Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **9700/34**

Advanced Practical Skills 2 **October/November 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

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 plant tissue is soaked in methylene blue solution, the stain enters the tissue and colours it blue. When the stained plant tissue is placed into a salt solution, methylene blue is released.

You are required to investigate the effect of different surface areas (independent variable) on the release of methylene blue from pieces of stained plant tissue.

You are provided with:

labelled	contents	hazard	volume /cm^3
S	salt solution *(sodium chloride)*	none	250

labelled	contents	hazard	details	quantity
P	plant tissue stained with methylene blue	methylene blue will stain your skin	same cross-sectional area, stained with methylene blue and washed	4 pieces

If any methylene blue comes into contact with your skin wash off immediately with water.

It is recommended that you wear safety glasses/goggles.

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

(a) State the hazard with the greatest level of risk when carrying out step 1 on page 4.
State the **level** of risk of the procedure: low or medium or high.

hazard .....

.....

level of risk .....
[1]

You are required to prepare pieces of plant tissue with different surface areas.

(b) Each piece of plant tissue has the same cross-sectional area. The largest piece needs to be cut to a length of **4 cm** by removing **each end**.

(i) Complete Fig. 1.1 to show how you will cut further pieces which reduce the length by half between each piece of plant tissue. *Fig. 1.1 is not drawn to scale*.

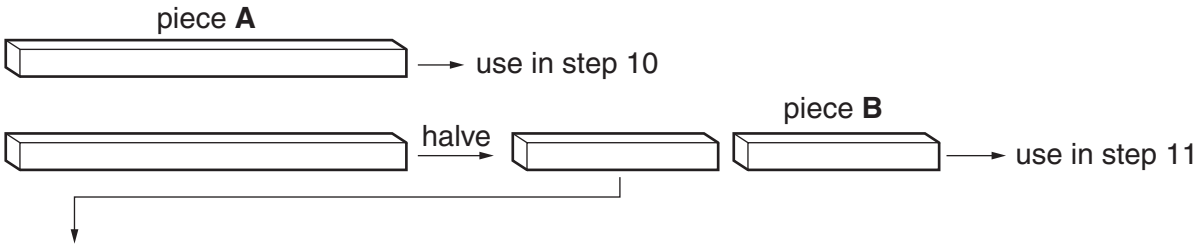


Fig. 1.1

[1]

(ii) Complete the table to show for each piece in **(b)(i)**:
- the dimensions of the piece of plant tissue
- the surface area of each piece.

piece	dimensions / mm	surface area / mm^2
A	*5 × 5 × 40*	850

[2]

Proceed as follows:

Always use blunt forceps when handling the plant tissue to avoid contact with the methylene blue solution.

1. Remove the pieces of plant tissue from the container, labelled **P**, and place them onto a white tile.

2. Prepare the pieces of plant tissue as stated in **(b)(ii)**.

3. Any pieces of plant tissue which you do not need should be put into the beaker labelled '**For waste**'.

You will need to prepare a number of pieces of plant tissue to enable you to have confidence in your results.

4. Empty the coloured water from the container labelled **P**.

5. Put the pieces of plant tissue into the empty container labelled **P** and cover with water from the beaker labelled '**Tap Water**'.

6. Change the tap water five times, either using a syringe or by pouring off the water.

Fig. 1.2 shows how you will set up the apparatus for each piece of plant tissue.

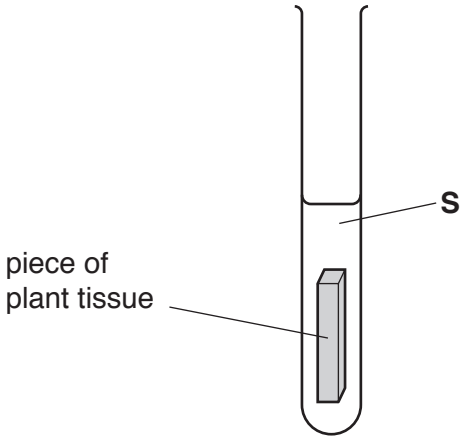


Fig. 1.2

(iii) Describe how you will standardise the volume of **S** for each piece of plant tissue.

.....

.....

