

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**  
**Advanced Subsidiary GCE**

**BIOLOGY**

**2801**

Biology Foundation

Wednesday

**15 JANUARY 2003**

Afternoon

1 hour

Candidates answer on the question paper.

Additional materials:

Electronic calculator

Ruler (cm/mm)

Candidate Name	Centre Number	Candidate Number										
	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table>						<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table>					

**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 on the question paper.
- Read each question carefully before starting your answer.

**INFORMATION FOR CANDIDATES**

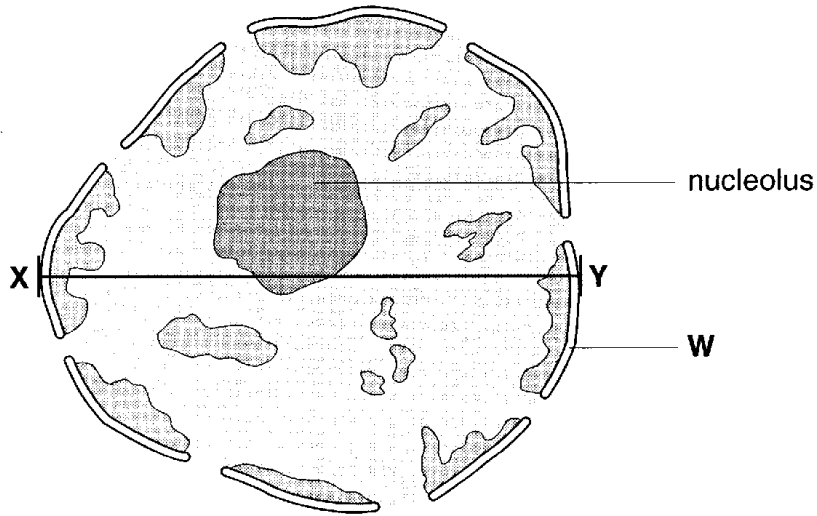
- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 60.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.

<b>FOR EXAMINER'S USE</b>		
<b>Qu.</b>	<b>Max.</b>	<b>Mark</b>
<b>1</b>	<b>8</b>	
<b>2</b>	<b>13</b>	
<b>3</b>	<b>15</b>	
<b>4</b>	<b>5</b>	
<b>5</b>	<b>10</b>	
<b>6</b>	<b>9</b>	
<b>TOTAL</b>	<b>60</b>	

**This question paper consists of 12 printed pages.**

Answer **all** the questions.

1 (a) Fig. 1.1 is a drawing of an animal cell **nucleus** as seen using an electron microscope.



**Fig. 1.1**

(i) Name the structure labelled **W**.

.....[1]

(ii) The actual diameter of the nucleus, measured along the line **XY**, is 7  $\mu\text{m}$ .

Calculate the magnification of the nucleus. Show your working.

.....  
.....  
.....

Answer .....[2]

(b) Each part of a cell is specialised to carry out a particular function.

Below is a list of parts of a cell, labelled **A** to **F**. Each of the list of statements, numbered 1 to 6, refers to one of these parts of the cell.

<b>A</b> nucleus	<b>1</b> where some lipids, including steroids, are made
<b>B</b> mitochondrion	<b>2</b> controls entry of substances into the cell
<b>C</b> plasma (cell surface) membrane	<b>3</b> controls the activities of the cell
<b>D</b> chloroplast	<b>4</b> where polypeptides are made
<b>E</b> smooth endoplasmic reticulum	<b>5</b> where photosynthesis takes place
<b>F</b> ribosomes	<b>6</b> where aerobic respiration takes place

Match a statement to each part of the cell. The first one has been done for you.

- A** ..... **3** .....
- B** .....
- C** .....
- D** .....
- E** .....
- F** .....

[5]

[Total: 8]

- 2 (a) Complete the following passage.

Glycogen is a type of carbohydrate known as a polysaccharide. In mammals, it is stored in particular parts of the body, namely the cells of the ..... and ..... Glycogen is a polymer of .....-glucose molecules. It forms coiled chains, in which the glucose molecules are joined by 1, ..... links. Many side chains are attached to the coiled chains by 1, ..... links. Starch is also a polysaccharide. It has two components, ..... and .....

[7]

- (b) The table below refers to chemical tests for biological molecules. Complete the table.

method	biological molecule tested for	observation if biological molecule is	
		present	absent
add a few drops of iodine solution			
add alcohol and shake; pour into water.			

