OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
Advanced Subsidiary GCE

BIOLOGY **2803/01**

Transport

Thursday   **10 JANUARY 2002**   Afternoon   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 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 stages in any calculations.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	7	
2	15	
3	5	
4	14	
5	13	
6	6	
TOTAL	60	

This question paper consists of 11 printed pages and 1 blank page.

SPA (CW/PW) S17776/3

Answer **all** questions.

1   The need to develop transport systems in multicellular organisms is related to changes in the surface area to volume ratio that occur as the organisms get larger.
Fig. 1.1 shows two cubes, **A** and **B**, of different sizes, used to represent two organisms.

cube **A**

2 cm

surface area of 1 face = 2 cm x 2 cm = 4 cm^2
surface area of cube = 4 cm^2 x 6 = 24 cm^2
volume of cube = 2 cm x 2 cm x 2 cm = 8 cm^3

surface area : volume = 3:1

cube **B**

4 cm
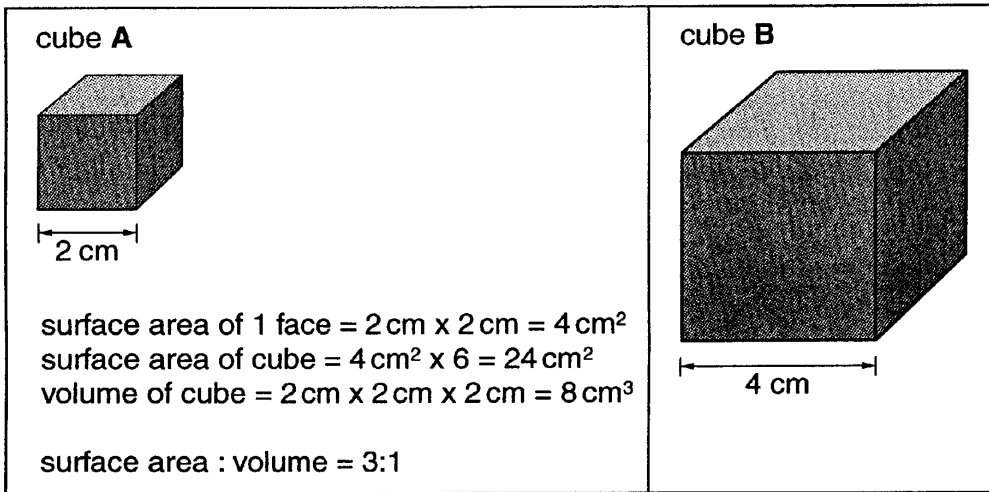
Fig. 1.1

(a) Calculate the surface area to volume ratio of cube **B**. Show your working.

....

....

....[2]

(b) Describe how the ratio of cube **B** has changed in comparison to cube **A**.

....

....

....[2]

(c) Describe how such changes in ratio have influenced the need for transport systems in plants and animals.

....

....

....

....[3]

[Total : 7]

2 Fig. 2.1 shows a section through a typical dicotyledonous stem.
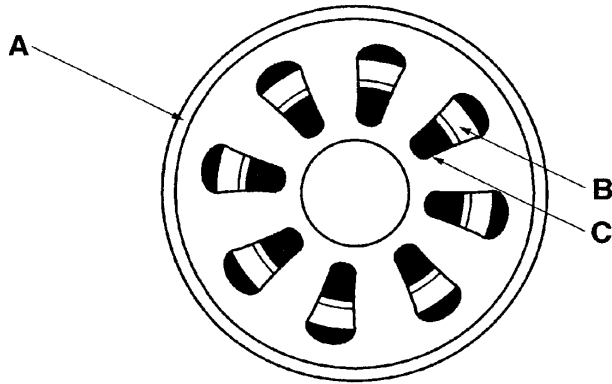
Fig. 2.1

(a) With reference to Fig. 2.1,

(i) name the tissues **A** to **C**;

A ....

B ....

C ....[3]

(ii) describe how the distribution of **B** and **C** would differ in a dicotyledonous root.

....

....