.....[1]

7. Label one test-tube as 850 (surface area in mm^2 of piece **A**).

8. Repeat step 7 for each of the other surface areas as in **(b)(ii)**.

9. Put the volume of **S** into **each** of the test-tubes as described in **(b)(iii)**.

10. Put piece **A** into the test-tube labelled 850.

11. Repeat for the other pieces of plant tissue, matching the surface area to the label on the test-tube.

12. Leave for 5 minutes.

While you are waiting continue with Question 1.
After 5 minutes you will need to remove the plant tissue from each test-tube so that the colour of each solution can be recorded.

13. After 5 minutes, pour the solution **and** the piece of plant tissue from **one** of the test-tubes into the beaker labelled **R**.

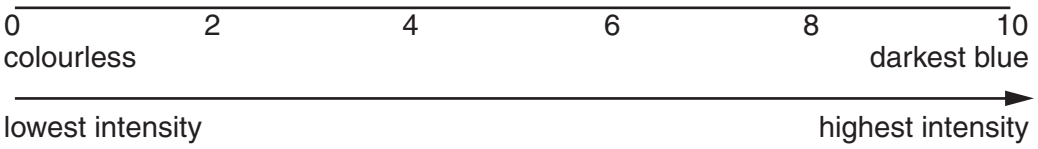
14. Put the piece of plant tissue into the container labelled '**For waste**'. Put the solution back into the test-tube.

15. Rinse beaker **R** with tap water.

16. Repeat step 13 to step 15 with each of the remaining test-tubes.

17. Put the test-tubes into the test-tube rack in the order of the intensity (quantity) of blue colour from lowest intensity to highest intensity.

18. Observe the colour in the test-tubes and use the number scale below to match each test-tube to an intensity of colour.



19. Record the results in **(b)(iv)** on page 6.

[Turn over

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

[6]

(v) *A student suggested:*

'The ruler used to measure the pieces of plant tissue resulted in both systematic error and random error.'

State which type of error, systematic or random, could affect the trend in the results. Give a reason for your answer.

type of error .....

reason .....[2]

(vi) Explain how the methylene blue solution was released from the stained plant tissue.

.....

.....

.....[1]

(vii) This procedure investigated the effect of different surface areas of stained plant tissue when placed into a salt solution.

To modify this procedure for investigating another variable, the independent variable (surface area) would need to be standardised.

Describe how the independent variable (surface area) would be standardised.

.....

.....

Consider how you would modify this procedure to investigate the effect of **temperature** on the stained plant tissue.

Describe how the independent variable, **temperature**, will be investigated.

.....

.....

.....

.....[3]

[Total: 17]

Check that you have finished the whole of Question 1.

2 Some plant cells, for example in roots, store starch as grains.

Fig. 2.1 shows some different shapes of starch grains and patterns in the surface of the starch grains.

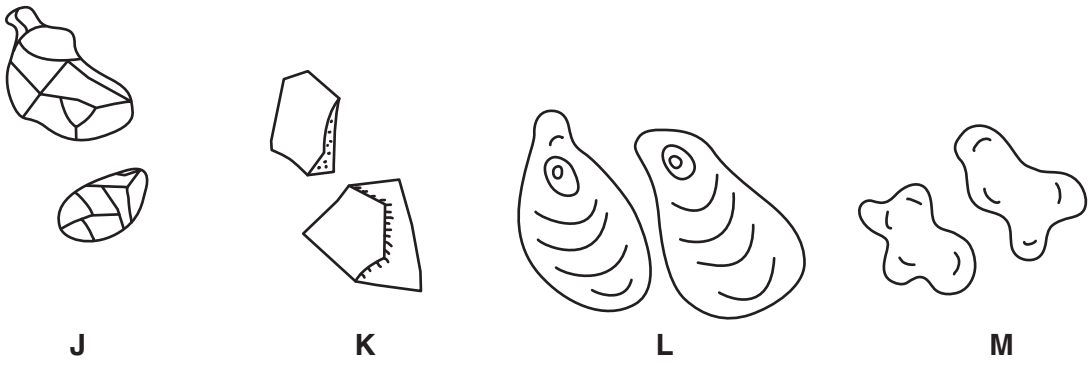


Fig. 2.1

You are required to:
- observe and draw the starch grains from potato cells
- observe the effect of iodine stain on starch grains.

You are provided with a piece of peeled potato tuber in a dish, labelled **T**, water in a container, labelled **W**, and iodine solution in a container labelled **I**.

1. Put one **clean and dry** microscope slide on a piece of black card with a paper towel underneath as shown in Fig. 2.2.

