OCR
RECOGNISING ACHIEVEMENT

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**

**Advanced Subsidiary GCE**

# BIOLOGY 2801

Biology Foundation

Monday **6 JUNE 2005** 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.

**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 | 4 | |
| 2 | 9 | |
| 3 | 6 | |
| 4 | 8 | |
| 5 | 13 | |
| 6 | 10 | |
| 7 | 10 | |
| TOTAL | 60 | |

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



Registered Charity Number: 1066969
[Turn over

For Examiner's Use

Answer **all** the questions.

**1** Fig. 1.1 is an electron micrograph of a plant cell.

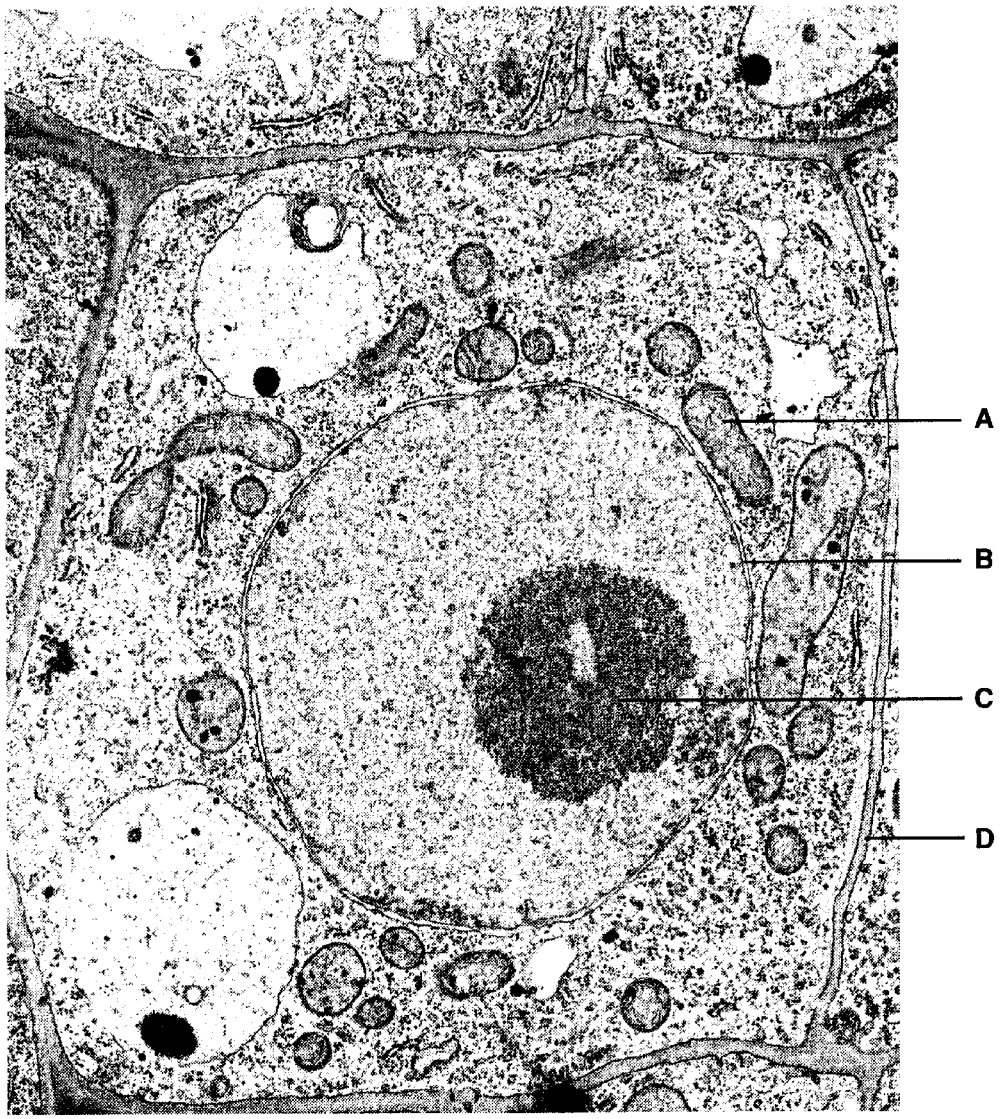



**Fig. 1.1**

Name the parts of the cell labelled **A** to **D**.

