

OXFORD CAMBRIDGE AND RSA EXAMINATIONS Advanced Subsidiary GCE

BIOLOGY 2801

Biology Foundation

Thursday 10 JANUARY 2002

Afternoon

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 and make sure you know what you have to do 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 calculations.

| FOR EXAMINER'S USE | | |
|--------------------|------|------|
| Qu. | Max. | Mark |
| 1 | 11 | |
| 2 | 20 | |
| 3 | 13 | |
| 4 | 8 | |
| 5 | 15 | |
| 6 | 10 | · |
| 7 | 13 | |
| TOTAL | 90 | |

Answer all questions.

| 1 | (a) | Describe a test which will indicate the presence of protein. | |
|---|-----|--|-----|
| | | Method | |
| | | | |
| | | | |
| | | Observation if protein is present. | |
| | | Ah . | [2] |

Fig. 1.1 shows a number of bonds or links, identified with the letters A to E, which are involved in the formation of proteins and polysaccharides. C, D and E are all covalent

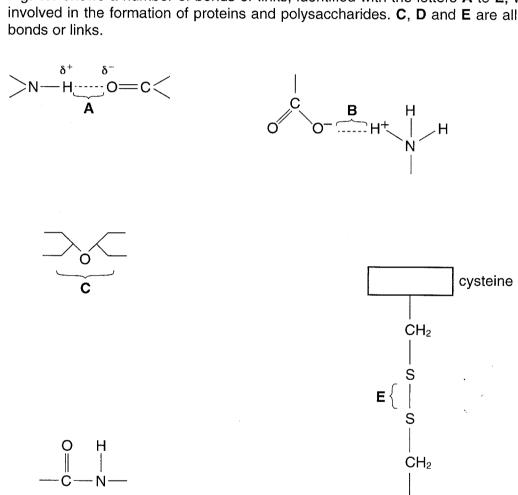


Fig. 1.1

cysteine

| (b) | (i) | Name the bonds A and B . |
|-----|---------------|--|
| | | A |
| | | B[2] |
| | (ii) | State the <i>specific</i> names given to bonds or links C to E . |
| | | c |
| | | D' |
| | | E[3] |
| (c) | With is us | n reference to Fig. 1.1, use one of the letters A to E to indicate the bond or link that sed |
| | (i) | to join glucose molecules in the formation of a polysaccharide; |
| | | |
| | (ii) | to join adjacent amino acids in the primary structure of a protein; |
| | | |
| | (iii) | in the secondary structure of a protein; |
| | | |
| | (iv) | only in the tertiary structure of a protein. |
| | | |
| | | [Total : 11] |

2 Fig. 2.1 represents the structure of the plasma (cell surface) membrane.

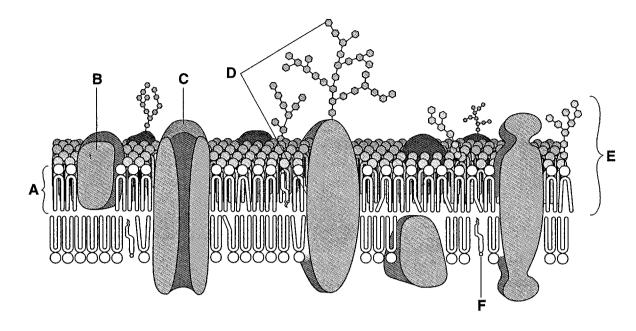


Fig. 2.1

| (a) | Name molecules A to F . | |
|-----|--|-----|
| | A | |
| | В | |
| | C | |
| | D | |
| | E | |
| | F | [6] |
| (b) | State the approximate width of the membrane. | |
| | | [1] |

Water moves across the plasma (cell surface) membrane by osmosis.

- (c) Complete the table below to
 - (i) show the direction in which water will move across the plasma (cell surface) membranes of cells in different conditions;
 - (ii) indicate whether or not the cell will burst.

Place a (✔) or a cross (✗) in each box of the table as appropriate.

| | initial net movement of water | | cell bursts |
|---|-------------------------------|-----|-------------|
| | in | out | Cell Dursis |
| leaf mesophyll cell immersed in distilled water | | , | |
| red blood cell immersed in concentrated salt solution | | | |
| red blood cell immersed in distilled water | | | |

[6]

| d) | With reference to Fig. 2.1, outline the ways in which substances, other than water, cross plasma (cell surface) membranes. |
|----|--|
| | (In this question, 1 mark is available for the quality of written communication.) |
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| | |
| | <i>f</i> |
| | |
| | [7] |

[Total : 20]

