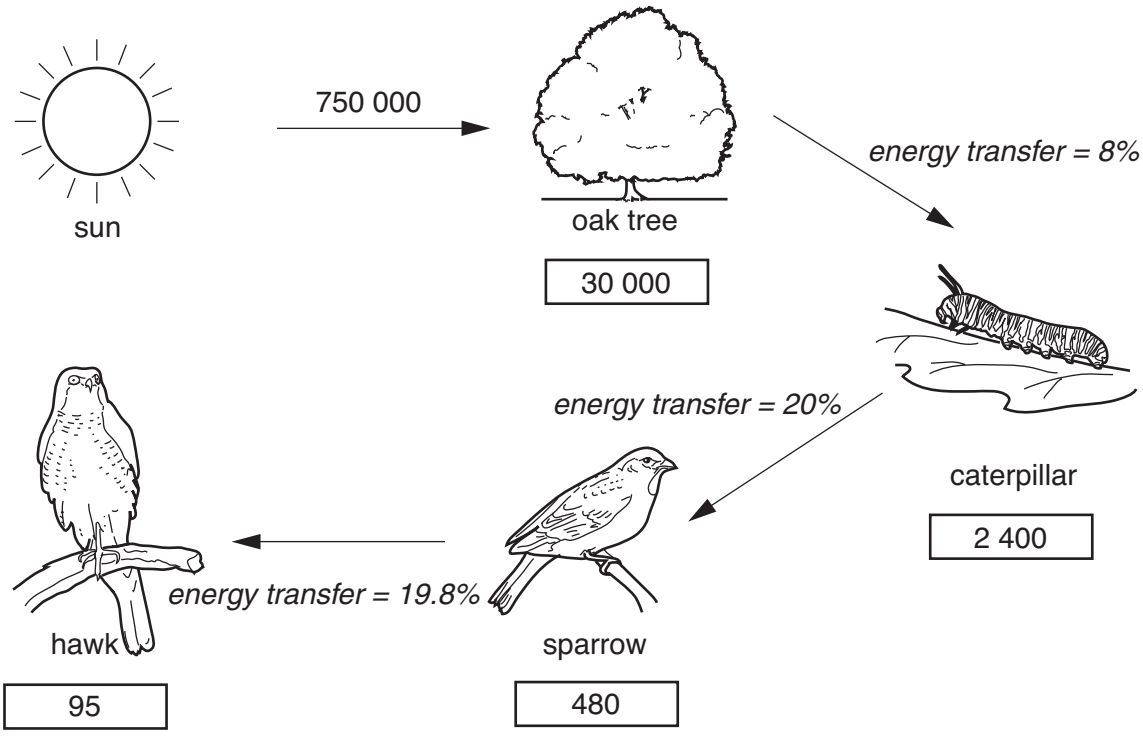


Fig. 1.1

Fig. 1.2 shows what happens to the food available to caterpillars in the food chain shown in Fig. 1.1.

