Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

4619373025

BIOLOGY **9700/35**

Paper 3 Advanced Practical Skills 1 **October/November 2019**

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.

For Examiner's Use	
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 the whole of Question 1 and Question 2.

1 Agar cubes that have been stained with a blue indicator can be used to investigate diffusion.

When ascorbic acid, **A**, diffuses into a stained agar cube, it causes the cube to decolourise (the blue colour disappears).

The end-point is reached when the cube has decolourised.

You will investigate the effect of changing the surface area to volume ratio of agar cubes on the diffusion of ascorbic acid by:

- cutting a block of stained agar, **B**, into cubes of different sizes
- putting cubes of different sizes into ascorbic acid, **A**
- recording the time taken for each size of agar cube to reach the end-point.

You are provided with the materials shown in Table 1.1.

Table 1.1

labelled	contents	hazard	volume /cm^3
A	10% ascorbic acid solution	none	120
B	one stained agar block	none	–

Use the blunt forceps and paper towel to handle the agar block.

If any of the materials come into contact with your skin, wash off immediately under cold water.

It is recommended that you wear suitable eye protection.

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(a) You will need to cut agar cubes of different sizes from the agar block, **B**.

The **largest** cube you will cut is 10 mm × 10 mm × 10 mm, as shown in Fig. 1.1.

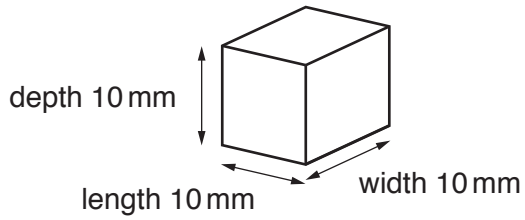


Fig. 1.1

Decide on the sizes of the other agar cubes you will investigate.

(i) Complete Table 1.2 to show the sizes of agar cubes you will investigate.

The first row, for the largest cube, has been completed for you.

Table 1.2

length × width × depth of cube /mm	surface area /mm^2	volume /mm^3	surface area: volume
10 × 10 × 10	600	1000	0.6 : 1

[3]

Carry out step 1 to step 13.

Use the blunt forceps and paper towel to handle the pieces of agar.

1. Draw a grid on the graph paper as shown in Fig. 1.2.

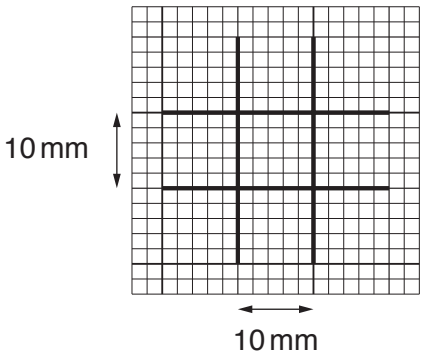


Fig. 1.2

2. Put the graph paper into the plastic wallet and put it on the white tile.

3. Cut a small piece of agar from block **B**. Put the small piece of agar on the plastic wallet so that it is on top of the grid (drawn in step 1).

4. Cut the small piece of agar so that each side is 10 mm, using the grid as a guide, as shown in Fig. 1.3.

   You will need to turn the piece of agar to make sure that each side is cut to 10 mm.

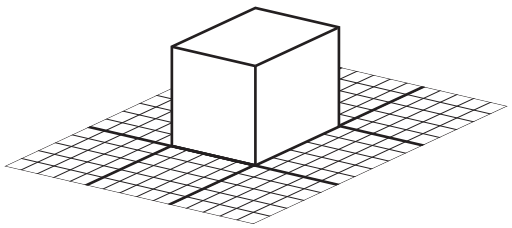


Fig. 1.3

5. Label a beaker **10 × 10 × 10** and put the agar cube you have cut into this beaker.

6. Put any waste pieces of agar into the container labelled **For waste**.

7. Remove the graph paper from the plastic wallet.

8. Draw on the graph paper a grid for each of the sizes of agar cube as stated in Table 1.2.

9. Repeat step 2 to step 6 with each of the sizes of agar cube as stated in Table 1.2.

10. Put 20 cm^3 of **A** into the beaker labelled **10 × 10 × 10**.

11. Repeat step 10 with each of the other beakers you have labelled.

12. Start timing.

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13. Record the time taken for each agar cube to reach the end-point (the agar cube has decolourised).

Do **not** stop the timer – keep it running continuously.

If any agar cube remains blue after 900 seconds, **stop timing** and record 'more than 900'.

You may use this space for raw results.

(ii) Record your results in an appropriate table.

[4]

(iii) Describe the trend in your results.

.....

.....

..... [1]

(iv) State **one** way in which you could improve the confidence in your results.

.....

.....

..... [1]

(v) Describe a suitable control for this investigation.

.....

.....

..... [1]

(vi) Using your knowledge of diffusion and your answers in **(a)(ii)** and **(a)(iii)**, suggest reasons why a **low** surface area to volume ratio could be a disadvantage to an organism.

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.....

..... [2]

(b) Table 1.3 shows three possible sources of error when carrying out the investigation described by step 1 to step 13.