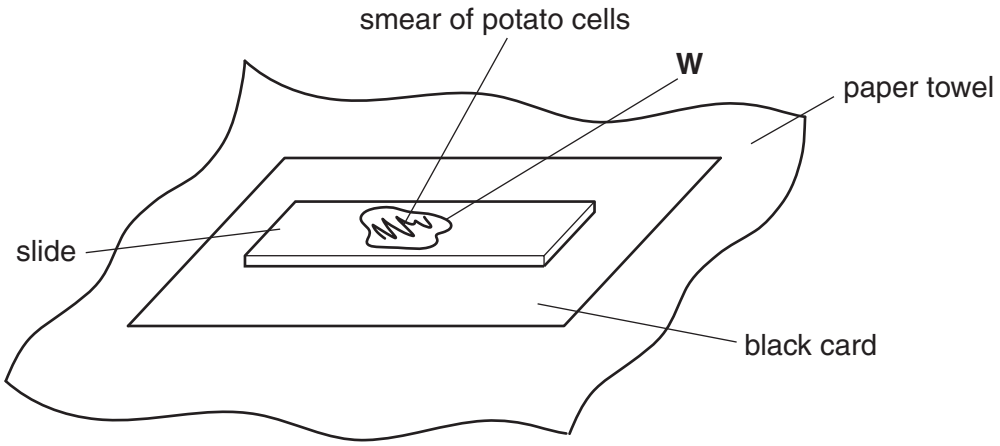


Fig. 2.2

2. Using a sharp blade or scalpel, cut the piece of potato to show a fresh surface.

3. Scrape the fresh surface of the piece of potato to remove a small quantity of tissue.

4. Put this tissue onto the slide and use the flat surface of the blade to squash this tissue.

5. Use forceps to remove any larger bits of tissue so that a smear of cells can be seen on the slide.

6. Put a few drops of **W** onto the smear of cells.

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

8. View the slide to observe the starch grains using the microscope. Select an area of starch grains on the slide.

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

You must adjust the fine focus to observe the patterns in the starch grains.

You are required to use a sharp pencil for drawings.

(a) Select **6** starch grains which show the different sizes and features of the grains.

(i) Make a large drawing of these 6 starch grains.

[5]

(ii) Use Fig. 2.1 to suggest which of the starch grains, **J**, **K**, **L** or **M** matches some of the grains observed on the slide.

answer .....[1]

9. Remove the slide from the microscope and place it on a paper towel.

You will now add solution **I** to the water on the slide without removing the coverslip.

10. Put a drop of solution **I** onto the slide so that the drop touches the **edge** of the coverslip. Wait a few seconds while the solution **I** moves under the coverslip. Use the paper towel to remove any excess liquid from the top of the coverslip.

11. Immediately use the microscope to observe the starch grains where there is solution **I** on the slide.

(iii) Suggest why using solution **I** as a stain may lead to inaccurate recording of the features of starch grains.

.....

.....[1]

(b) Scientists investigated the mean size of starch grains in cells from five different types of maize **D**, **E**, **F**, **G** and **H**.

The results are shown in Table 2.1.

Table 2.1

type of maize	size of starch grain / μm					mean size of starch grains / μm
	1	2	3	4	5	
D	16.240	16.255	16.525	16.260	16.245	
E	16.725	16.730	16.715	16.730	16.725	16.725
F	17.195	17.205	17.200	17.198	17.202	17.200
G	16.975	16.980	16.970	16.976	16.974	16.975
H	17.945	17.950	17.955	17.940	17.960	17.950

