UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

*8376729673*

**BIOLOGY** **9700/31**

Advanced Practical Skills 1 **May/June 2012**

**2 hours**

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black ink.
You may use a pencil for any diagrams, graphs or rough working.
Do **not** use red ink, staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

| For Examiner's Use | |
|---|---|
| 1 | |
| 2 | |
| Total | |

This document consists of **9** printed pages and **3** blank pages.


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You are reminded that you have **only one hour** for each question in the practical examination.

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You should:

- Read carefully through **the whole** of Question 1 and Question 2.
- Plan your use of **the time** to make sure that you finish all the work that you would like to do.

You will **gain marks** for recording your results according to the instructions.

**1** When onion cells are placed into a sodium chloride solution with a higher concentration than the cells, water leaves the vacuoles and the cells become plasmolysed.

You are provided with three samples of onion tissue, each soaked in a different concentration of sodium chloride solution, labelled **S1**, **S2** and **S3**.

The three concentrations of sodium chloride solution are 0.25 mol $dm^{-3}$, 0.50 mol $dm^{-3}$ and 1.0 mol $dm^{-3}$.

The onion tissue in **S1** is in 1.00 mol $dm^{-3}$ sodium chloride solution.

You are required to:

- observe and record the cells in **S1** and the effect of adding water, **W**, to these cells
- observe and record the onion cells to identify the concentration of the sodium chloride solutions, **S2** and **S3**.

You are advised to read steps 1 to 12 before proceeding.

Proceed as follows:

1. Label one **dry and clean** microscope slide **S1** and put the slide on a paper towel.
2. Put a few drops of the sodium chloride solution from **S1** onto the slide.
3. Remove a piece of the onion tissue from solution **S1** and, using forceps or fingers, peel off the inner concave epidermis as shown in Fig. 1.1.

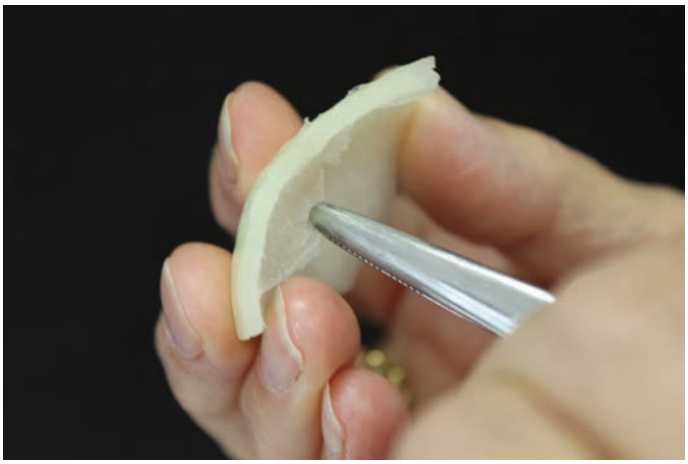


**Fig. 1.1**

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4. Cut one piece of the epidermis to fit under the coverslip. Replace the remaining epidermis into the solution in **S1**.

5. Place the epidermis into the sodium chloride solution on the slide as shown in Fig. 1.2. If the epidermis is folded, you may need to add more drops of sodium chloride solution so that it floats and uncurls. It is important to stop the epidermis from drying out.

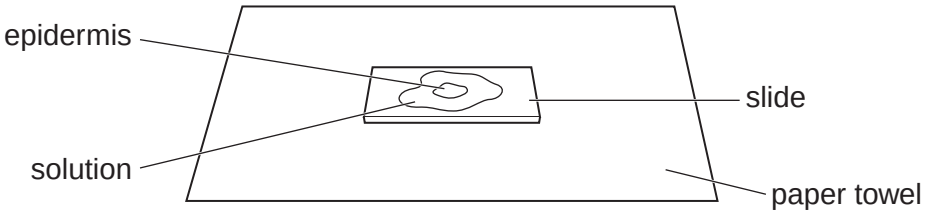



**Fig. 1.2**

6. Cover the epidermis on the slide with a coverslip and use a paper towel to remove any excess liquid that is outside the coverslip.

7. View the slide using the microscope. You may need to reduce the amount of light entering the microscope to observe the cells clearly.

**(a) (i)** Make a large drawing of two adjacent (touching) cells which show the effect of soaking the cells in the 1.00 mol $dm^{-3}$ sodium chloride solution, **S1**.

Label a cell membrane.

[4]

**(ii)** Describe how you will obtain **quantitative** results to identify the concentration of the sodium chloride solutions, **S2** and **S3**, compared with **S1**.

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.....

.....

.....

.....

..... [2]

**(b) (i)** Prepare the space below to record your quantitative results as you have described in **(a)(ii)**.

[5]

8. Record the result for **S1**.

9. Take the slide off the microscope and remove the coverslip.

10. Remove as much of the 1.00 mol $dm^{-3}$ sodium chloride solution as you can and put a few drops of **W** onto the epidermis. Replace the coverslip and leave the slide until step 12.

11. Repeat steps 1 to 8 with **S2** and **S3** (note: you do not need to repeat **(a)(i)**).

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**(ii)** Identify the concentrations of sodium chloride solution in **S2** and **S3**. Complete the table.

| solution | concentration of sodium chloride solution / mol $dm^{-3}$ |
|---|---|
| **S1** | 1.00 |
| **S2** | |
| **S3** | |

[1]

**(iii)** Describe how you identified the concentrations of sodium chloride.

.....