3 Fig. 3.1 represents part of the cycling of nitrogen within an ecosystem.

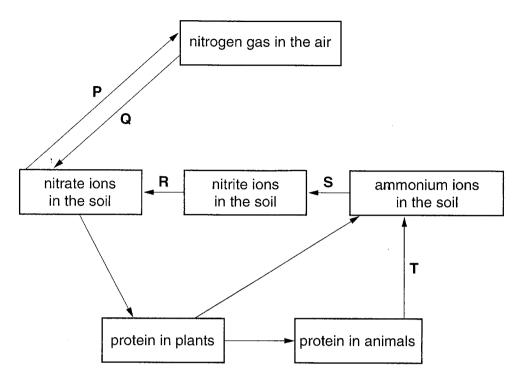


Fig. 3.1

| (a) | (1) | State the name of process P. |
|-----|-------|---|
| | | [1] |
| | (ii) | State which type of organism carries out process P. |
| | | [1] |
| | (iii) | State a natural process represented by Q . |
| | | [1] |
| | (iv) | Name the organisms which carry out processes R and S . |
| | | [2] |
| (b) | | ine how protein in animals is converted to ammonium ions in the soil, as indicated on Fig. 3.1. |
| | | |
| | | |
| | ••••• | |
| | ••••• | <i>f</i> |
| | ••••• | |
| | | rol |

(c) Complete the following passage by inserting the appropriate term in each space. The first one has been inserted for you.

| The grey squirrel lives in deciduous woodland (its |
|---|
| acorns and toadstools and is, therefore, a primary |
| eat animal material, such as eggs or young birds, it occupies more than one |
| |
| been carried out to establish the number of squirrels (the of |
| squirrels) in oak woodland on the island of Anglesey, North Wales. It has been |
| discovered that the number of grey squirrels has been increasing dramatically. The grey |
| squirrel was introduced into Britain from North America and has outcompeted the native |
| red squirrel so effectively that the numbers of red squirrels are now very low. As a result |
| of their interaction with the organisms of the other species in the habitat (the |
| |
| they live and with which they interact) has been affected. [5] |

[Total: 13]

| 4 | Xylem is found in roots, stems and leaves of flowering plants. Xylem contains several types of cell, two of which are vessel elements and fibres. Vessel elements are arranged in columns with no end walls between them, forming long hollow tubes. These tubes are called vessels and their function is to transport water and mineral salts. Fibres are narrow, very elongated and thick walled cells which provide support. | | |
|---|---|--|--|
| | (a) | Use this information to explain why xylem is considered to be a tissue. | |
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| | • | em tissue can be viewed using a light microscope or an electron microscope. With reference to both light and electron microscopy, explain and distinguish between the terms <i>magnification</i> and <i>resolution</i> . | |
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| | | [4] | |
| | | [Total: 8] | |

| 5 | Son | ne pl | ant cells divide by mitotic cell division. |
|---|-----|--------|--|
| | (a) | Exp | plain the role of mitotic cell division in the life of plants. |
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| | | | |
| | | | |
| | | | [4] |
| | Can | icer i | n humans results from uncontrolled mitotic cell division. |
| | (b) | Ехр | lain why |
| | | (i) | it is advisable to apply high factor sun screen when going out into the sun in the summer; |
| | | | |
| | | | |
| | | | [1] |
| | | (ii) | it may be less harmful to smoke low tar cigarettes than those with high tar; |
| | | | |
| | | | |
| | | | [1] |
| | (| (iii) | radiographers stand behind a lead screen while taking X-rays. |
| | | | |
| | | | |
| | | | [1] |
| | | | |

| (c) | Describe the behaviour of a chromosome during a mitotic cell cycle. |
|-----|---|
| | (In this question, 1 mark is available for the quality of written communication.) |
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| | [8] |

[Total : 15]

| 6 | Enz | yme | mes are proteins with a tertiary structure. | | | | |
|---|-----|-------|--|--|--|--|--|
| | (a) | Ехр | lain the importance of the tertiary structure to the functioning of an enzyme. | | | | |
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| | Ess | | citogo io often coursed by the common setting of minutes in the common setting of minutes in the common setting of the common settin | | | | |
| | | | oilage is often caused by the enzyme action of microorganisms. | | | | |
| | (1) | (i) | some foods are preserved in vinegar; | | | | |
| | | (1) | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | [2] | | | | |
| | | (ii) | foods are heated to very high temperatures before being canned. | | | | |
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| | | | | | | | |
| | | | | | | | |
| | | | [2] | | | | |
| | | | | | | | |

During cheese production, rennet is used to solidify the protein in the milk. Rennet is a commercially prepared form of rennin, an enzyme found naturally in the stomachs of young mammals.

| (c) | Explain why the temperature of the milk needs to be kept between 30 $^{\circ}\text{C}$ and 40 $^{\circ}\text{C}$ during this stage of cheese production. |
|-----|--|
| | |
| | |
| | |
| | ; |
| | P.Y. |
| | [2] |
| | |
| | [Total : 10] |

7 Fig. 7.1 represents a nucleotide which forms part of a DNA molecule.

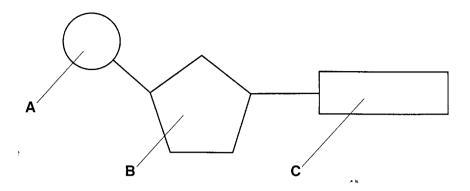


Fig. 7.1

| (a) | (i) | Name A to C. |
|-----|------|---|
| | | A |
| | | В |
| | | C [3] |
| | (ii) | State which part of the nucleotide contains nitrogen. |
| | | [1] |

During research into the mechanism of DNA replication, bacteria were grown for many generations in a medium containing only the 'heavy' isotope of nitrogen, ¹⁵N. This resulted in all the DNA molecules containing only ¹⁵N. This is illustrated in Fig. 7.2.