(i) Complete Table 1.3 by stating the type of error as systematic or random and the effect on the trend seen in the results. The first one has been completed for you.

Table 1.3

source of error	type of error	effect on trend
the 10 cm^3 mark on the syringe used to measure the volume of **A** actually measured 10.2 cm^3	systematic	no effect as the same syringe was used each time
the agar block, **B**, had lumps in it where it was not dissolved properly		
it was difficult to judge the end-point		

[2]

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The procedure, described by step 1 to step 13, investigated the effect of surface area to volume ratio on diffusion, using the time taken to reach the end-point.

Think about how you could modify this procedure to investigate the effect of **ascorbic acid concentration** on the time taken to reach the end-point.

(ii) The size of the agar cube should be standardised.
Look at your results in **(a)(ii)** and state a size of agar cube that is appropriate to use.

size of agar cube ..... [1]

(iii) Describe how you would modify the procedure to investigate the effect of **ascorbic acid concentration** on the time taken to reach the end-point.

.....

.....

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.....

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.....

.....

..... [2]

(c) Ascorbic acid is found in plants.

Iodine solution can be used to determine the concentration of ascorbic acid in a plant extract.

Fig. 1.4 shows a calibration graph that can be used to estimate the concentration of ascorbic acid in a plant extract.

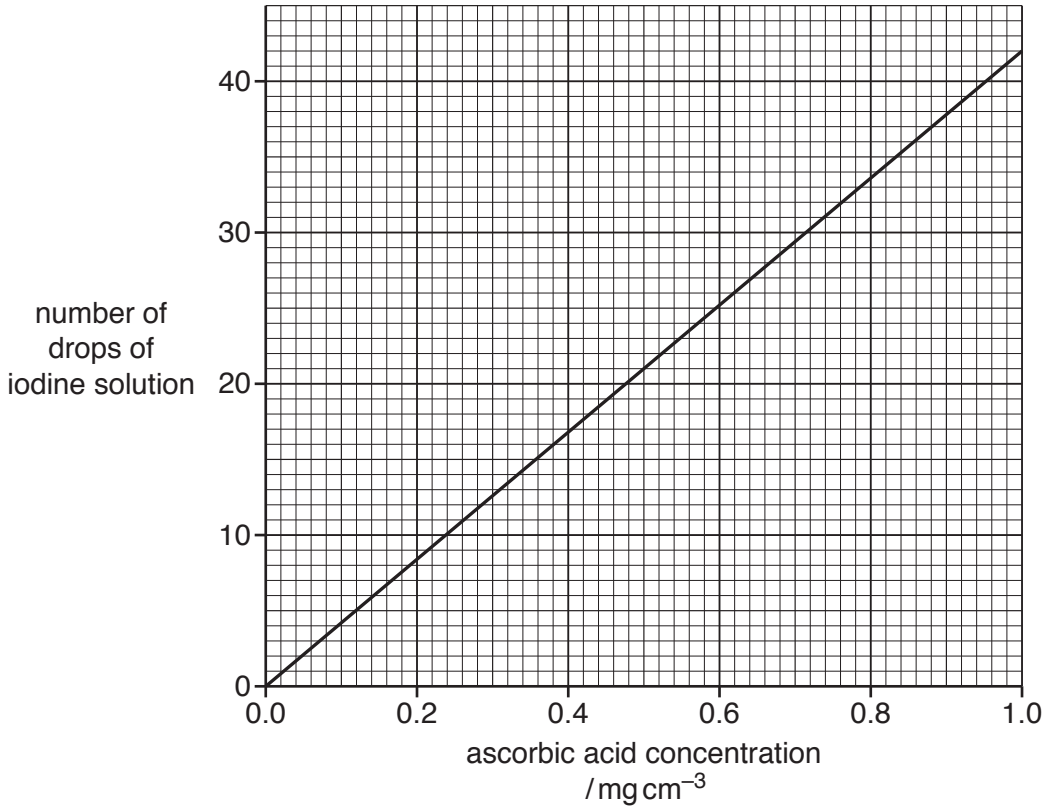


Fig. 1.4

A student carried out an investigation to compare the concentration of ascorbic acid in different plant extracts.

The results are shown in Table 1.4.

Table 1.4

plant extract	number of drops of iodine solution	ascorbic acid concentration / mg cm^{-3}
C	40	0.95
D	8	0.19
E	26	0.62
F	13	
G	2	0.04

(i) Using the graph in Fig. 1.4, complete Table 1.4 for plant extract **F**. [1]

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(ii) Plot a bar chart of the data in Table 1.4 on the grid in Fig. 1.5.

Use a sharp pencil for drawing graphs.

