

**Tuesday 21 May 2013 – Afternoon**

**AS GCE BIOLOGY**

**F211/01** Cells, Exchange and Transport

Candidates answer on the Question Paper.

**OCR supplied materials:**

- Insert (inserted)

**Other materials required:**

- Electronic calculator
- Ruler (cm/mm)

**Duration: 1 hour**

**MODIFIED LANGUAGE**




Candidate forename		Candidate surname	
-----------------------	--	----------------------	--

Centre number						Candidate number				
---------------	--	--	--	--	--	------------------	--	--	--	--

**INSTRUCTIONS TO CANDIDATES**

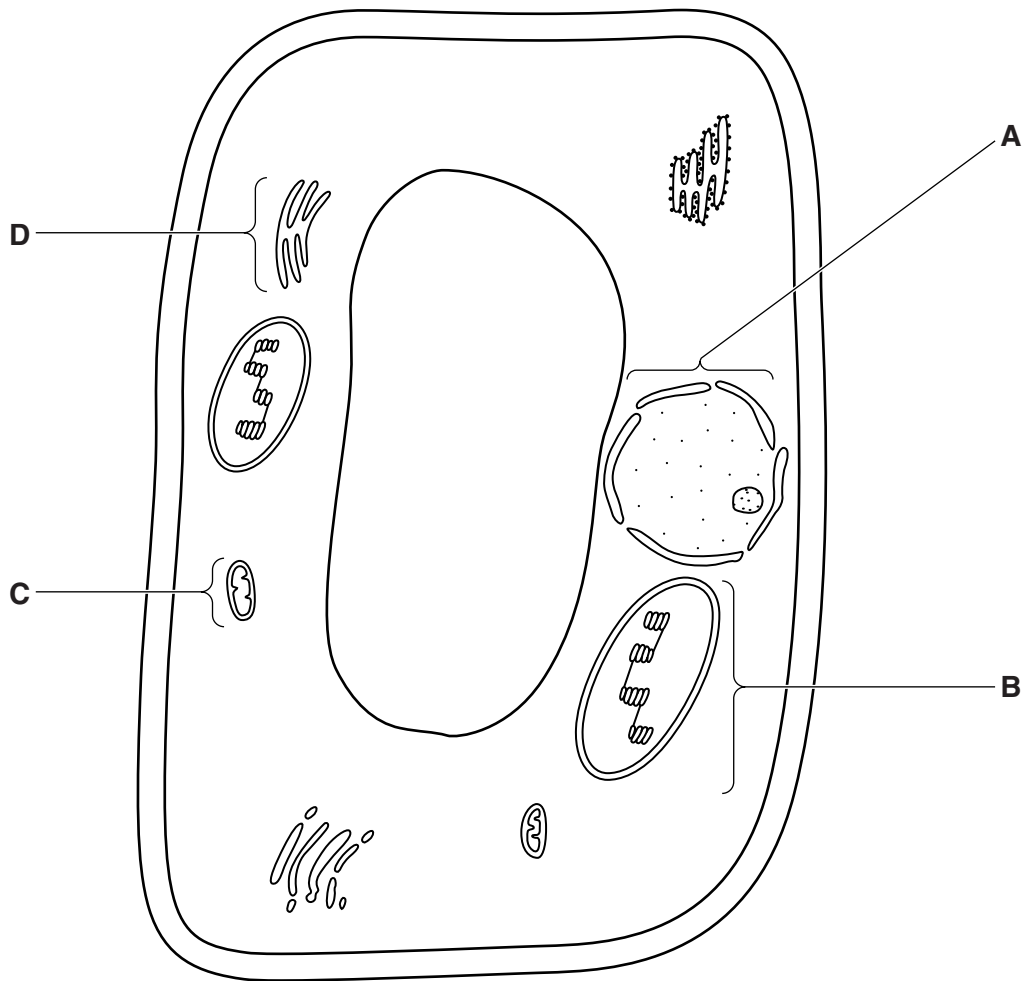
- The Insert will be found in the centre of this document.
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

**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**.
-  Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **16** pages. Any blank pages are indicated.

Answer **all** the questions.

- 1 Fig. 1.1 is a diagram of a plant cell.



**Fig. 1.1**

- (a) (i) Name the cell components labelled **A** and **B**.

**A** .....

**B** .....

[2]

- (ii) State the **functions** of the components labelled **C** and **D**.

**C** .....

.....

.....

**D** .....

.....

.....

[2]

- (b) A student suggested that the details of component **C** could be seen clearly with a very good light microscope.

Explain why the student's suggestion is incorrect.

.....

.....

.....

.....

.....

.....

..... [2]

- (c) Staining is a process often used in microscopy.