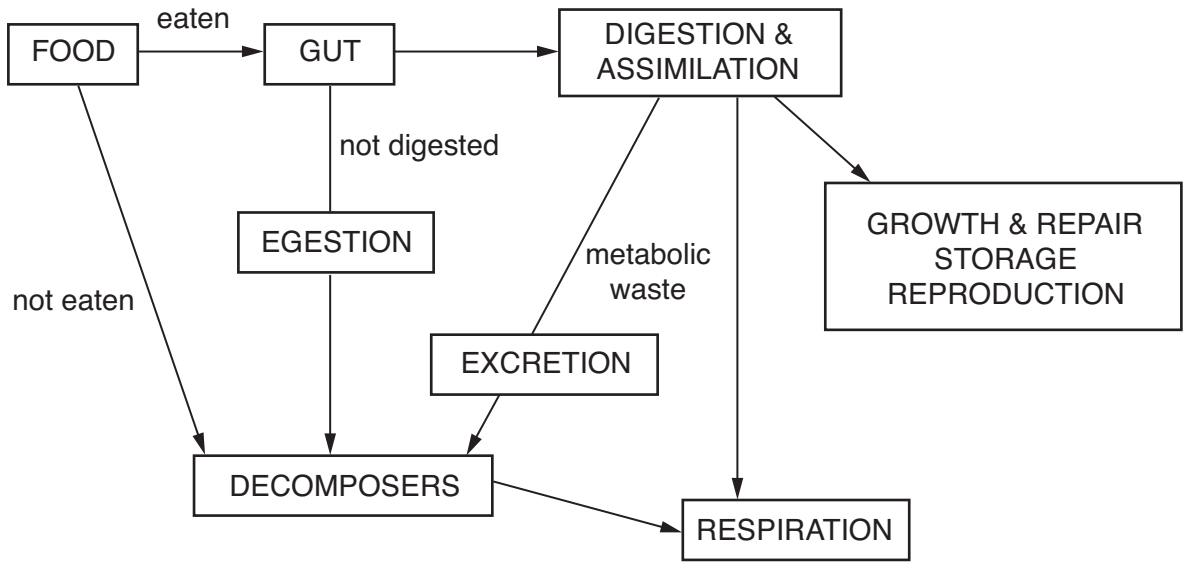


Fig. 1.2

(i) Fig. 1.1 shows that each trophic level has less energy flowing through it than the previous trophic level.

Use the information in Fig. 1.2 to explain why this is the case.

.....

.....

.....

.....

.....

.....[3]

(ii) Explain the differences in the **percentage** of energy transferred between the trophic levels shown in Fig. 1.1.

.....

.....

.....

.....[2]

[Total: 9]

2 **(a)** Table 2.1 shows information about tests that identify three different types of biological molecule.

Complete the table to show the names of the types of molecule that are tested, the reagents used and the results obtained.

Table 2.1

type of molecule tested	reagents used	positive result	negative result
protein	....	....	blue solution
.....	alcohol and water	white emulsion	clear liquid
starch	....	.....	yellow solution

[5]

(b) A student followed a procedure to find the concentration of reducing sugars in a fruit juice. The first part of the method used was as follows:

- A range of glucose solutions of different concentrations was made up, starting with a 20 g dm^{-3} glucose solution.
- Each solution was boiled with excess Benedict's solution.
- When there was no further change in colour, the liquid was cooled and filtered.
- The absorbance of the liquid was measured with a colorimeter. (A colorimeter measures the amount of light that is absorbed by a coloured solution.)

The student's results are shown in Fig. 2.1.

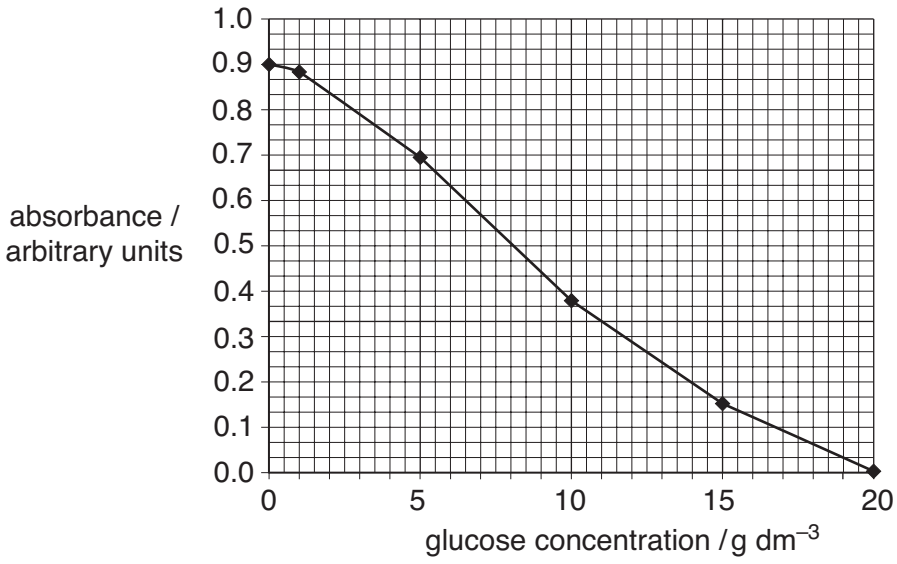


Fig. 2.1

(i) State **two** precautions that the student should have taken during the procedure to ensure that the results give a valid comparison between the different glucose solutions.

