Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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4948066975 9

BIOLOGY **9700/35**

Paper 3 Advanced Practical Skills 1 **October/November 2016**

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, paperclips, 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.

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1	
2	
Total	

This document consists of **13** printed pages and **3** blank pages.

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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, think about 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 ethanol the stain moves out of the cells and is released.

You will investigate the effect of concentration of ethanol (independent variable) on the release of methylene blue solution from pieces of stained plant tissue.

You are required to:

- prepare different concentrations of ethanol, **E**, using simple dilution
- record the colours for the known concentrations of ethanol
- record the colour for an unknown concentration of ethanol, **U**
- use the results to estimate the concentration of ethanol in **U**.

You are provided with:

labelled	contents	hazard	volume / cm^3
E	1.0% ethanol	flammable	40
W	distilled water	none	250
U	unknown concentration of ethanol	flammable	15

labelled	contents	hazard	quantity
P	plant tissue stained with methylene blue	methylene blue solution will stain your skin	3 pieces

You should wear suitable eye protection especially when handling the ethanol.

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

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(a) You are required to make concentrations of ethanol using simple dilution of the 1.0% ethanol, **E**, which reduces the concentration by 0.25% between each successive dilution.

You will need to prepare 10 cm^3 of each concentration.

Table 1.1 shows how to make up two of the concentrations of ethanol you will use.

(i) Complete Table 1.1 by showing as many extra concentrations as you need.

For each concentration state:

- the volume of 1.0% ethanol, **E**, you will use
- the volume of distilled water, **W**, you will use
- the resulting percentage concentration of ethanol.

Table 1.1

volume of 1.0% ethanol, **E** /cm^3	volume of distilled water, **W** /cm^3	percentage concentration of ethanol
10.0	0.0	1.00
0.0	10.0	0.00

[3]

Proceed as follows:

1. Prepare the concentrations of ethanol as shown in Table 1.1 in the beakers provided.
2. Label the test-tubes with the concentrations of ethanol.
3. Put 5 cm^3 of each dilution of ethanol into the labelled test-tubes.
4. Label one test-tube **U** and put 5 cm^3 of **U** into this test-tube.

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

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5. Remove the pieces of plant tissue from the container labelled **P** and put them on the white tile. Cut the ends off each piece of plant tissue.

6. Cut the plant tissue into **equal** lengths of approximately 2 cm.

7. Empty the coloured water from **P** into the container labelled **For Waste**.

8. Put the pieces of plant tissue back into **P** and cover the pieces with tap water from the container labelled **T**.

9. Change the tap water five times to remove excess methylene blue solution, either using a syringe or by pouring off the water into the container labelled **For Waste**.

Fig. 1.1 shows how you will set up the apparatus for each concentration of ethanol.

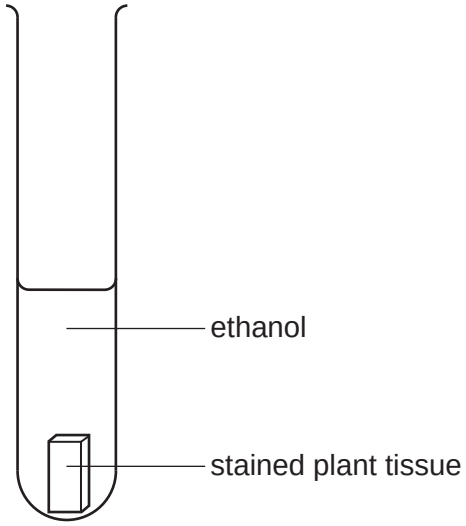

Fig. 1.1

10. Remove the pieces of plant tissue from **P** and put them on a paper towel.

11. Put one piece of plant tissue into each test-tube, including **U** and start timing. Leave for 10 minutes.

    While you are waiting continue with Question 1.

    After 10 minutes you will need to remove the plant tissue from each test-tube so that the colour of each solution can be recorded.

12. After 10 minutes pour the solution **and** the piece of plant tissue from **one** of the test-tubes into the beaker labelled **R**.

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

14. Rinse beaker **R** with water from the container labelled **For washing**.

15. Repeat step 12 to step 14 with each of the remaining test-tubes, including **U**.

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16. Arrange the test-tubes in the order of intensity of blue colour from lowest intensity to highest intensity.

17. Observe the colour in the test-tubes and match the intensity of colour in each test-tube to the key shown in Fig. 1.2.
You may observe the same intensity of colour for more than one test-tube.

