

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced Subsidiary GCE

BIOLOGY

2801

Biology Foundation

Thursday

8 JANUARY 2004

Morning

1 hour

Candidates answer on the question paper.

Additional materials:

Electronic calculator

Ruler (cm/mm)

Candidate Name

Centre Number

Candidate
Number

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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 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	6	
2	8	
3	6	
4	12	
5	12	
6	16	
TOTAL	60	

This question paper consists of 12 printed pages.

Answer **all** the questions.

1 Fig. 1.1 is a plan diagram of tissues in a transverse section of a dicotyledonous leaf.

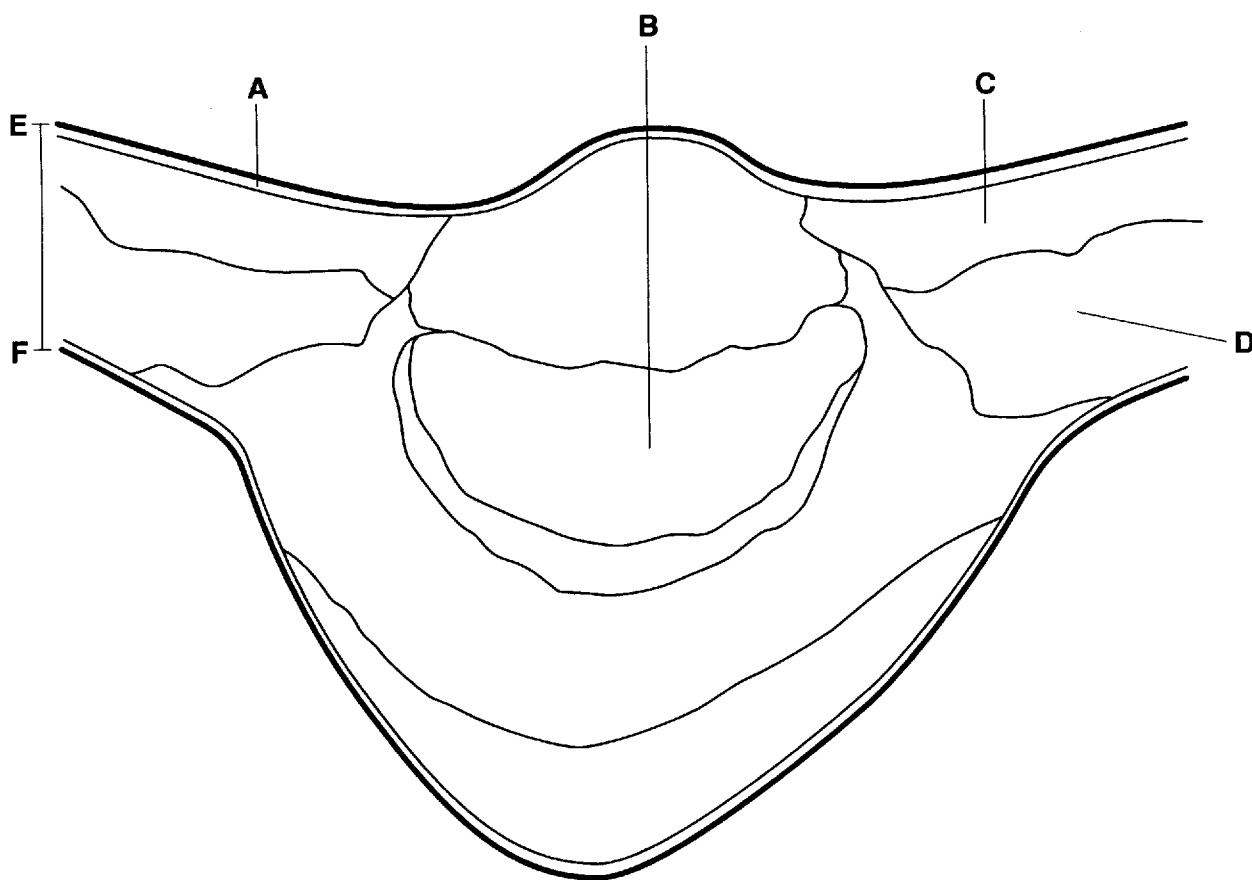


Fig. 1.1

(a) Name tissues **A** to **D**.

- A**
- B**
- C**
- D**[4]

(b) The actual thickness of the leaf along the line **EF** is 0.6 mm.

Calculate the magnification of the diagram. Show your working.

Magnification = x[2]

[Total: 6]