1 .....

.....

2 .....

.....[2]

(ii) In the second part of the method, the student tested the fruit juice. The absorbance reading obtained was 0.60 arbitrary units.

Use Fig. 2.1 to determine the reducing sugar concentration of the fruit juice.

..... g dm^{-3} [1]

(iii) This procedure does **not** test for non-reducing sugars, such as sucrose.

How should the procedure be altered to determine the concentration of **non-reducing sugar** in the fruit juice?

.....

.....

.....

.....

.....

.....[2]

[Total: 10]

3 Fig. 3.1 is a drawing of an alveolus together with an associated blood capillary.

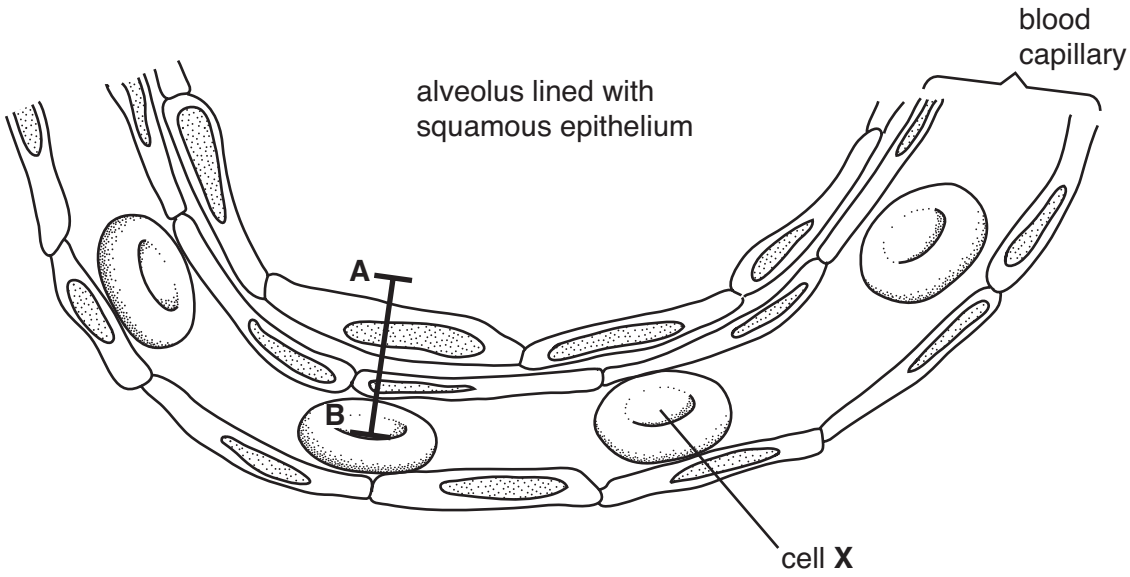


Fig. 3.1

(a) (i) State a feature, **visible in Fig. 3.1**, that shows that squamous epithelial cells are eukaryotic.

.....[1]

(ii) State why squamous epithelium is described as a tissue.

.....

.....[1]

(iii) State **two** features of a gas exchange surface, such as the lining of the alveolus.

1 .....

2 .....[2]

(b) Oxygen diffuses from the alveolus into cell **X**. Cell **X** carries oxygen around the body in the blood stream.

(i) **Name** the compound inside cell **X** that combines with oxygen.

.....[1]

(ii) **Name** the metal ion required for the formation of the compound in **(b)(i)**.

.....[1]

(c) The line **AB** in Fig. 3.1 represents an actual distance of 1.5 µm.

Calculate the magnification of the drawing. Show your working.

Answer = x ..... [2]

(d) In this question, one mark is available for the quality of spelling, punctuation and grammar.

When passing from the alveolus to cell **X**, oxygen diffuses through cell membranes.