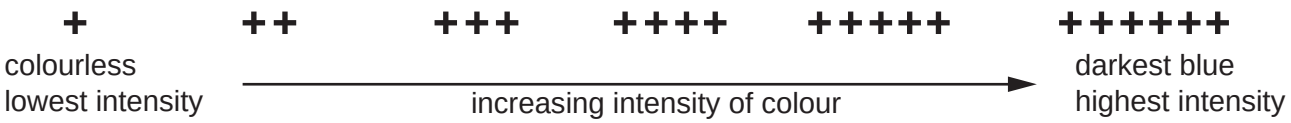

Fig. 1.2

18. Record your results for the known concentrations of ethanol in **(a)(ii)** and record the result for **U** in **(a)(iii)**.

(ii) Prepare the space below and record your results for the known concentrations of ethanol.

[4]

(iii) Record your result for **U** and use this and your results in **(a)(ii)** to estimate the concentration of ethanol in **U.**

*result for **U*** .....

*estimated concentration of ethanol in **U*** .....[2]

(iv) Explain how the ethanol affected the release of methylene blue from the plant cells.

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.....

.....[3]

(v) This procedure investigated the effect of the concentration of ethanol on the release of methylene blue solution from pieces of stained plant tissue.

To modify this procedure for investigating another variable, the independent variable (concentration of ethanol) would need to be standardised.
Describe how the concentration of ethanol could be standardised.

.....

.....

Consider how you would modify this procedure to investigate the effect of **temperature** on the release of methylene blue solution from pieces of stained plant tissue.

Describe how this independent variable, **temperature**, could be investigated.

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.....[3]

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Question 1 continues on page 8

(b) A student investigated the effect of placing pieces of tissue from a potato in sucrose solutions of different concentrations. At the start, each sample of potato tissue was weighed and the initial mass was recorded. Then each sample of potato tissue was placed into a different concentration of sucrose solution.

After a set time the potato tissue was removed and the final mass of the potato tissue was recorded.
The percentage change in mass for each sample of potato tissue was calculated.

The results of the student's investigation are shown in Table 1.2. Note: the percentage change in mass is shown to the nearest 0.5%.

Table 1.2

sucrose concentration / mol dm^{-3}	initial mass / g	final mass / g	percentage change in mass
0.0	1.84	2.15	17.0
0.2	1.65	1.80	
0.4	1.43	1.48	3.5
0.6	1.62	1.31	–19.0
0.8	1.43	1.08	–24.5
1.0	1.68	1.19	–29.0

(i) Complete Table 1.2 by calculating the percentage change in mass for the 0.2 mol dm^{-3} sucrose solution.

[1]

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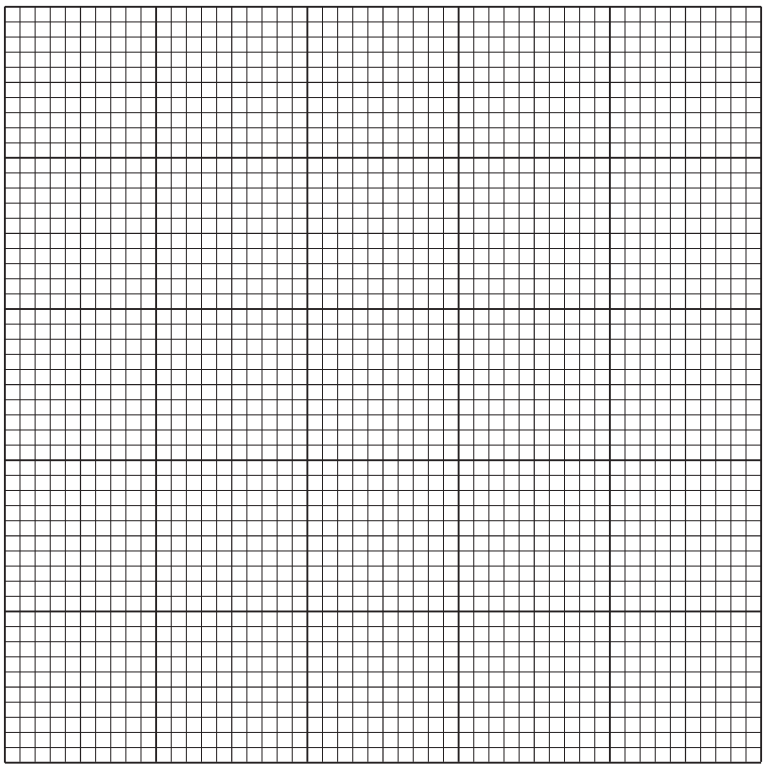
You are required to use a sharp pencil for graphs.