**A** .....

**B** .....

**C** .....

**D** .....[4]

[Total: 4]

For Examiner's Use

**2** Glucose:

- is a carbohydrate
- is a hexose (six-carbon sugar)
- has the formula $C_6H_{12}O_6$
- has a six-membered ring structure.

Fig. 2.1 shows the molecular structures of two monosaccharide sugars, glucose and fructose.

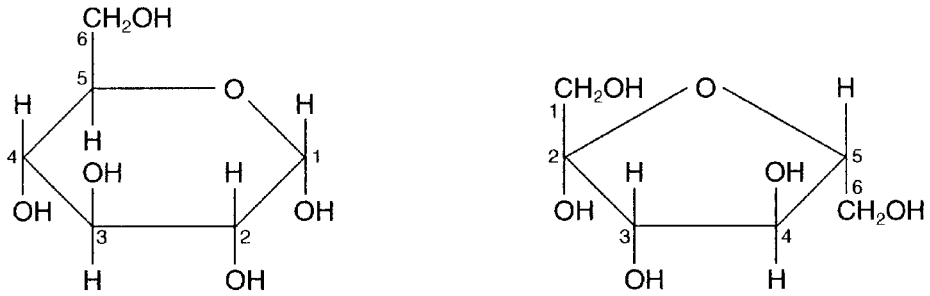



**Fig. 2.1**

**(a)** State **one** way, **visible in Fig. 2.1**, in which the structure of fructose is:

similar to glucose;

.....

.....

different from glucose.

.....

.....[2]

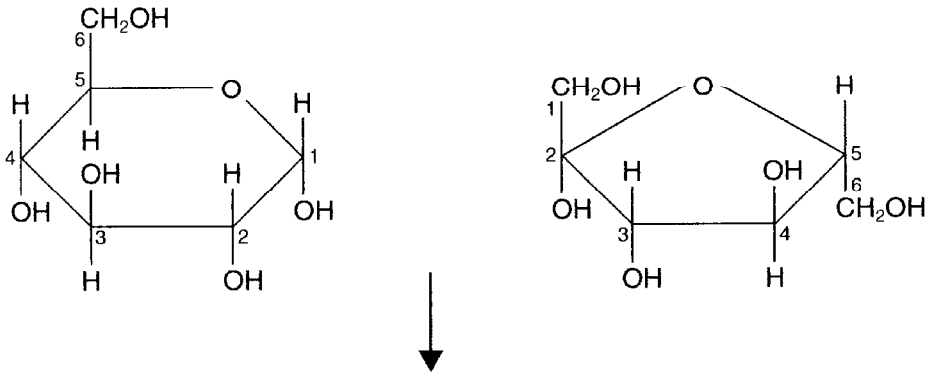
**(b)** Maltose and sucrose are disaccharide sugars in which a bond joins two monosaccharide molecules. Sucrose is formed by the formation of a bond between carbon 1 of a glucose molecule and carbon 2 of a fructose molecule.

**(i)** Name the bond that joins the two molecules to form a disaccharide.

.....[1]

For Examiner's Use

**(ii)** Complete the diagram below to show what happens when the glucose and fructose molecules join together.




[2]

**(c)** **(i)** Describe the test that is used to indicate the presence of a reducing sugar, such as glucose, and state the observation that would be made if glucose was present.

description of test

.....

.....

.....

.....

observation if glucose is present

.....

.....[3]



**[Turn over**

For Examiner's Use

**(ii)** No change is observed if sucrose, a non-reducing sugar, is tested for in this way. The bond between the glucose and fructose units must first be broken. The test for a reducing sugar can then be carried out.

Describe how this bond can be broken chemically before carrying out the test for a reducing sugar.

.....