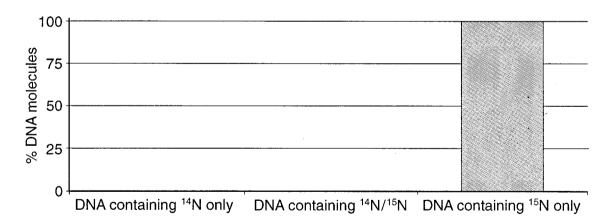


Fig. 7.2

These bacteria were then grown in a medium containing only 'light' nitrogen, ¹⁴N. After the time taken for the DNA to replicate once, the DNA was analysed. The results are shown in Fig. 7.3.

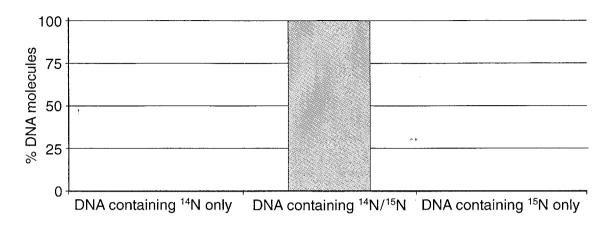


Fig. 7.3

| Explain now these data support the semi-conservative hypothesis of DNA replication. |
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| |
| [3] |

The bacteria continued to grow in the 'light' nitrogen, ¹⁴N, medium until the DNA had replicated once more. The DNA molecules were analysed. The results are shown in Fig. 7.4.

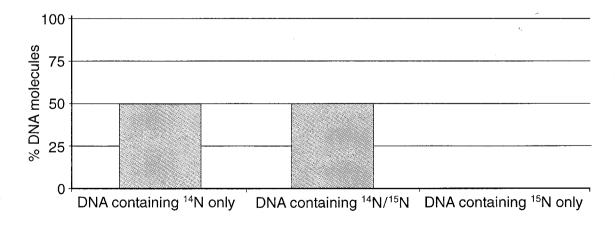


Fig. 7.4

Fig. 7.5 shows simple diagrams of DNA molecules, indicating the nitrogen content of each.

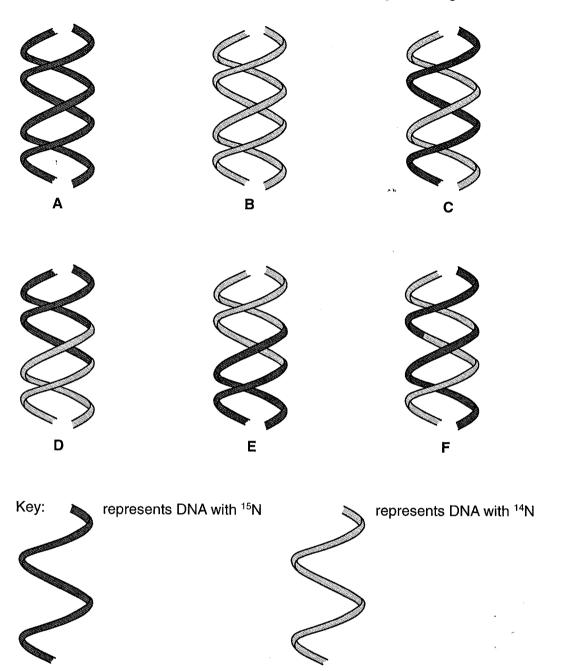
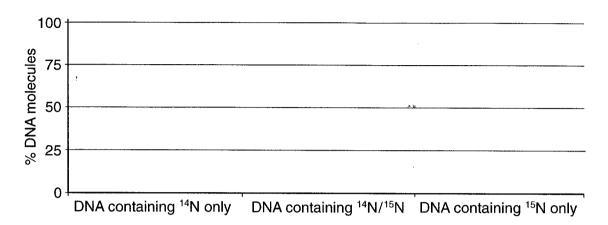


Fig. 7.5

| (c) | With reference to Fig. 7.5, select the letter or letters which best represent the bDNA in Fig. 7.2, Fig. 7.3 and Fig. 7.4. | oacte | ərial |
|-----|--|-------|-------|
| | Fig. 7.2 | | |
| | Fig. 7.3 | | |
| | Fig. 7.4 | r | [3] |

The bacteria continued to grow in the 'light' nitrogen, ¹⁴N, medium until the DNA had replicated once more. The DNA molecules were analysed.

(d) Complete the bar chart below to indicate the expected results of the composition of these DNA molecules.



[3]

[Total: 13]

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