Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

BIOLOGY **9700/33**

Advanced Practical Skills 1 **May/June 2015**

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 pen.
You may use an HB pencil for any diagrams or graphs.
Do **not** use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
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 **13** printed pages and **3** blank pages.

CAMBRIDGE International Examinations

[Turn over

Before you proceed, read carefully through **the whole** of Question 1 and Question 2.

Plan the use of the two hours to make sure that you finish all the work that you would like to do.

If you have enough time, consider how you can improve the accuracy of your results, for example by obtaining and recording one or more additional measurements.

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

1 When onion cells are placed into a solution, water will move depending on the water potential inside the cells and the water potential of the surrounding solution.

The water potential of a solution depends on both the concentration and the type of molecule dissolved.

You are required to:

- identify **S1**, **S2** and **S3** by carrying out tests for carbohydrates, using the reagents provided
- investigate the effect of water and each of the solutions **S1**, **S2** and **S3** on onion cells.

You are provided with:

labelled	contents	hazard
S1, **S2** and **S3**	see below	none
W	water with one piece of onion tissue	none

Each of **S1**, **S2** and **S3** contains a piece of onion tissue and one of the following:

- a mixture of sucrose solution and glucose solution
- sodium chloride solution
- starch solution.

By using **only two** of the biological molecule tests for carbohydrates, you should be able to identify the solutions, **S1**, **S2** and **S3**.

(a) (i) Identify **S1**, **S2** and **S3** by carrying out tests using the apparatus and reagents provided. Decide which biological molecule to identify in the **first** test.

Complete the following:
First test: Test for .....

Describe how you will use the reagent(s) to carry out this test.

.....

.....

.....[1]

Carry out the **first test** and record your observations in **(a)(iii)**.

(ii) Decide which biological molecule to identify in the **second** test.

Complete the following:
Second test: Test for .....

Describe how you will use the reagent(s) to carry out this test.

.....

.....

.....[1]

Carry out the **second test** and record your observations in **(a)(iii)**.

(iii) Prepare the space below and record your observations for each test.

[3]

(iv) Complete the table to identify **S1**, **S2** and **S3**.

molecule(s)	**solution**
mixture of sucrose and glucose	
sodium chloride	
starch	

[1]

When carrying out a practical procedure, the hazards of the use of all the apparatus and all of the reagents need to be considered, then the level of risk needs to be assessed as low or medium or high.

(v) State the hazard with the greatest level of risk when using the apparatus and reagents to **test S1**, **S2** and **S3** for biological molecules.
State the level of risk of the procedure: low or medium or high.

hazard .....

level of risk .....

[1]

You are required to investigate the effect of water, **W**, and each of the solutions, **S1**, **S2** and **S3**, on the cells of the epidermis of onion.

(b) (i) Complete the sentence below by choosing from the following words:

enters **leaves** **plasmolysed** **turgid**

You may use each word once or more than once or not at all.

When onion cells are placed into a solution with a more negative water potential than the cells, water ..... the vacuoles and the cells become ..... .

[1]

You are required to investigate the effect of water and **each** of the solutions on the onion cells by:

- observing 10 cells in one field of view
- counting and recording the number of these cells which are plasmolysed
- making a drawing of one typical cell from each of **W** and **S1**.

Proceed as follows:

1. Label one **clean, dry** microscope slide '**W**' and put the slide on a paper towel.

2. Put a few drops of **W** onto the slide.

3. Remove a piece of the onion tissue from **W** and, using forceps or fingers, peel off the inner epidermis, as shown in Fig. 1.1.