.....[1]

[Total: 9]

For Examiner's Use

**3** Fig. 3.1 represents an enzyme and a number of other molecules.

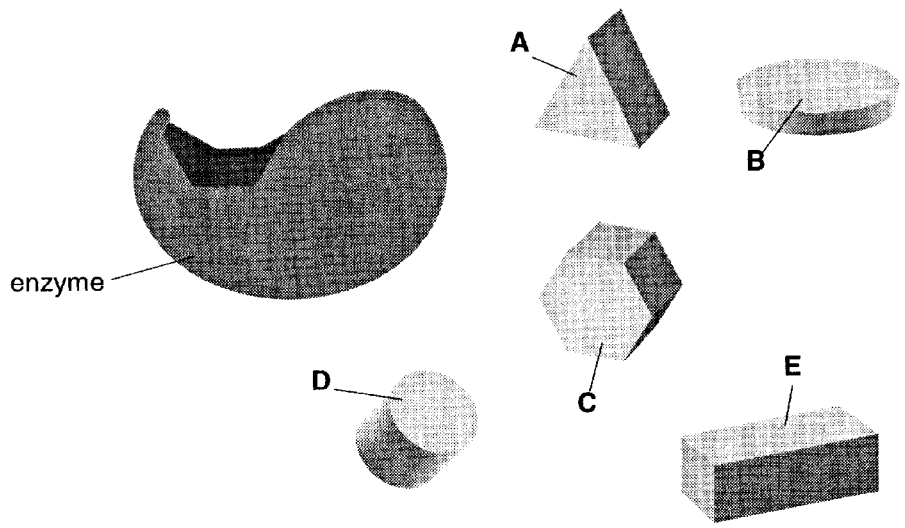



**Fig. 3.1**

**(a)** Label on Fig. 3.1 the active site of the enzyme. [1]

**(b)** Write the letter of the molecule that is most likely to be the substrate for this enzyme.

.....[1]

**(c)** Use the information in Fig. 3.1 to explain **enzyme specificity**.

.....

.....

.....

.....

.....

.....[3]

**(d)** One hypothesis of the mechanism of enzyme action is the 'lock and key' hypothesis. Another hypothesis, the 'induced fit' hypothesis, involves the enzyme changing shape slightly to allow the substrate to fit perfectly. The substrate also changes shape slightly.

Suggest how the **substrate** changing shape slightly will assist enzyme action.

.....

.....[1]

[Total: 6]

For Examiner's Use

**4** An experiment was carried out in which an artificial membrane was used to form the boundary of a model of a cell. A solution of different sugars was placed inside this 'cell', which was then placed in a beaker containing a solution of sucrose and glucose.

The artificial membrane is:
- permeable to monosaccharides (e.g. glucose and fructose) and water;
- not permeable to disaccharides (e.g. maltose and sucrose);
- flexible.

Fig. 4.1 shows the 'cell', together with the concentrations of the sugars inside the 'cell' and in the surrounding solution. The figures represent the concentration in mol $dm^{-3}$.

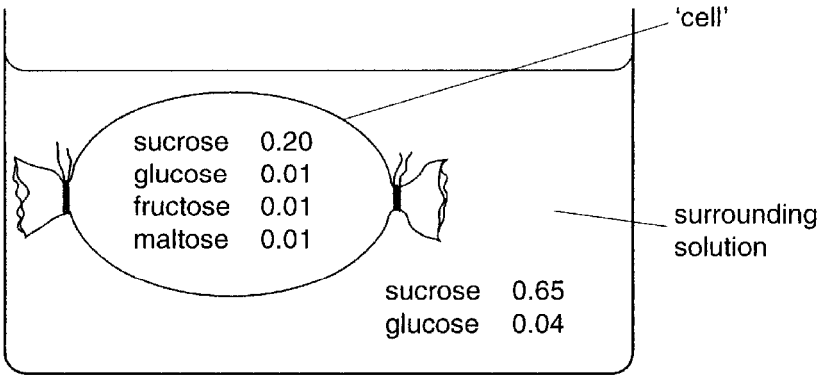



**Fig. 4.1**

**(a) (i)** State which sugar or sugars will show a net movement **out of** the 'cell'.

.....[1]

**(ii)** State which sugar or sugars will show a net movement **into** the 'cell'.

.....[1]

**(iii)** Name the method by which these sugars cross the membrane.

.....[1]

**(iv)** Explain why the volume of the 'cell' would change during the experiment.

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.....

.....

.....[4]

For Examiner's Use

**(b)** The artificial membrane used in this experiment does not resemble a plasma (cell surface) membrane in all respects.

State **one** method by which substances would be **unable** to cross the artificial membrane.

.....[1]

[Total: 8]

For Examiner's Use

5 **(a)** State the term that best describes the following.