[4]

- (c) A student was carrying out some tests to identify substances present in a solution. It was known that there were **two** different food substances in the solution. **Three** different tests were carried out, each one on a **separate** 10 cm<sup>3</sup> sample. The tests that were carried out and the results are shown in the table below.

	test	result
1	the biuret test was carried out	a purple colour was observed
2	the Benedict's test was carried out	the blue colour of the reagent did not change on heating
3	dilute hydrochloric acid was added and the mixture was boiled; it was allowed to cool, neutralised and then test 2 was carried out	the blue colour of the reagent changed to a brick-red precipitate on heating

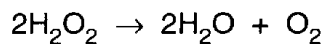
State the **two** food substances present in the student's solution.

1. ....

2. ....[2]

[Total: 13]

- 3 A student investigated the activity of catalase by measuring the release of oxygen from hydrogen peroxide. The reaction occurs as follows:



The student added  $5\text{cm}^3$  of a catalase solution to  $10\text{cm}^3$  of a 5% hydrogen peroxide solution and placed the mixture in the apparatus shown in Fig. 3.1. The total volume of gas collected was recorded every 20 seconds. The results are shown in Fig. 3.2.

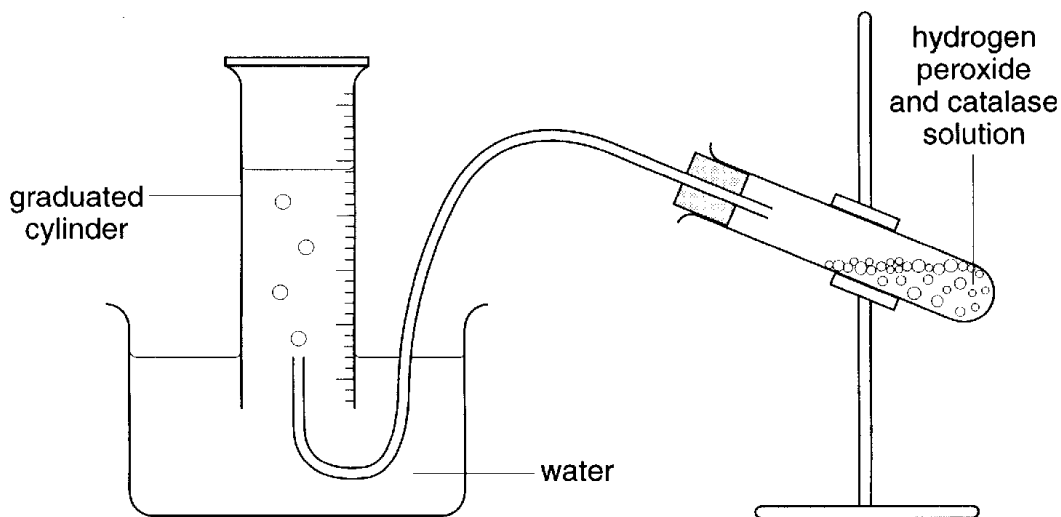


Fig. 3.1

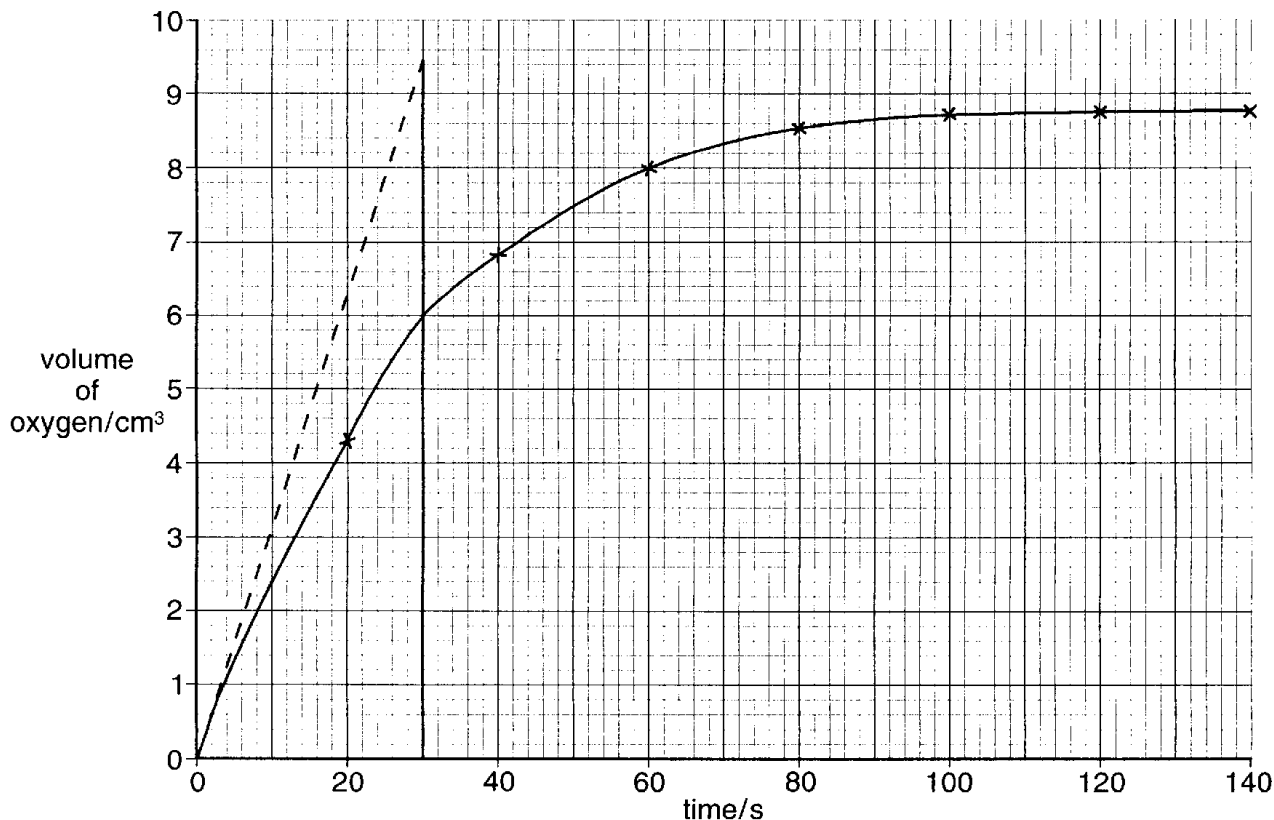


Fig. 3.2

(a) One way of calculating the rate of reaction is to use the formula