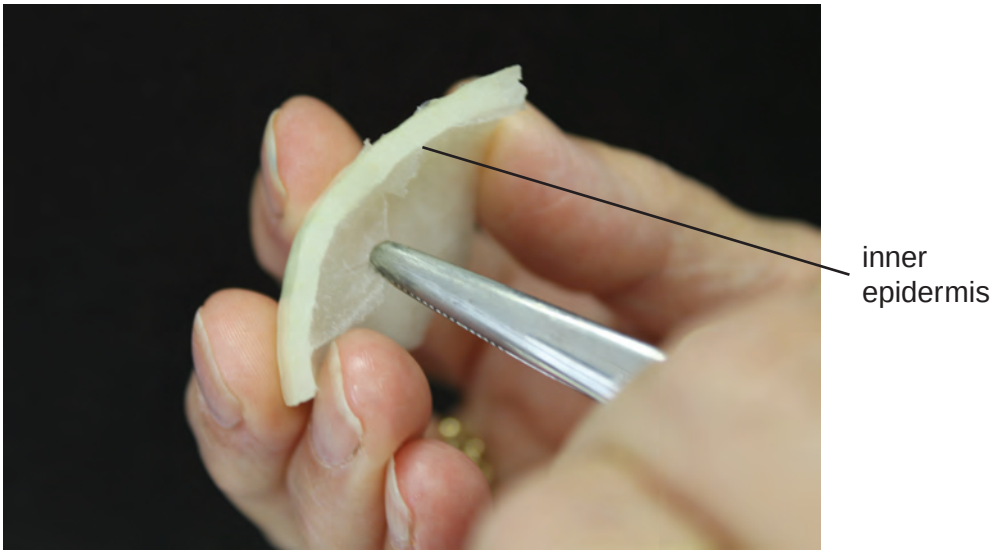


Fig. 1.1

4. Cut one piece of the epidermis that will fit under a coverslip. Replace the remaining epidermis into **W**.

5. Place the epidermis on the slide as shown in Fig. 1.2. If the epidermis is folded, you may need to add more drops of **W** so that it floats and uncurls.

6. It is important to prevent the epidermis from drying out so add more drops of **W** if needed.

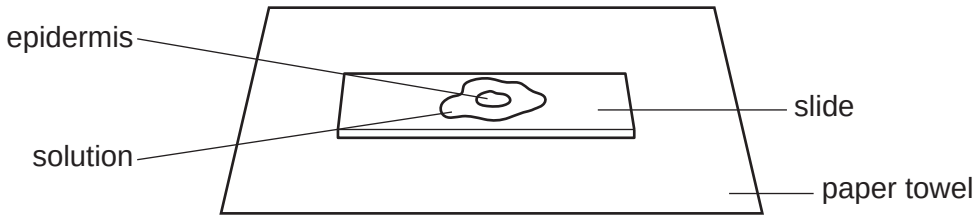


Fig. 1.2

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

8. Select an area of cells which show the effect of **W**. Observe 10 cells and record in **(b)(ii)** the number of these cells which show signs of plasmolysis.

9. Repeat step 8 for a different field of view.

You may need to reduce the amount of light entering the microscope to observe cells clearly.

10. Repeat steps 1 to 9 using the piece of onion from **S1** and mounting the piece of epidermis in the solution from **S1**.

11. Repeat steps 1 to 9 using the piece of onion from **S2** and then the piece of onion from **S3**.

(ii) Prepare the space below and record your results.

[3]

(iii) Identify **one** significant error in measuring the dependent variable.

.....

.....[1]

You are required to use a sharp pencil for drawings.

(iv) Make a drawing of one cell from the epidermis in **W** and one cell from the epidermis in **S1**. The cells you choose must show the effect of **W** and **S1**.

Use **one** ruled label line and label to identify the cytoplasm in **each** cell.

*cell from epidermis in **W***

*cell from epidermis in **S1***

[4]

(v) Explain, using your knowledge of the movement of water, the effect of **S1** and **S3** on the cells of the epidermis.

S1

.....

.....

.....

S3

.....

.....

.....

[3]

[Total: 19]

2 **(a)** A student used a model to study the loss of water from stomata in leaves.

At the start of the investigation the model was set up as shown in Fig. 2.1.

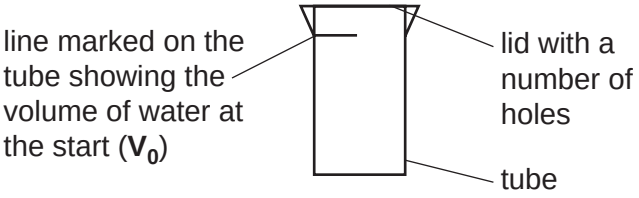


Fig. 2.1

The student investigated the effect that different numbers of holes in the lids had on the evaporation of water from the tube.

Each tube was set up with a lid with either 5 or 10 or 15 or 20 holes.

The tubes were left for 9 days and then the volume of the water remaining was marked with a second line on the tube. The volume of water at the start, $\mathbf{V_0}$, and the volume of water after 9 days, $\mathbf{V_9}$, were measured.

The volume of water lost by evaporation was calculated.