....[2]

(b) Describe the pathways and explain the mechanisms by which water is absorbed from the soil and transported across the root and up to the leaves.
(*In this question, 1 mark is available for the quality of written communication.*)

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....[10]

[Total :15]

3   Insert the most appropriate word or words in the paragraph below on mammalian gas exchange.

The surface area of the lungs is greatly increased by large numbers of structures called

.... which are the sites of gas exchange. The process of exchange is

entirely by .... and this is made more effective by the fact that the

walls of these structures consist of .... Their

surfaces are moist and once oxygen has entered the capillaries it passes into the

.... via the plasma and is rapidly transported away from the site of

exchange, thus maintaining the ....

needed for efficient exchange.

[Total : 5]

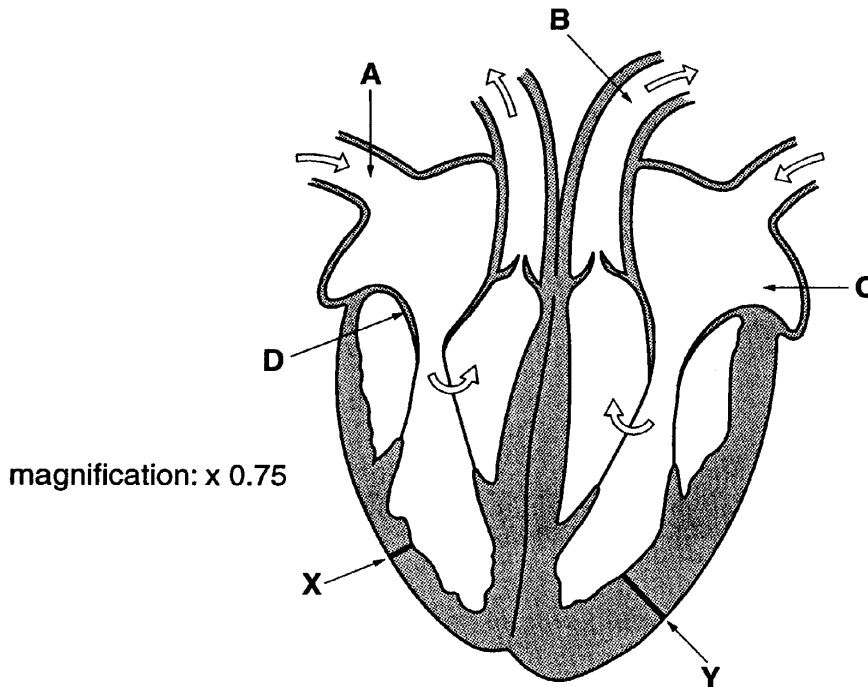4   Fig. 4.1 shows a simplified diagram of the human heart and associated blood vessels in vertical section.

magnification: x 0.75

Fig. 4.1

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

A ....

B ....

C ....

D .... [4]

(b) (i) The actual width of the wall at **X** is 4 mm. Calculate the actual width of the wall at point **Y** using the scale provided. Show your working.

....

....

....[2]

(ii) Explain the significance of this difference in thickness between the walls at **X** and **Y** in terms of the functioning of the heart.

....

....

....

....

....[3]

(c) Complete the table below by adding T (true) or F (false) against the statements about the cardiac cycle.

	T or F
cardiac muscle is myogenic	
contraction occurs in the diastolic phase	
the left and right ventricles contract at the same time	
when the left ventricle contracts, the semilunar valve in the aorta shuts	
the semilunar valves have tendons to prevent inversion	

[5]

[Total : 14]

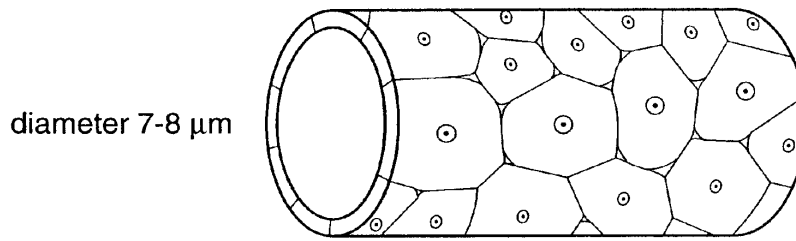**5** Fig. 5.1 shows the structure of a capillary.

diameter 7-8 μm

Fig. 5.1

(a) Complete the table to state **three** features of capillaries which allow them to function effectively and explain how each helps with exchange between the blood and tissue fluid.

feature	explanation of the role in exchange

[6]

Fig. 5.2 shows some of the pressures involved in exchange between a capillary and the tissue fluid around it. **A** and **B** are points at opposite ends of the capillary.

