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Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5123914689

BIOLOGY **9700/35**

Advanced Practical Skills 1 **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 **11** printed pages and **1** blank page.

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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, 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 A number of plant tissues are coloured because the cells contain chemicals called anthocyanins. These anthocyanins change colour according to the pH and the colour changes are reversible.

You are provided with red cabbage which contains anthocyanins and can be used to make a pH indicator solution.

You are required to:

- prepare a pH indicator solution from red cabbage
- investigate the effect of pH (the independent variable) on the colour of the indicator solution
- identify the pH of the solutions, **S1** and **S2**.

You are provided with:

Table 1.1

labelled	contents	hazard	volume / cm^3
pH 3	solution of pH 3	irritant	30
pH 4	solution of pH 4	irritant	30
pH 6	solution of pH 6	irritant	30
S1	solution of unknown pH	irritant	30
S2	solution of unknown pH	irritant	30
W	distilled water	none	30

labelled	contents	hazard	quantity
P	red cabbage	–	pieces of leaves

It is recommended that you wear safety glasses/goggles.

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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 using the solutions in Table 1.1.
State the **level** of risk of using the solutions: low or medium or high.

hazard .....

level of risk .....
[1]

Proceed as follows:

1. Cut the red cabbage leaves into small pieces and place into the water in beaker **A**.

2. Heat the water in beaker **A** and boil for 5 minutes.

3. Turn off the Bunsen burner and leave the water in beaker **A** to cool for 5 minutes to produce a coloured liquid.
This is your pH indicator solution.

While you are waiting continue with Question 1.

4. After 5 minutes, pour approximately 100 cm^3 of this pH indicator solution into a container. Most of the cabbage leaves should remain in beaker **A**.

You are now going to investigate the effect of pH on the colour of the pH indicator solution.

You will need to decide how to standardise the volume of pH indicator solution required to observe the colour change.

So that you can observe the colour change clearly, you need to decide the volume of pH indicator solution to add.

5. Put 4 cm^3 of the **pH 6** solution into a test-tube.

6. Put 1 cm^3 of pH indicator solution into the same test-tube and mix the contents.

7. Add further 1 cm^3 volumes, up to 5 cm^3, in order to decide which volume to use to observe the colour change clearly.

8. Record in **(b)(ii)** the final colour of the pH indicator solution at **pH 6**.

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(b) (i) State the **volume** of pH indicator solution you will use to observe the colour change clearly and describe how you will standardise the volume of the pH indicator solutions to carry out step 9.

volume ..... cm^3

description .....

.....[1]

9. Using the information in step 5 and **(b)(i)**, find the colour of the pH indicator solution with **pH 3**, **pH 4**, **W, S1** and **S2**. Record all your observations in **(b)(ii).**

(ii) Prepare the space below and record all your observations.

[5]

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(iii) Fig. 1.1 shows the position of pH 7 on a scale.
Using your results in **(b)(ii)** complete Fig. 1.1 to show:

- the positions of pH 3, pH 4 and pH 6 on the scale
- the positions of **W**, **S1** and **S2** on the scale.

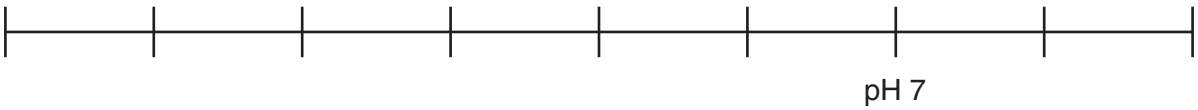


Fig. 1.1

[2]

(c) Like red cabbage, beetroot cells also contain anthocyanins.

A student investigated the effect of temperature on the cell surface membranes of beetroot.

- Beetroot was cut into 1 cm^3 cubes.
- One cube of beetroot was put into each of five test-tubes containing water which had been heated to 25°C or 30°C or 35°C or 45°C or 50°C.
- All other variables were standardised.
- The cubes were removed after 15 minutes.
- The absorbance of light by the coloured liquid left in the test-tubes was measured using a colorimeter.

The absorbance of light by pure water is 0.000 arbitrary units.