You are provided with four tubes labelled **1**, **2**, **3** and **4**. Each tube is marked with lines to show the volume of water at the start and after 9 days.

You are required to:

- measure the volume of water at the start of the investigation in each tube, $\mathbf{V_0}$
- measure the volume of water remaining in each tube after the 9 days, $\mathbf{V_9}$
- calculate the volume of water lost by evaporation in each tube (processed results).

(i) Describe how you will measure the volumes $\mathbf{V_0}$ and $\mathbf{V_9}$ (raw results) using the apparatus provided.

.....

.....

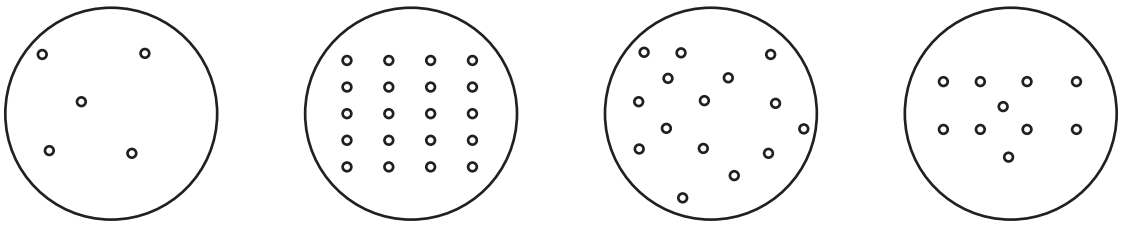
.....[1]

Carry out your method as described in **(a)(i)** for each of the four tubes and record your raw results and processed results in **(a)(ii)** on page 9.

(ii) Prepare the space below and record your raw and processed results.

[4]

Fig. 2.2 shows four lids labelled **P**, **Q**, **R** and **T**.



lid **P** lid **Q** lid **R** lid **T**

Fig. 2.2

(iii) Using your processed results, complete the table below to show which lid was used to cover which tube.

tube label	**lid used to cover the tube**
1	
2	
3	
4	

[1]

(iv) A control experiment is set up to make sure that the trend in the results is caused by the variable under investigation and not by some other variable.

Describe a control experiment for this investigation.

.....

.....[1]

(v) The student wanted to increase the rate of evaporation from the tubes, without removing the lid or altering the number or size of the holes.

Describe how the student could have changed the procedure to increase the rate of evaporation.

.....

.....

.....

.....[2]

A student investigated the relationship between the total circumference of the holes and rate of evaporation.

The student repeated the investigation with different lids with 0 or 5 or 10 or 20 holes. All the holes had the same diameter.

The student processed the results by calculating the total circumference of the holes and the rate of evaporation of water per day.

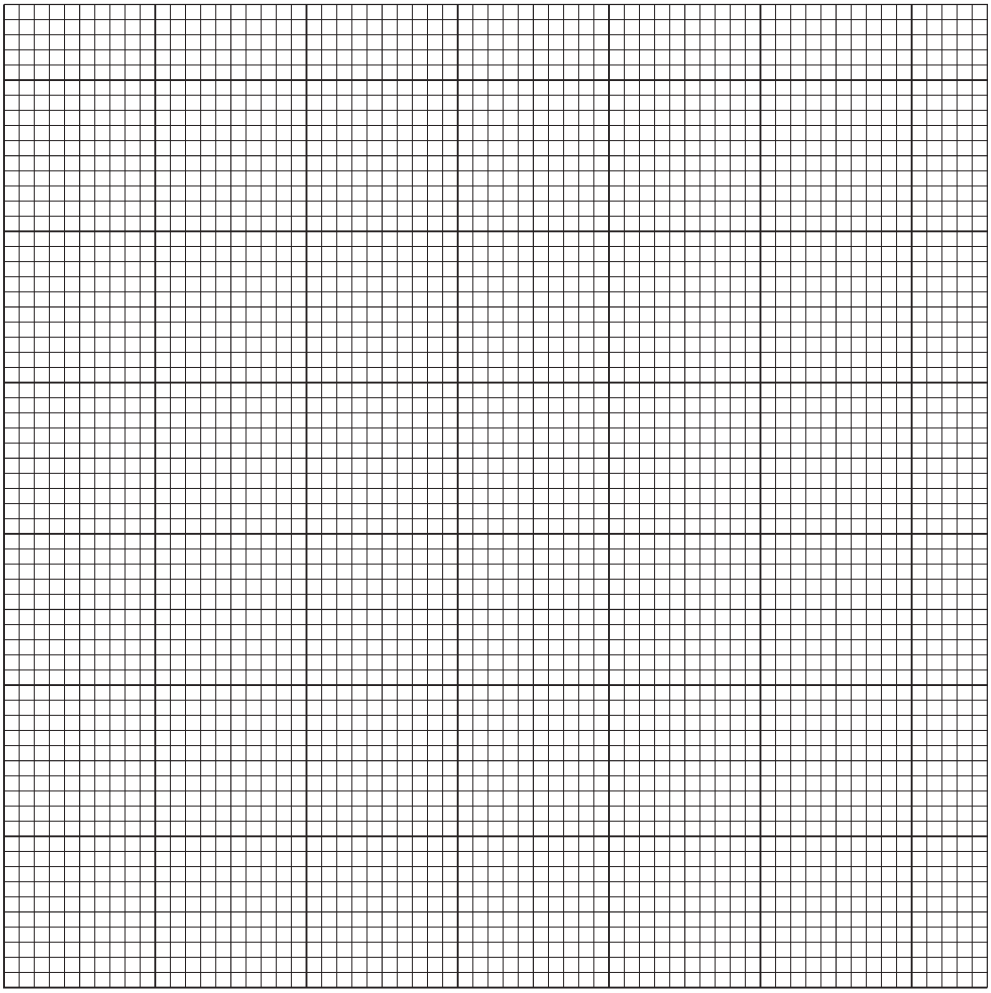
The processed results are shown in Table 2.1.