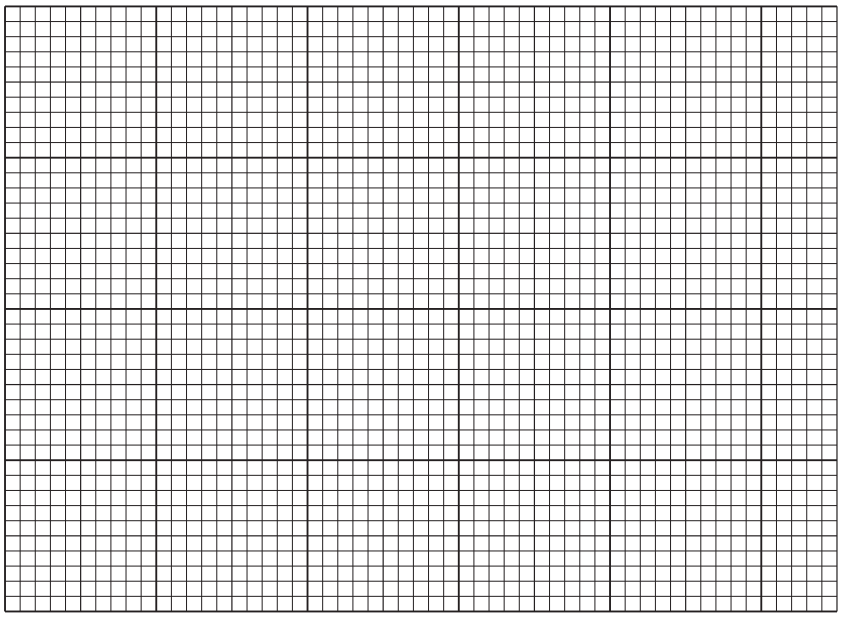
(i) Circle the anomalous result in Table 2.1. [1]

(ii) Complete the table by calculating the missing mean value. [1]

You are required to use a sharp pencil for charts.

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

*Note: To plot the data clearly, the scale should **not** have 0 at the origin.*



[4]

(iv) Suggest **one** reason which might explain the differences in the mean size of starch grains between different types of maize.

.....

.....

.....[1]

(c) A student calibrated the eyepiece graticule in a light microscope using a stage micrometer scale so that they could find the actual length of specimens observed using a light microscope.

The calibration was: one eyepiece graticule division equal to 0.023 mm.

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

(i) State which unit is the most appropriate for use with a light microscope **and** show how the value 0.023 mm is converted to this unit.

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

[2]

(ii) Fig. 2.3 is a photomicrograph showing a stained transverse section through a root with a root nodule.

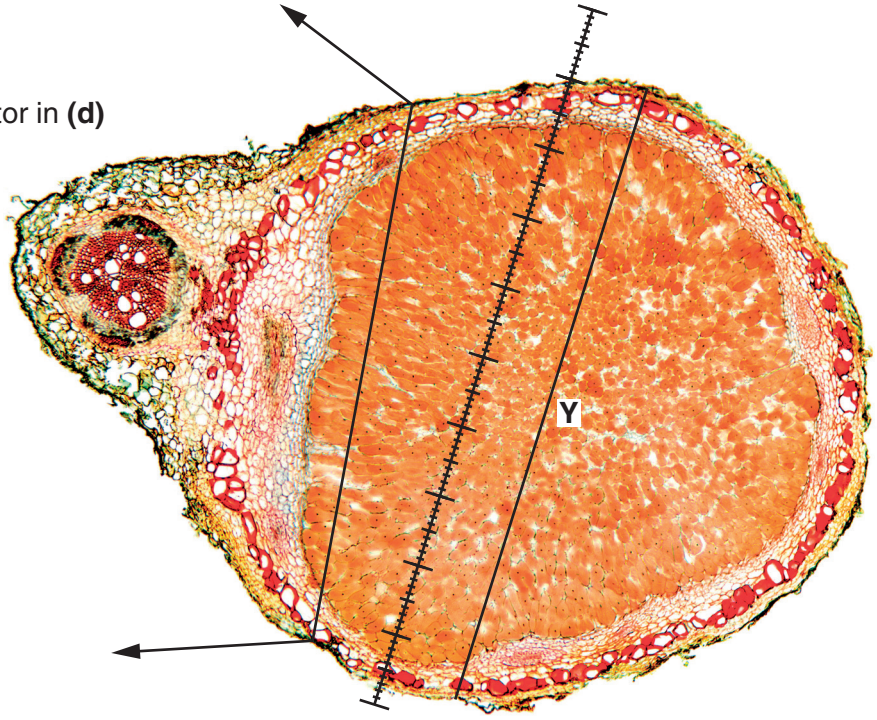


Fig. 2.3

Fig. 2.3 was produced using the same microscope with the same lenses as the student.

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

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

actual total width .....[2]

You are required to use a sharp pencil for drawings.

(d) Draw a large plan diagram of the sector as shown on Fig. 2.3.

You are not expected to be familiar with this specimen.

Use **one** ruled label line and label to identify the vascular bundle.

[5]

[Total: 23]

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