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

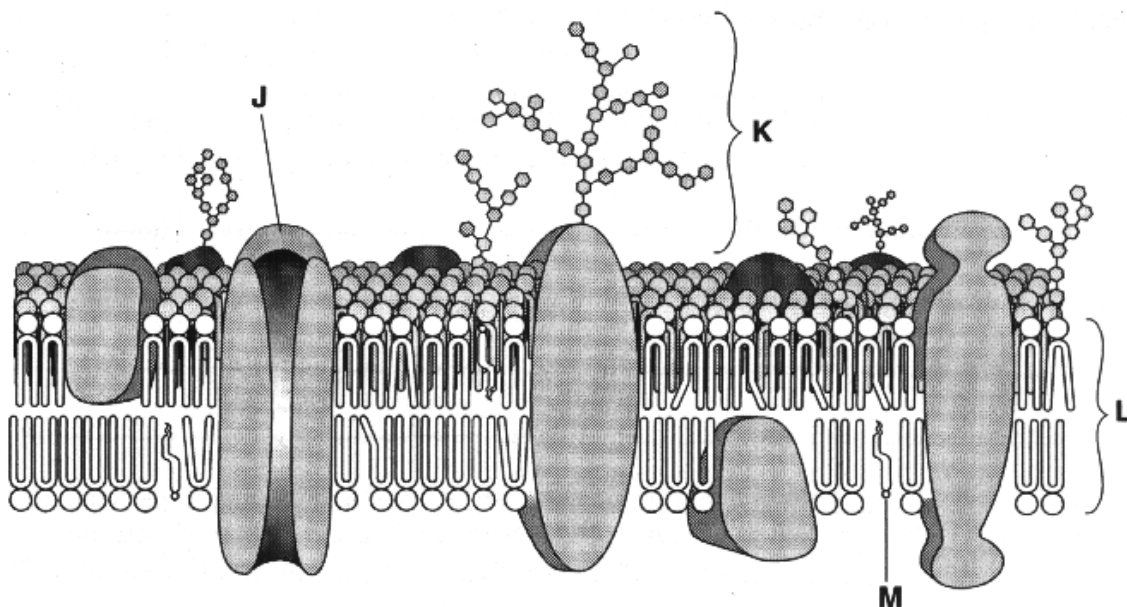


Fig. 2.1

- (i) State **one function** of the parts labelled J to M.

J

.....

K

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L

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M

.....[4]

- (ii) Circle the most appropriate measurement for the actual width of this membrane.

0.07 μm

7 nm

0.0007 mm

7 μm

[1]

(b) Endocytosis is one method by which substances enter cells.

Describe the process of endocytosis.

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.....[3]

[Total: 8]

3 Three statements about different aspects of biology are given below.

- (a) 'X-rays are an essential tool in medicine. Before being X-rayed, a female patient is asked to inform X-ray staff if she is pregnant.'

Suggest why it is **not** advisable for a pregnant woman to be X-rayed unless it is essential.

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.....[2]

- (b) 'The use of landfill (rubbish) sites close to residential areas is often a concern to local people. A recent report suggests that there is a link between these sites and an increased incidence of cancer and abnormal births.'

Suggest how the landfill sites might be responsible for these problems.

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.....[2]

- (c) 'Scientists have discovered that certain microorganisms can survive in the Antarctic, completely surrounded by ice.'

Suggest how this discovery was useful in the development of certain biological washing powders.

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.....[2]

[Total: 6]

4 (a) Some single-celled organisms live in estuaries where the concentration of salt changes regularly.

Explain, in terms of water potential, the problem faced by these organisms.

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.....[2]

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

Some of the properties of water are listed below.

- boils at 100 °C
- freezes at 0 °C
- water below 4 °C is less dense than water above 4 °C
- excellent solvent
- much energy is required to raise the temperature of water
- much energy is required to change water into water vapour
- high surface tension and cohesion

Describe **and** explain the roles of water in living organisms **and** as an environment for living organisms.

You will gain credit for using information about the properties of water.

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.....[9]

Quality of Written Communication [1]

[Total: 12]

5 (a) DNA and RNA are nucleic acids.

State **two** ways in which the structure of DNA differs from that of RNA.

1

2[2]

(b) The DNA molecule is made of two chains of nucleotides, wound into a double helix.

(i) Describe the structure of a **DNA nucleotide**.

You may use the space below to draw a diagram if it will help your description.

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[3]

(ii) Describe how the two nucleotide chains in DNA are bonded together.

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[3]

6 (a) Nitrifying and denitrifying bacteria are involved in the nitrogen cycle.

Explain the role in the nitrogen cycle of

(i) nitrifying bacteria;

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(ii) denitrifying bacteria.

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.....[4]

(b) Read the following passage carefully, then answer the questions below.

5 *Rhizobium* is a bacterium that is closely associated with the roots of certain plants known as legumes. These plants produce chemicals to attract the bacteria and extra root hairs are produced. The bacteria attach to the surface of the root hairs. Chemical links are formed between a complex polysaccharide on the bacterial surface and lectin, a protein, formed by the plants. The bacteria penetrate the cell walls of the root hairs and enter the cells. The presence of the bacteria stimulates the cells of the root to divide, forming swellings known as nodules.

10 The bacteria produce an enzyme, nitrogenase, that is the catalyst for the conversion of nitrogen gas to ammonia. The bacteria use carbon compounds manufactured by the plant to respire, making energy available for this conversion. The ammonia is then used to form amino acids. Nitrogenase only functions in low oxygen concentrations. The root cells produce a pigment, leghaemoglobin, that is very similar to haemoglobin. Leghaemoglobin absorbs
15 oxygen, leaving low concentrations in the nodules.

(i) *Rhizobium* is a prokaryotic organism.

State **one** characteristic that is typical of prokaryotes, but not of eukaryotes.

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

- (ii) Lectin (line 5) and polysaccharides are compounds that are formed from small molecules joined together by chemical bonds.

Explain how the small molecules are joined together to form these compounds.

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.....[3]

- (iii) Leghaemoglobin contains the same metal element as haemoglobin.

Name this metal element.

.....[1]

- (iv) State the names of **two** proteins, **other than lectin**, mentioned in the passage.

1

2[2]

- (v) Name the process that occurs in *Rhizobium* to convert nitrogen gas into ammonia.

.....[1]

- (vi) It has been suggested that oxygen is an inhibitor of nitrogenase.

Explain **one** way in which oxygen could act as an inhibitor.

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.....[2]

- (c) Genetic engineers have tried to introduce genes for nitrogenase into wheat, which is **not** a legume.

Suggest the possible advantages of developing this wheat.

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.....[2]

[Total: 16]

END OF QUESTION PAPER