Describe how other molecules or ions cross a plasma (cell surface) membrane by **active transport** and **facilitated diffusion**.

You should refer to the structure of the plasma (cell surface) membrane in your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[7]

Quality of Written Communication [1]

[Total: 16]

[Turn over

4 An experiment was carried out in which the enzyme lipase was used to hydrolyse a triglyceride. The pH of the reaction mixture was recorded at regular intervals during the experiment. The results are shown in Table 4.1.

Table 4.1

time / min	pH
0	7.0
2	6.2
4	5.6
6	5.1
8	4.7
10	4.6
12	4.6
14	4.6

(a) (i) State what is meant by the term *hydrolysis*.

.....

.....[1]

(ii) Explain why the pH falls during the reaction.

.....

.....

.....[2]

(iii) After 14 minutes, the mixture was analysed and unreacted triglyceride was found to be present. No inhibitor was added to the reaction mixture.

Explain why the reaction had stopped after 10 minutes.

.....

.....

.....

.....

.....[2]

(b) Explain how a **non-competitive** inhibitor affects the rate of an enzyme-catalysed reaction.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 8]

5 Complete the following passage by inserting the most suitable terms in the blank spaces.

Mitosis is a type of nuclear division and can be observed using a light microscope.

In the first stage, known as ..... , the chromosomes become visible.

Each chromosome is seen as two chromatids joined at the

..... .

The nuclear ..... breaks down, a spindle is formed and the .....

..... line up at the equator.

During the stage known as ..... the chromatids separate, one of each pair moving to opposite ..... of the spindle.

Separate nuclei are formed. The cytoplasm is then shared between the daughter cells in a process known as ..... .

These two cells are ..... identical. [8]

[Total: 8]

6 During research into the mechanism of DNA replication, bacteria were grown on a medium containing nitrogen isotopes. The nitrogen isotopes used were 'heavy' nitrogen, ^{15}N, and 'light' nitrogen, ^{14}N. After growth, the bacterial DNA was isolated from the cells and spun in a centrifuge. The DNA settled in the centrifuge tube at a position that corresponded to its density, indicating the proportion of the different types of DNA present in the sample.

Bacteria were grown for many generations in a medium containing only the 'heavy' isotope of nitrogen, ^{15}N. This resulted in all the DNA molecules containing only ^{15}N. The result after centrifugation is shown in Fig. 6.1.

These bacteria were then grown in a medium containing only 'light' nitrogen, ^{14}N. After allowing time for the DNA to replicate once, the DNA was analysed as before. The result is shown in Fig. 6.2.

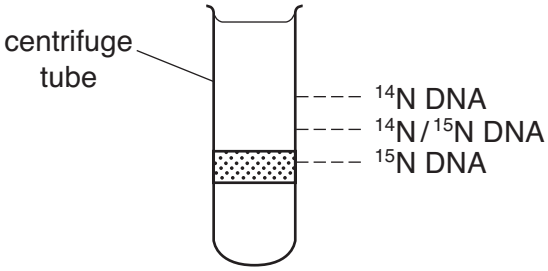


Fig. 6.1

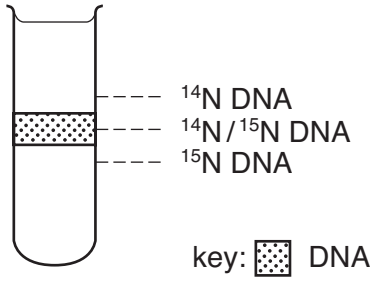


Fig. 6.2

(a) Explain how this information supports the semi-conservative hypothesis of DNA replication.

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

The bacteria were allowed to continue to grow in the 'light' nitrogen, ^{14}N, until the DNA had replicated once more. The DNA was analysed as before and the result is shown in Fig. 6.3.

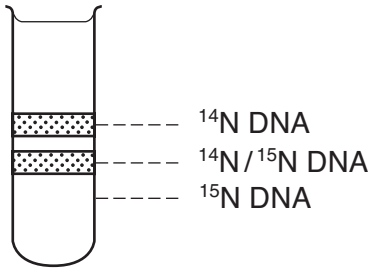


Fig. 6.3

Fig. 6.4 shows simple diagrams of DNA molecules, indicating the nitrogen content of each.