Describe the **advantages** of staining specimens to be viewed under a microscope.

.....

.....

.....

.....

.....

..... [2]

[Total: 8]

- 2 A student wanted to measure the rate of diffusion. Cubes of agar jelly containing an indicator were placed into dilute hydrochloric acid. The indicator changes from pink to colourless in acidic conditions.

The student used cubes of different sizes.

The student recorded the time taken for the pink colour of each cube to disappear completely.

The student's results are recorded in Table 2.1.

Length of side of cube (mm)	Surface area of cube (mm <sup>2</sup> )	Volume of cube (mm <sup>3</sup> )	Surface area to volume ratio	Time taken for pink colour to disappear (s)	Rate of diffusion (mm s <sup>-1</sup> )
2	24	8	3.0:1	50	0.020
5	150	125	1.2:1	120	0.021
10	600	1 000		300	0.017
20	2 400	8 000	0.3:1	700	0.014
30	5 400	27 000	0.2:1	1 200	0.013

**Table 2.1**

- (a) (i) Calculate the surface area to volume ratio of the cube with 10 mm sides.

Show your working.

Answer = ..... [2]

- (ii) Describe the relationship between the rate of diffusion and the surface area to volume ratio. Use the data in Table 2.1.

.....

.....

.....

..... [2]

- (iii) Explain the importance of the relationship between rate of diffusion and the surface area to volume ratio for large plants.

.....

.....

.....

.....

.....

.....

..... [2]

- (b) Another student used the same raw data obtained in the experiment but calculated a different rate of diffusion for each cube.

This student's results are shown in Table 2.2.

Length of side of cube (mm)	Time taken for pink colour to disappear (s)	Rate of diffusion (mm s <sup>-1</sup> )
2	50	0.040
5	120	0.042
10	300	0.033
20	700	0.029
30	1200	0.025

**Table 2.2**

In this student's table, the calculation of the rate of diffusion is incorrect.

- (i) Suggest the method used to calculate the rate of diffusion in Table 2.2.

.....

..... [1]

- (ii) State why the method in (b)(i) is incorrect.

.....

.....

.....

..... [1]

(c) The lungs in mammals are adapted to improve efficiency of gaseous exchange.

The table lists some of the adaptations of the lungs.

Complete the table explaining how each adaptation improves efficiency of gaseous exchange.

Adaptation	How this adaptation improves efficiency of gaseous exchange
squamous epithelium	..... ..... .....
large number of alveoli	..... ..... .....
good blood supply	..... ..... .....
good ventilation	..... ..... .....

[4]

[Total: 12]

**BLANK PAGE**

**Question 3 begins on page 8**

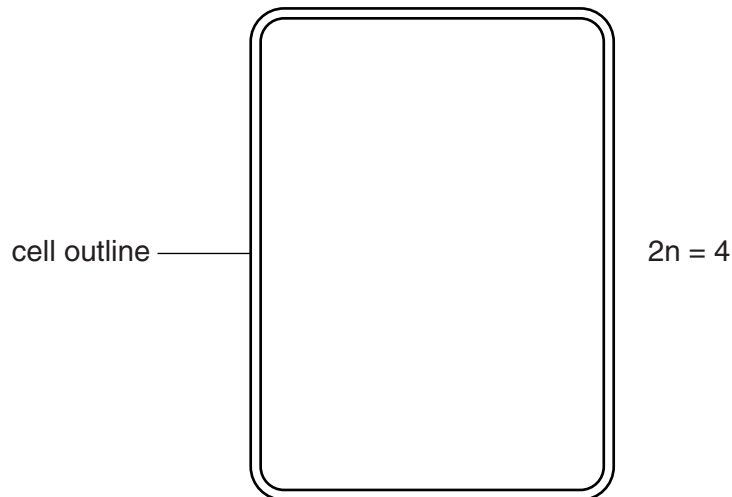
**PLEASE DO NOT WRITE ON THIS PAGE**

- 3 (a) (i) Name the type of nuclear division that occurs in plant growth.

..... [1]

- (ii) Draw the **chromosomes** within the cell outline as they would appear during **metaphase** of nuclear division.

The diploid number of chromosomes is **four**.



