Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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0123456789

BIOLOGY **9700/03**

Paper 3 Advanced Practical Skills **For Examination from 2016**

SPECIMEN PAPER

2 hours

Candidates answer on the Question Paper.

No Additional Materials are required.

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.

This document consists of **10** printed pages and **2** blank pages.

CAMBRIDGE International Examinations

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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 Yeast cells use enzymes as part of their metabolic reactions. Some of these reactions release carbon dioxide.

You are required to investigate the effect of temperature (independent variable) on the release of carbon dioxide by yeast cells.

You are provided with:

labelled	contents	hazard	volume / cm^3
Y	active yeast cells in suspension in a glucose solution	none	100

Proceed as follows:

You are required to change the temperature of **Y** during the investigation.

1. Put the beaker containing **Y** into a large beaker, **W**, which will be the water-bath as shown in Fig. 1.1.

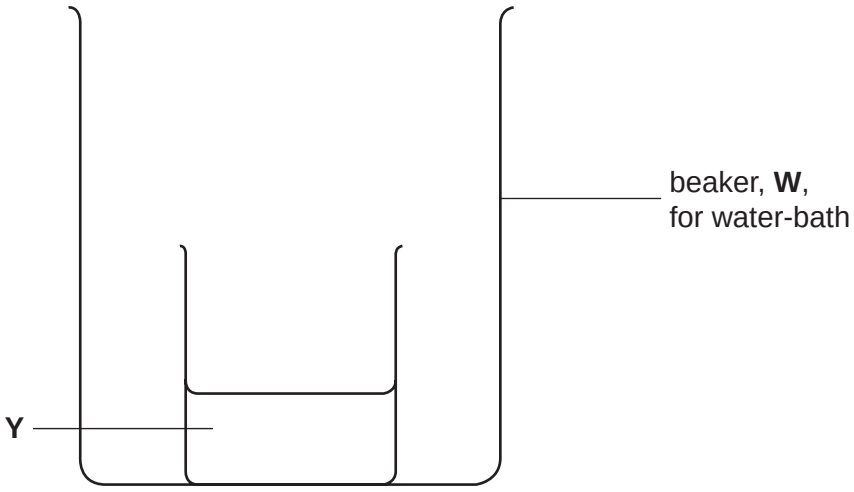

Fig. 1.1

(a) Decide what level of water you will start with in **W**.

(i) Draw on Fig. 1.1 the level of water you will start with in **W**. [1]

2. Put hot water from the beaker labelled **Hot** into **W** to **below** the level you decided.

   Add hot and cold water as needed to obtain a water-bath of between 50 °C and 55 °C and adjust the volume of the water to the level you decided in **(a)(i)**.

   *The beaker containing **Y** may float but should not spill its contents.*

3. Leave **Y** (in **W**) for 5 minutes to reach a temperature between 50 °C and 55 °C.

   Decide which other temperatures you will investigate to show the effect of temperature on the enzymes in yeast cells.

(ii) State the temperatures you have decided to use.

..... [1]

Fig. 1.2 shows the apparatus set up to measure the release of carbon dioxide from **Y**. The carbon dioxide released into **B** can be measured (dependent variable) by counting the number of bubbles.

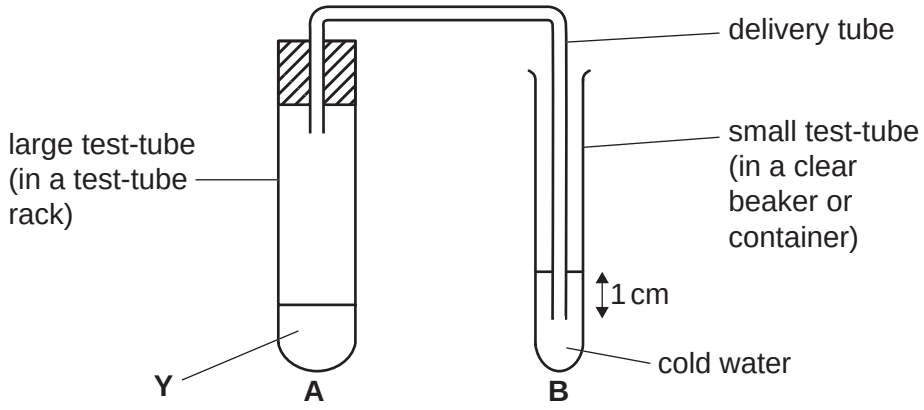

Fig. 1.2

The end of the delivery tube should be 1 cm below the level of the water in test-tube **B** as shown in Fig. 1.2.