Table 2.1

total circumference of holes / mm	**rate of evaporation of water / cm^3 day^{-1}**
0.00	0.22
7.75	0.53
15.50	0.85
23.25	1.17
26.00	1.28

You are required to use a sharp pencil for graphs.

(b) Plot a graph of the data shown in Table 2.1.



[4]

(c) Fig. 2.3 is a stained transverse section through a plant stem.
You are not expected to be familiar with this specimen.

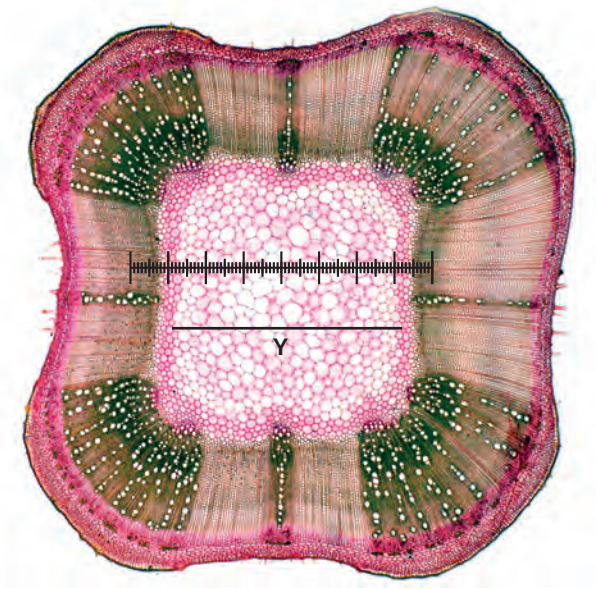


Fig. 2.3

Draw a large plan diagram of the quarter of the stem as shown in Fig. 2.4.

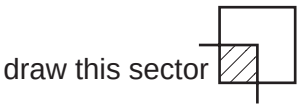


Fig. 2.4

[4]

(d) A student calibrated the eyepiece graticule in a light microscope using a stage micrometer scale so that the actual length of the tissues could be found.

The calibration was: one eyepiece graticule division equal to 0.024 mm.

(i) The use of the unit mm is **not** the most appropriate unit for use with the light microscope.

State which unit is most appropriate for use with the light microscope and show how 0.024 mm is converted to this unit.

You may lose marks if you do not show your working.

unit .....[2]

(ii) Fig. 2.3 shows a photomicrograph taken using the same microscope with the same lenses as the student.

Use the calibration of the eyepiece graticule division from **(d)(i)** and Fig. 2.3 to calculate the actual total width of the pith, shown by line **Y**.

You may lose marks if you do not show all the steps in your calculation and do not use appropriate units.

actual total width .....
[2]

[Total: 21]

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