**(i)** The role of an organism in an ecosystem.

.....[1]

**(ii)** All the members of the same species present in a habitat.

.....[1]

**(iii)** All the organisms of all the species present in the same habitat.

.....[1]

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

Fig. 5.1 represents the energy flow through an ecosystem.

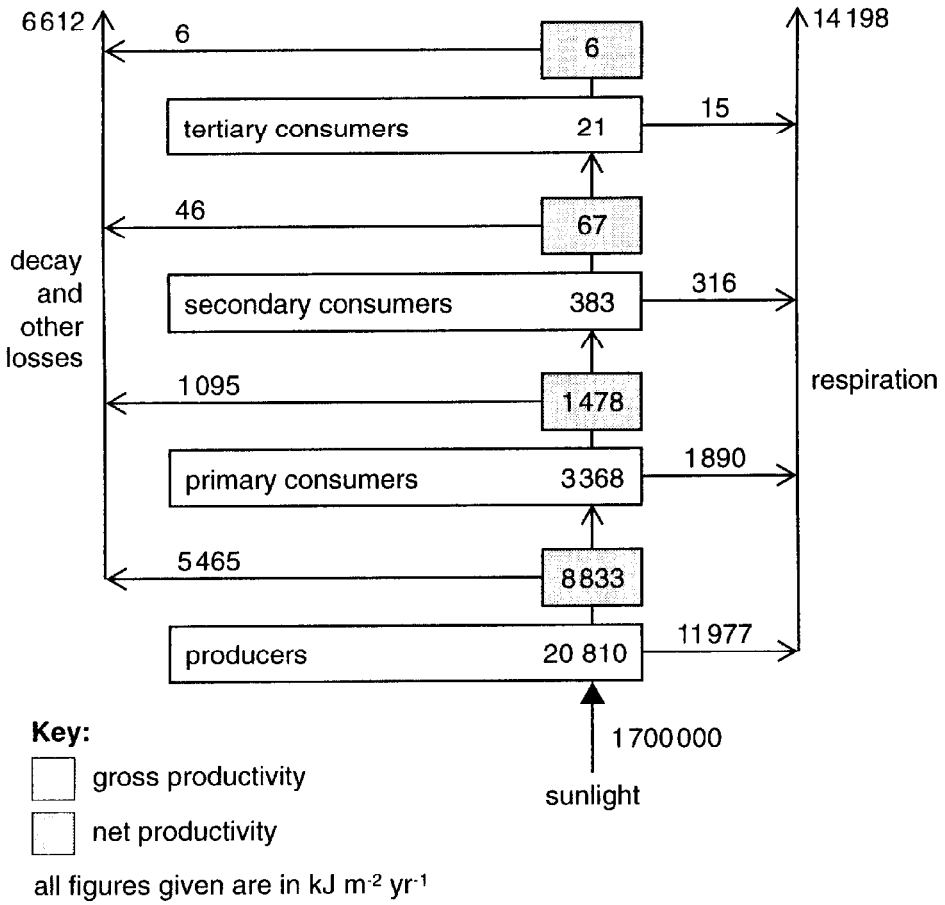


**Fig. 5.1**

For Examiner's Use

Explain how energy is transferred through food chains and food webs in an ecosystem.
You should refer to the efficiency of this transfer in your answer.
You will gain credit if you make use of the information in Fig. 5.1.

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Quality of Written Communication [1]

[Total: 13]



**[Turn over**

For Examiner's Use

6 **(a)** State **two** functions of mitosis.

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.....

.....[2]

**(b)** Name the stage of mitotic cell division during which each of the following takes place.

**(i)** Nuclear envelope reforms.

.....[1]

**(ii)** Chromosomes align at equator.

.....[1]

**(iii)** Chromosomes become visible.

.....[1]

**(iv)** Chromatids move towards the poles.

.....[1]

**(v)** Spindle microtubules shorten.

.....[1]

**(c)** A human egg is described as haploid.

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

.....[1]

**(ii)** Explain why, in the human life cycle, it is important that eggs are haploid.

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.....[2]

[Total: 10]

For Examiner's Use

7 **(a)** Many human proteins, such as growth hormone, are now produced in large quantities by genetically engineered cells. Previously, growth hormone was extracted from animals.