Effective blood pressure = (SP + HP of blood) − (SP + HP of tissue fluid).

HP = hydrostatic pressure produced by the pumping of the heart.
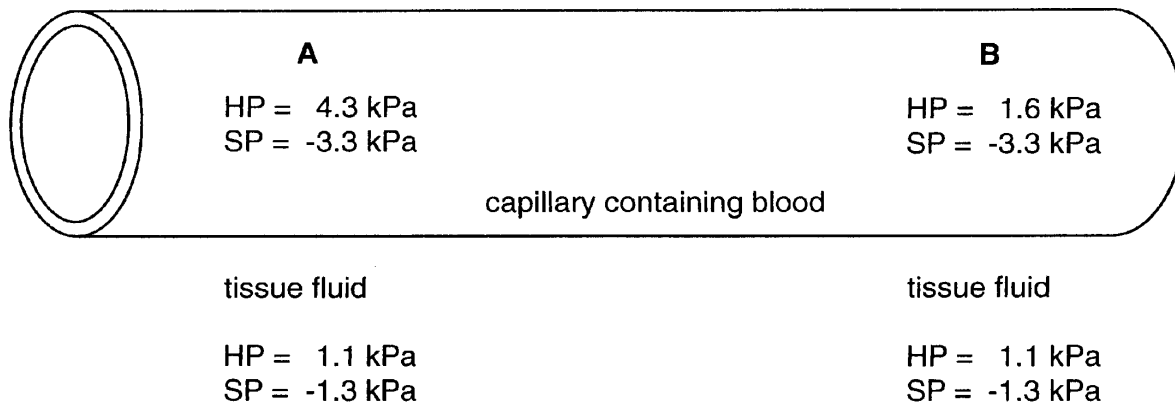SP = solute potential; an osmotic effect due to solutes dissolved in the blood or tissue fluid.

A
HP = 4.3 kPa
SP = -3.3 kPa

B
HP = 1.6 kPa
SP = -3.3 kPa

capillary containing blood

tissue fluid

HP = 1.1 kPa
SP = -1.3 kPa

tissue fluid

HP = 1.1 kPa
SP = -1.3 kPa

Fig. 5.2

(b) The effective blood pressure at **A** is 1.2 kPa.

    (i) Calculate, showing your working, the effective blood pressure at **B**.

    ....

    ....

    ....[2]

    (ii) Mark by means of an arrow on the diagram the direction the fluid will move between the blood and the tissue fluid at **A**. [1]

Some of the tissue fluid does not return to the capillaries, but enters another set of vessels.

(c) Name the fluid in these vessels and describe its composition.

    name ....

    composition ....

    ....

    ....

    ....[4]

[Total : 13]