$$\frac{\text{volume of oxygen collected}}{\text{time taken for collection}}$$

Use the formula to calculate the rate, in  $\text{cm}^3 \text{min}^{-1}$ , over the first 30 seconds.

.....  
.....

Answer ..... $\text{cm}^3 \text{min}^{-1}$  [2]

(b) In order to compare rates of reaction, the *initial* rate of reaction is used. This is the rate of reaction within the first few seconds, during which the reaction is proceeding at the maximum possible rate.

The dashed line on Fig. 3.2 shows the initial rate of oxygen production. Using this line, it can be calculated that the initial rate of production would be  $19 \text{ cm}^3 \text{min}^{-1}$ .

Explain why the initial rate of reaction is greater than the rate you calculated in (a).

.....  
.....  
.....  
.....  
.....[2]

(c) In this question, one mark is available for the quality of written communication.

Describe and explain the effect of factors, **other than substrate concentration**, on the rate of enzyme-controlled reactions.

Your answer should include reference to enzyme structure.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

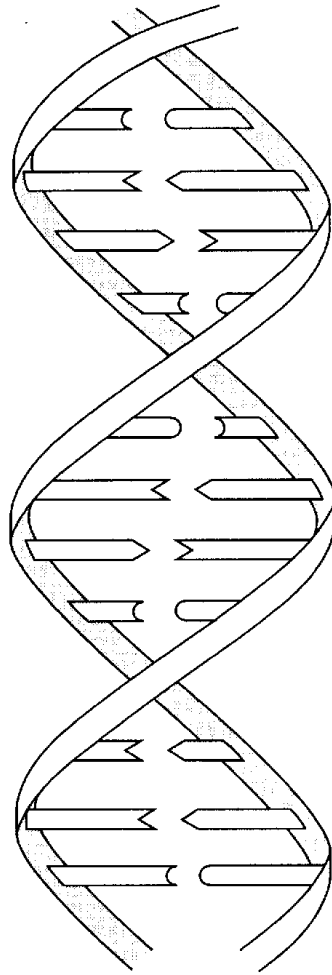
.....[10]

Quality of Written Communication [1]

[Total: 15]



- 4 A DNA molecule is made up of two polynucleotide strands which are twisted into a double helix, as shown in Fig. 4.1.



**Fig. 4.1**

DNA is involved in transcription, which is part of protein synthesis, and replication.