State **two** advantages of producing growth hormone by genetically engineered cells.

1 .....

.....

2 .....

.....[2]

**(b)** Many human proteins are attached to specific sugars that are important in the functioning of the protein. Some of these proteins are found in the plasma (cell surface) membrane. Fig. 7.1 represents a protein of this type.

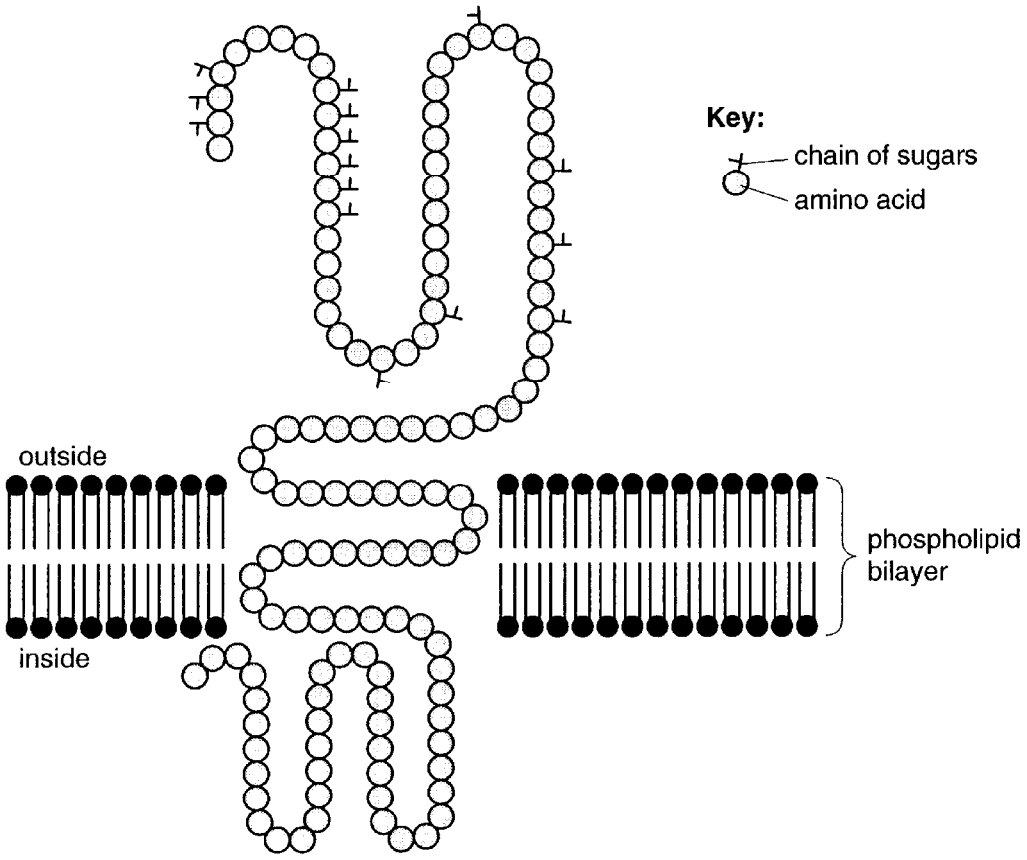


**Fig. 7.1**

**(i)** What name is given to proteins with sugars attached?

.....[1]

**(ii)** State **one** function of this type of protein in plasma (cell surface) membranes.

.....

.....[1]

**(c)** Scientists have produced strains of genetically engineered yeast that are capable of producing proteins and adding the branching arrangement of sugars characteristic of human cells. Each strain of yeast produces a different specific protein.

The process involves:

- removing the yeast gene that is responsible for adding the yeast sugars to the protein;
- adding to the yeast a gene from roundworms that builds short chains of mannose sugar units;
- adding two further genes, one from humans and one from a fungus, that add other sugars, such as galactose, to the short chains and make branched chains.

**(i)** State the type of enzyme that is used to remove a gene from the rest of an organism's DNA.

.....[1]

**(ii)** Describe how the foreign genes can be inserted into DNA.

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.....[3]

**(iii)** Suggest how the gene from roundworms is responsible for the building of short chains of mannose sugar units.

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.....[2]

[Total: 10]

**END OF QUESTION PAPER**