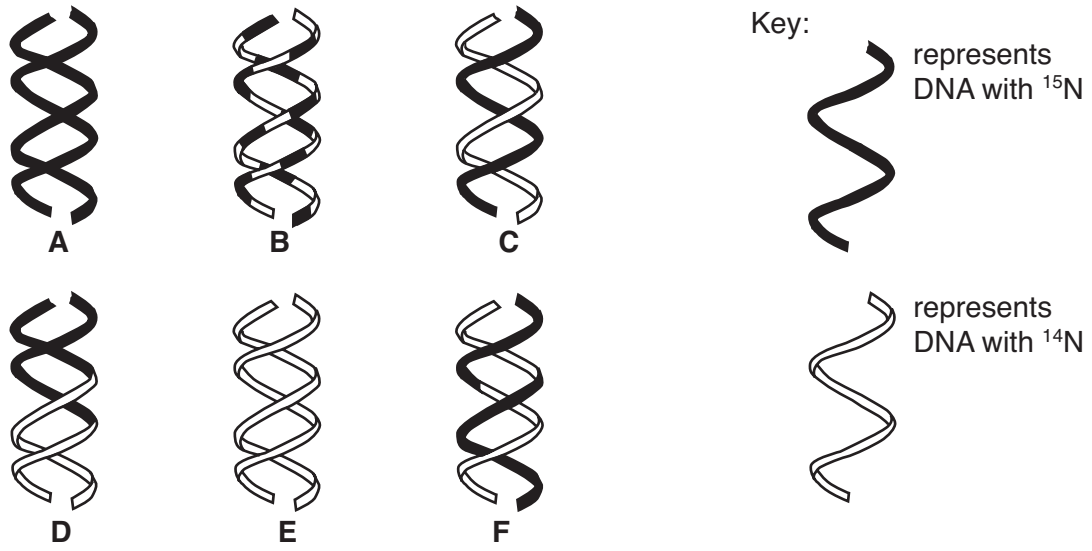


Fig. 6.4

(b) Select the letter or letters from Fig. 6.4 representing the bacterial DNA in Fig. 6.1, Fig. 6.2 and Fig. 6.3.

Fig. 6.1 .....

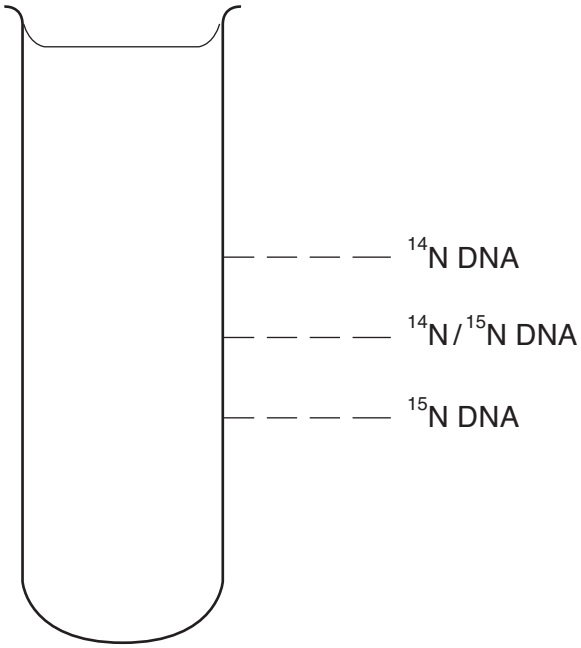
Fig. 6.2 .....

Fig. 6.3 .....[3]

Question 6 continues on the next page.

(c) The bacteria were allowed to continue to grow in the 'light' nitrogen, ^{14}N, until the DNA had replicated once more. The DNA molecules were analysed as before.

Complete the diagram to indicate the expected results showing the composition of these DNA molecules.



[2]

[Total: 9]

END OF QUESTION PAPER

.