6 Fig. 6.1 is a plan diagram of a transverse section of a leaf from *Nerium oleander*, a plant adapted to survive in dry areas. Detail of the lower epidermis that lines the stomatal chambers is shown in Fig. 6.2.
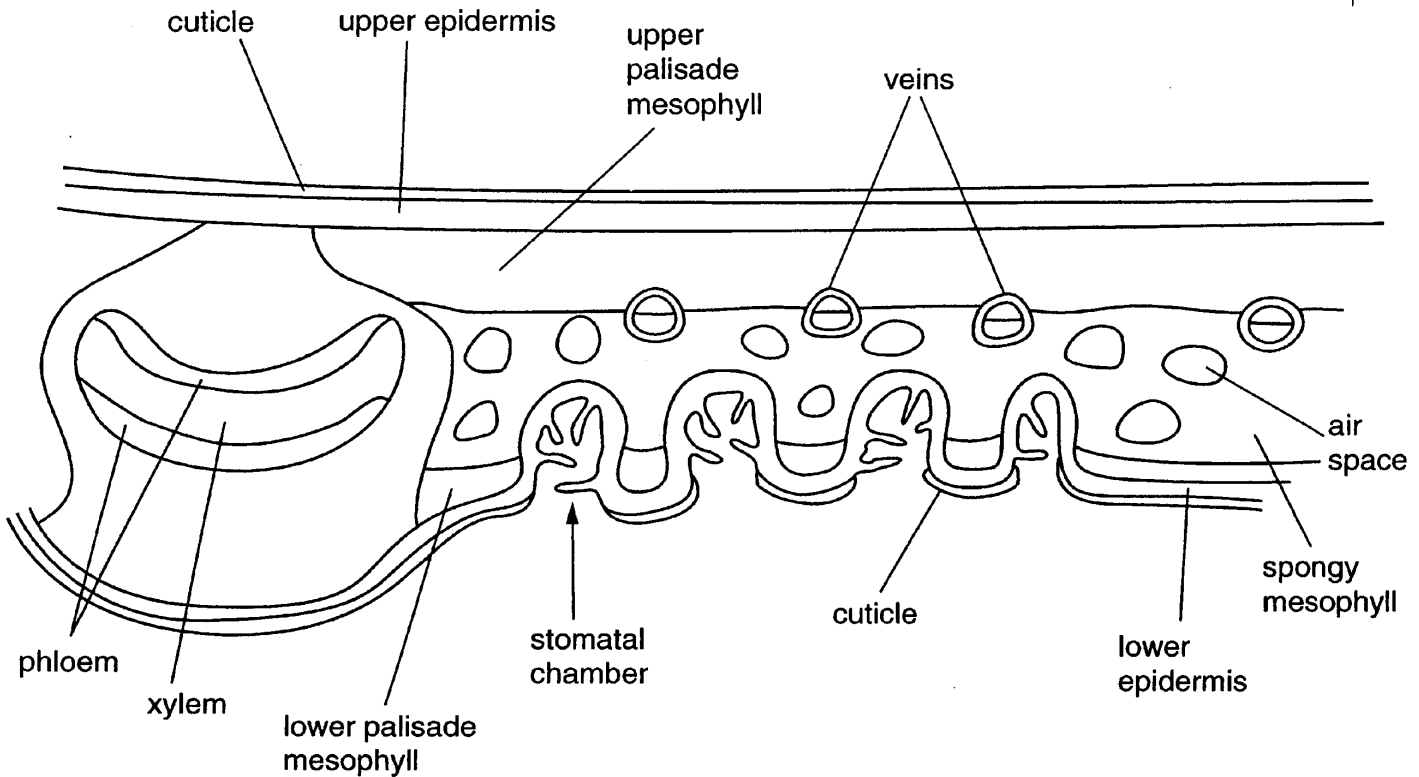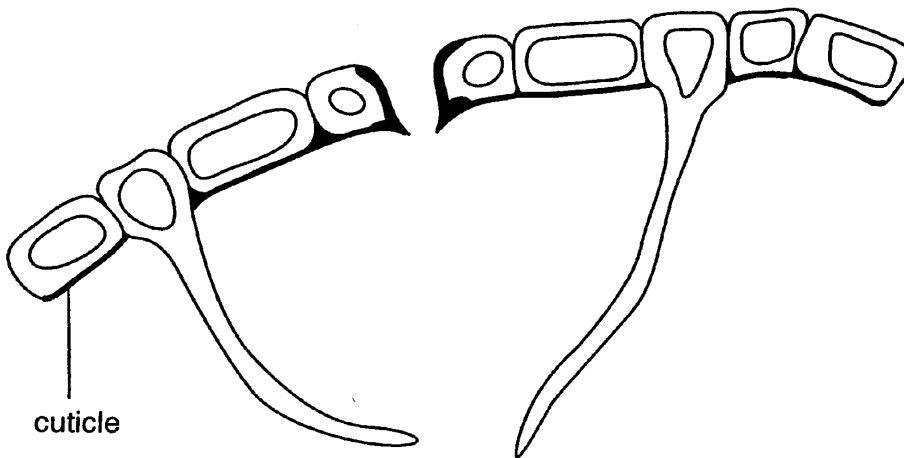

Fig. 6.1

Fig. 6.2

Select **three** of the features shown on Fig. 6.1 and state how each feature helps the plant to survive in dry areas.

feature 1 ....

....

....

feature 2 ....

....

....

feature 3 ....

....

....

[Total : 6]