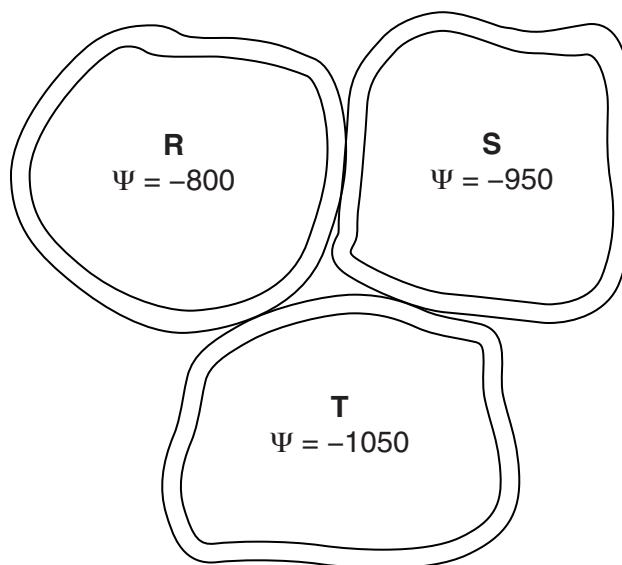
[2]

- (iii) Cytokinesis follows nuclear division.

After cytokinesis, the cells elongate due to water uptake by osmosis.

Fig. 3.1 shows three plant cells. The value shown in each cell refers to the water potential,  $\Psi$ , in kPa.

**Draw arrows on Fig. 3.1** to show the movement of water between cells **R**, **S** and **T**.



[2]

**Fig. 3.1**



- (b) Fig. 3.2, **on the insert**, shows the stump of a tree with new branches growing from the stump.

New growth in a stem or trunk comes from the **cambium**. The cambium is situated between the xylem and phloem tissues.

Explain why the new branches in Fig. 3.2 are seen growing from a position just under the bark of the cut surface.

.....

.....

.....

.....

..... [2]

- (c) Name **one** other place where growth occurs in a plant.

..... [1]

- (d) Look at the areas labelled **L** on Fig. 3.2.

These are areas of loosely packed cells in the bark called lenticels. Lenticels allow gases to diffuse into the living tissues of the trunk.

Suggest why lenticels are essential to the survival of large multicellular plants. Explain why similar structures are not found in large multicellular animals.

.....

.....

.....

.....

.....

..... [2]

[Total: 10]



Suggest why this treatment might help adults with sickle cell anaemia.

..... [2]

- 

*In your answer you should use appropriate technical terms, spelled correctly.*

[4]

**Turn over**

..... [2]



[5]

- (c) (i) Name the component of a cell membrane that becomes more fluid as temperature increases.

..... [1]

- (ii) Name the component of a cell membrane that denatures as temperature increases.

..... [1]

- (iii) Liver cells contain membrane-bound organelles called peroxisomes.

These organelles contain catalase, an enzyme that breaks down hydrogen peroxide to release oxygen gas.

A student carried out an investigation on catalase using the following procedure:

- two identical sized cubes were cut from a piece of fresh liver
- one cube was frozen overnight and then defrosted
- the other cube was stored in the refrigerator
- both cubes were returned to room temperature. They were placed in separate test tubes containing equal volumes of 2% hydrogen peroxide solution.

The student observed that the cube of liver that had been frozen and defrosted, bubbled significantly more than the cube that had been in the refrigerator.

Suggest an explanation for this result.

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

[Total: 11]

- 6 (a) Distinguish between the term *transpiration* and the *transpiration stream*.

.....

.....

.....

.....

.....

.....

..... [3]

- (b) Xerophytes are plants that are adapted to living in dry conditions.

The lists describe four general features of leaves.

From each list, select the leaf that belongs to a xerophyte.

Place a tick (✓) in the correct box. The first one has been done for you.

**Presence of hairs on leaves**

Leaf A	no	
Leaf B	yes	✓
Leaf C	no	

**Mean number of stomata (cm<sup>-2</sup>)**

Leaf D	30 000	
Leaf E	23 000	
Leaf F	13 000	

**Mean surface area of one leaf (cm<sup>2</sup>)**

Leaf G	0.2	
Leaf H	10.0	
Leaf I	23.0	

**Thickness of cuticle (μm)**

Leaf J	4.25	
Leaf K	8.50	
Leaf L	2.00	

[3]

- (c) The transport system of multicellular plants consists of xylem and phloem tissue.

The table shows the contrasts between the structure and roles of xylem and phloem.

Complete the table using the most appropriate word or words.

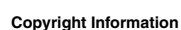
<b>Xylem</b>	<b>Phloem</b>
xylem transports water and .....	phloem transports assimilates such as .....
.....	sieve tubes contain perforated cross walls
xylem vessel walls are impregnated with .....	sieve tube walls have no additional support
xylem vessel walls contain ..... that allow water to pass into adjacent vessels	there are many gaps in the cell walls between companion cells and sieve tube elements called .....

[4]

[Total: 10]

**END OF QUESTION PAPER**

This image shows a blank sheet of white paper designed for writing. It features a series of evenly spaced horizontal blue lines across its entire width. A single vertical red line runs down the left side, creating a narrow margin. The paper is otherwise completely empty, with no text or markings.



OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.