Complete the table, putting a tick (✓) in the column(s), where relevant, to indicate whether each statement refers to transcription, replication or both. The first one has been done for you.

	transcription	replication
free nucleotides bond to the DNA strand	✓	✓
two new DNA molecules are produced		
only the part of the DNA molecule containing the gene unwinds		
hydrogen bonds are broken between the two DNA strands		
cytosine nucleotides bond to guanine on the DNA strand		
uracil nucleotides bond to adenine on the DNA strand		

[5]

[Total: 5]

5 (a) The alveoli form the gaseous exchange surface of the mammalian lung. Each alveolus has a very thin lining, made up of a single layer of squamous epithelial cells, approximately 0.5 μm thick.

(i) State why this thin lining allows diffusion of oxygen and carbon dioxide to take place efficiently.

.....  
.....[1]

(ii) State **two other** features of the gaseous exchange surface that allow efficient diffusion of gases.

1.....  
2.....[2]

(b) The efficiency of gaseous exchange is reduced by lung cancer.

(i) Explain the link between cell division and cancer.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....[3]

(ii) State **two** factors that cause cancer.

1.....  
2.....[2]

(iii) A method of treatment for cancer involves reducing the diameter of blood vessels leading to the affected area. Suggest why this treatment might be effective in treating cancer.

.....  
.....  
.....  
.....[2]

[Total: 10]

6 Fig. 6.1 represents part of a food web of a lake.

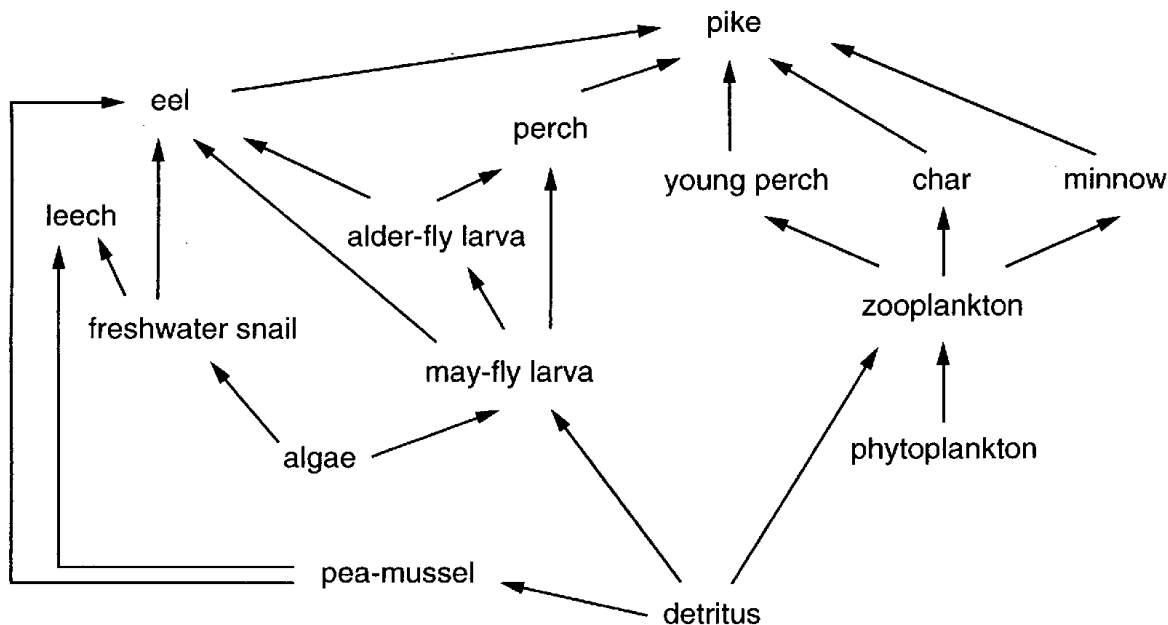


Fig. 6.1

(a) Name **two** organisms from the food web shown in Fig. 6.1 that feed only as secondary consumers.

.....  
 .....[1]

(b) Explain what is meant by each of the following terms. In each case, give a suitable example from the information provided above.

(i) *producer*

.....  
 .....  
 .....[2]

(ii) *trophic level*

.....  
 .....  
 .....[2]

(iii) *ecosystem*

.....  
 .....  
 .....[2]

(c) The table shows the efficiency of energy conversion of two trophic levels in the ecosystem.

	percentage conversion efficiency
producer	5.3
primary consumer	14.8

Suggest reasons for these differences in efficiency of energy conversion.

.....

.....

.....

.....

.....

.....

.....[2]

[Total: 9]