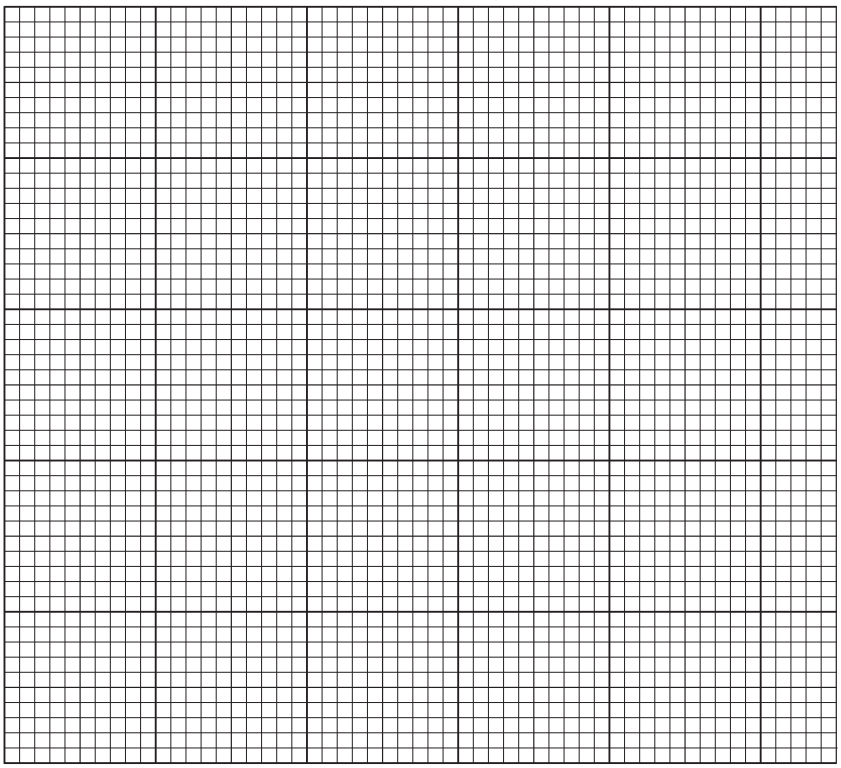


Fig. 1.5

[4]

[Total: 22]

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

You are not expected to be familiar with this specimen.

Use a sharp pencil for drawing.

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

(a) **(i)** Draw a large plan diagram of the whole root.

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

[5]

(ii) Observe the cells in the xylem of the root on **L1**.

Select **one** large xylem vessel and **three** adjacent, touching vessels which show observable features of the xylem.

Each cell must touch at least **two** of the other cells.

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

Use **one** ruled label line and label to identify the lumen in one of the cells.

[6]

(b) Fig. 2.1 is a photomicrograph of a stained transverse section through the root of a different plant.

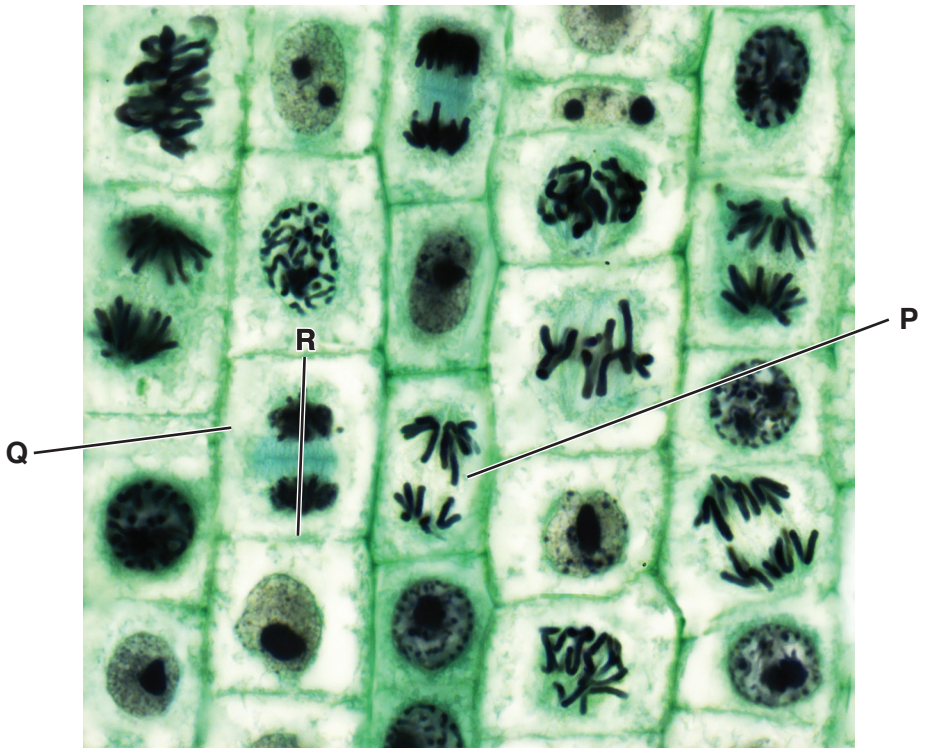


Fig. 2.1

(i) Cell **P** in Fig. 2.1 is in a stage of mitosis.

State the stage of mitosis shown in cell **P**.

Give a reason for your answer.

stage .....

reason .....

.....

.....

[2]

(ii) State the total number of cells in Fig. 2.1 that are in the same stage as cell **P**.

..... [1]

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(iii) The actual length of cell **Q** is 41.6 μm, as shown by line **R**.

Calculate the magnification of the photomicrograph in Fig. 2.1.

Show all the steps in your working and use appropriate units.

magnification = ... [4]

[Total: 18]

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