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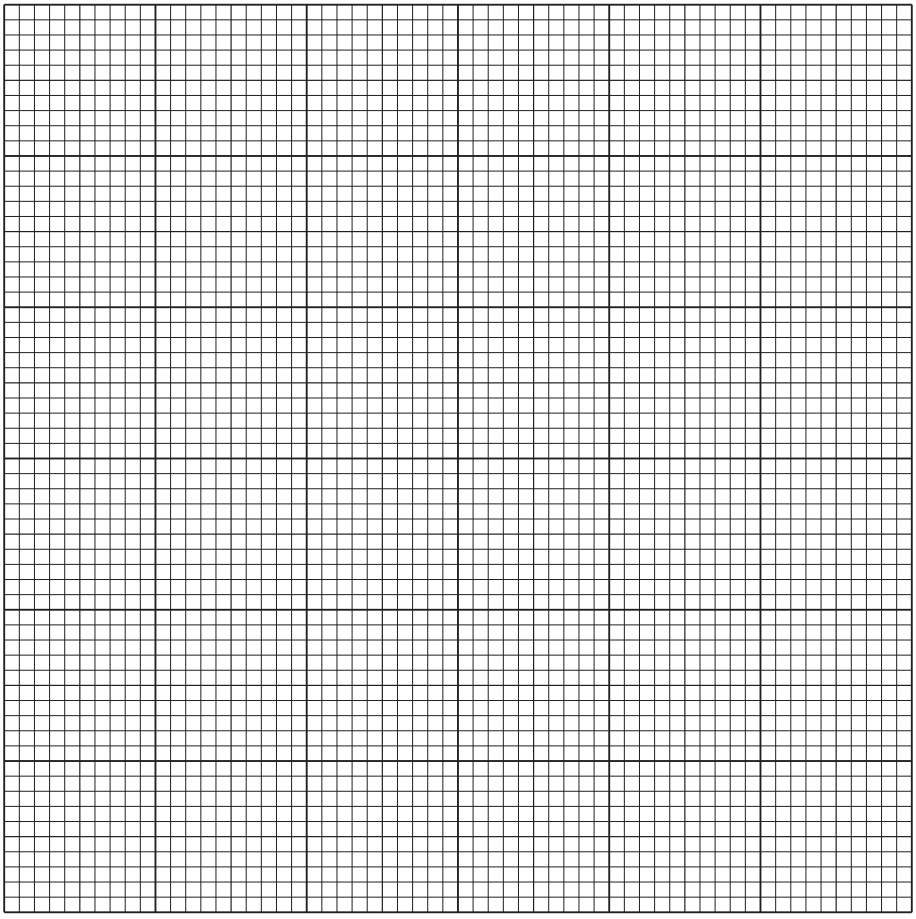
The results of the student's investigation are shown in Table 1.2.

Table 1.2

temperature / °C	absorbance of light by the coloured liquid / arbitrary units
25	0.080
30	0.155
35	0.225
45	0.395
50	0.580

You are required to use a sharp pencil for graphs.

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



[4]

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(ii) Use your graph to estimate the absorbance of light at 40°C.
Show on your graph how you estimated the absorbance of light.

absorbance .....[2]

(iii) Explain the effect of temperature on the permeability of cell surface membranes in beetroot.

.....

.....

.....

.....

.....[3]

The student decided to investigate the effect of alcohol on the cell surface membranes of beetroot cubes at 20°C.

(iv) Describe how the temperature will be standardised in this investigation.

.....

.....[1]

(v) Describe how the independent variable will be investigated.

.....

.....

.....[2]

[Total: 21]

Check that you have finished the whole of Question 1.

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2 **L1** is a slide of a stained transverse section through a plant stem.

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 half of the stem to show the observable features.

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

[5]

(ii) Annotate your diagram to describe one difference between the cells in the centre (pith) and the cells in the outer layer (epidermis). [1]

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(iii) Select one group of four cells from the pith. Each cell of the group must touch two of the other cells.

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

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

[5]

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(b) Fig. 2.1 and Fig. 2.2 are photomicrographs of transverse sections (TS) of leaves from the same plant.

TS of leaf grown in sunlight

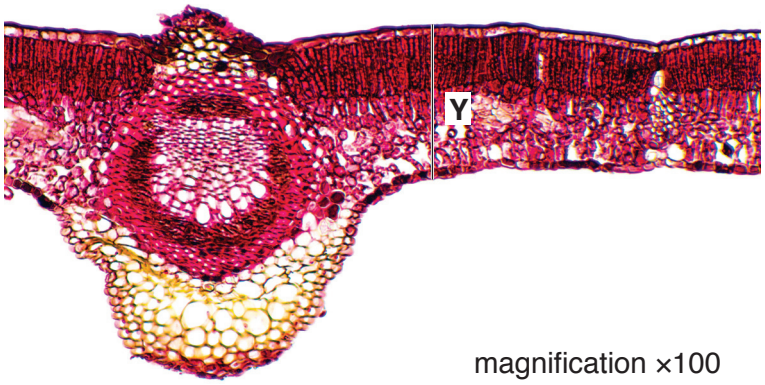


Fig. 2.1

TS of leaf grown in shade



Fig. 2.2

(i) Calculate the **actual** thickness of the leaf grown in sunlight as shown by line **Y** on Fig. 2.1.

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

actual length .....μm
[3]

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(ii) Prepare the space below so that it is suitable for you to record observable differences between Fig. 2.1 and Fig. 2.2.
Do **not** include difference in thickness of the leaves.

Record your observations in the space you have prepared.

[4]

(iii) A student observed a different plant of the same species shown in Fig. 2.1. The student determined the ratio of the thickness of a leaf grown in sunlight to the thickness of a leaf grown in shade as 120:60.

However, a ratio may be simplified to the smallest possible whole number on each side.

In this example, both sides of the ratio 120:60 are divisible by 60, so the simplest ratio for the thickness of leaves measured by the student is 2:1.

The actual thickness of the leaf grown in shade in Fig. 2.2 is 70 μm.

Determine the simplest ratio of the thickness of the leaf grown in sunlight in Fig. 2.1 compared to the thickness of the leaf grown in shade in Fig. 2.2.

ratio .....
[1]

[Total: 19]

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