.....

.....

.....

..... [2]

12. Put the **S1** slide onto the microscope and select two adjacent cells to show the difference in the cells after adding the water compared with those drawn in **(a)(i)**.

**(c) (i)** Make a large labelled drawing of these two adjacent (touching) cells.

Label a cell wall.

[3]

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**[Turn over**

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**(ii)** Use your knowledge and understanding of plasmolysis to explain how and why the cells changed when they were left in water.

.....

.....

.....

.....

..... [2]

**(d)** Suggest how you would modify this investigation to find the **water potential** of the onion cells.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 22]

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**2** You are required to investigate the effect of staining the tissues of sweet banana with iodine solution.

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You are provided with a piece of sweet banana.

Proceed as follows:

1. Cut a transverse (cross) section of the banana, approximately 5 mm thick, including the outer skin, as shown in Fig. 2.1.

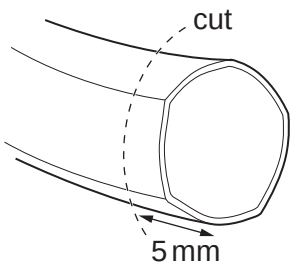



**Fig. 2.1**

**(a) (i)** Draw a large plan diagram of the transverse section.

[4]

2. Put two or three drops of iodine solution on the surface of the transverse section of the banana and spread out the iodine solution.

**(ii)** Observe the effect of iodine solution on the different tissues.

Annotate the diagram in **(a)(i)** to describe the effect of staining with iodine solution on the different tissues. [1]

**(iii)** Describe the pattern of staining that you observe.

.....

..... [1]

**(b) (i)** Calculate the ratio of the mean of the total width of the section to the mean width of the outer skin.

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You may lose marks if you do not show your working or if you do not use appropriate units.

[3]

**(ii)** State the value of the smallest division on the ruler used to measure the widths in **(b)(i)**. .....

State the actual error in measuring the widths in **(b)(i)**. ..... [1]

Table 2.1 shows some of the components in 100 g of plantain and sweet banana.

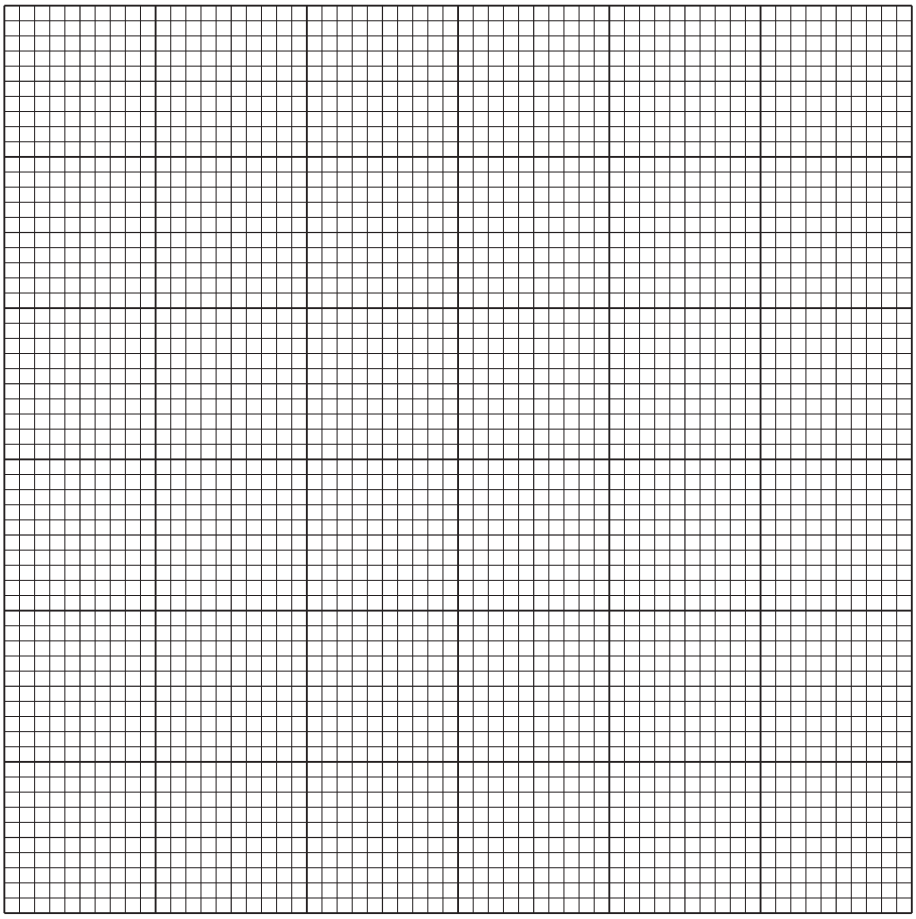
**Table 2.1**

| component | percentage mass | |
|---|---|---|
| | **plantain** | **sweet banana** |
| fat | 0.50 | 0.25 |
| carbohydrate | 28.00 | 19.50 |
| protein | 1.50 | 1.75 |
| fibre and others | 2.00 | 2.50 |

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**(c)** Plot a chart of the data in Table 2.1.

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[4]

The components in Table 2.1 make up a certain percentage of the total mass of the plantain and sweet banana. Water makes up the balance of the total mass.

**(d)** Calculate the difference in percentage water content between plantain and sweet banana.

You may lose marks if you do not show your working or if you do not use appropriate units.

..... % [4]

[Total: 18]

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