(ii) Plot a graph of the data shown in Table 1.2.



[4]

(iii) Use your graph to estimate the percentage change in mass of the potato tissue for a sucrose concentration of 0.7 mol dm^{-3}.

Show on your graph how you estimated the percentage change in mass.

percentage change in mass .....[2]

[Total: 22]

2 **K1** is a slide of a stained transverse section through a plant root.

You are not expected to be familiar with this specimen.

You are required to use a sharp pencil for drawings.

(a) **(i)** Draw a large plan diagram of the quarter of the root shown by the shaded area in Fig. 2.1.

Use **one** ruled label line and label to identify the xylem.

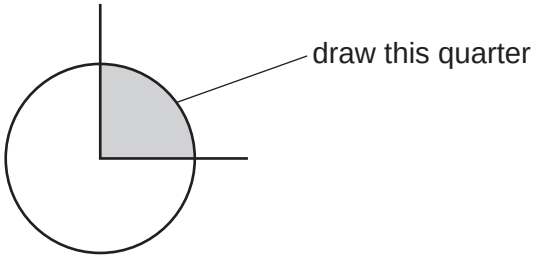


Fig. 2.1

You are expected to draw the correct shape and proportions of the different tissues.

[4]

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(ii) Observe the central tissue in the root on **K1**. These cells are not identical.

Select one group of **four** adjacent (touching) cells which show some of the differences between these cells. Each cell must touch at least two of the other cells.

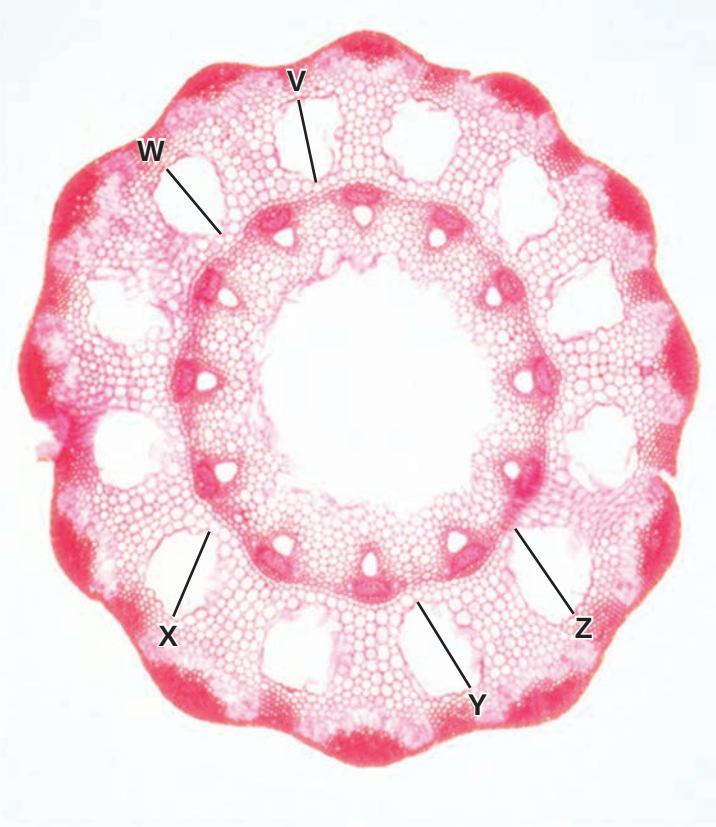
Make a large drawing of this group of **four** cells.

Use **one** ruled label line and label to identify the cell wall of **one** cell.

[5]

(b) Fig. 2.2 is a photomicrograph of a stained transverse section through a stem of a different plant.

You are not expected to be familiar with this specimen.



magnification × 36

Fig. 2.2

(i) Use the magnification and the lines in Fig. 2.2 to find the actual diameter, in μm, of the air spaces labelled **V**, **W**, **X**, **Y** and **Z**.

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

V ……. μm, **W** …… μm, **X** ……. μm, **Y** …… μm, **Z** …… μm [3]

(ii) Using the actual diameters calculated in **(b)(i)**, calculate the **mean** actual diameter of an air space.
You may lose marks if you do not show your working or if you do not use appropriate units.

mean actual diameter .....[2]

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(c) Prepare the space below so that it is suitable for you to record the observable differences between the root on **K1** and the stem in Fig. 2.2.

Record your observations in the space you have prepared.

[4]

[Total: 18]

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