Decide how you will standardise the position of the delivery tube in test-tube **B** as shown in Fig. 1.2.

(iii) Describe how you will standardise the position of the tube.

.....

..... [1]

4. Put water from the beaker, labelled **Cold** into test-tube **B** as shown in Fig. 1.2.

   For up to 3 minutes, you are required to count the number of bubbles released and process the results to find the number of bubbles released per minute.

Decide how many readings to take, and for how long to take each reading. Each reading should be made and recorded in **(v)**.

After collecting all the readings find the number of bubbles released per minute and record these processed results in **(v)**.

5. Remove the small beaker or container containing **Y** from **W**.

(iv) Record the temperature of **Y**. ..... [1]

6. Stir **Y** and put 15 cm^3 into the large test-tube **A**. Put the beaker containing **Y** back into **W**.

7. Immediately set up the apparatus as shown in Fig. 1.2 and leave for 2 minutes before starting to record the number of bubbles released.

8. After recording for 3 minutes, remove the bung from test-tube **A**. You are provided with a container labelled '**For waste'** and a container labelled '**For washing'** so you can re-use the large test-tube **A**.

9. Repeat step 2 to step 8 for each of the temperatures you decided in **(ii)**.

(v) Prepare the space below and record your results for each temperature.

[5]

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

.....

..... [1]

(vii) State whether the error when using the syringe is systematic or random **and** give a reason for your answer.

systematic or random .....

.....

reason .....

.....

..... [1]

(viii) Describe **three** improvements to this investigation which would increase the confidence in your results.

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.....

..... [3]

(b) Some scientists investigated the effect of the concentration of glucose solution, mixed with the suspension of yeast cells, on the activity of the enzymes. The activity of the enzymes was measured by the time taken to collect 10 cm^3 of carbon dioxide.

The results are shown in Table 1.1.

Table 1.1

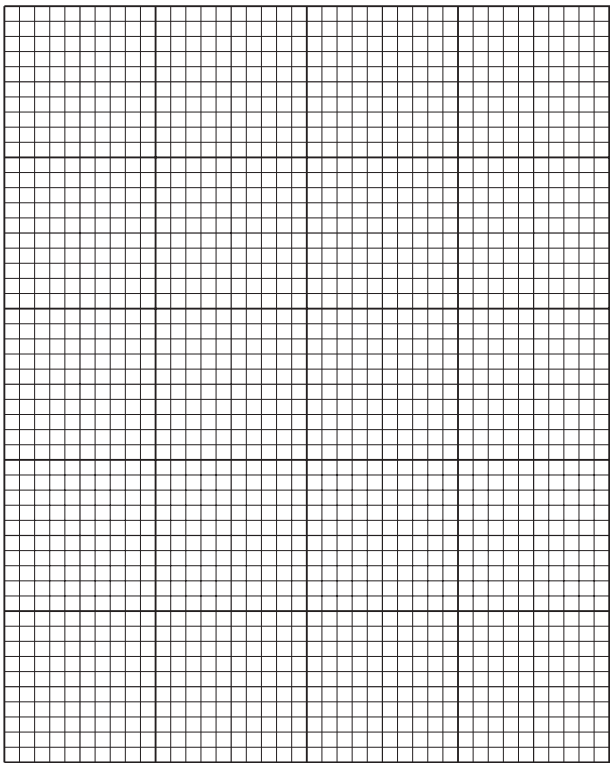
percentage concentration of glucose solution	time taken to collect 10 cm^3 of carbon dioxide / s					
	trial 1	trial 2	trial 3	trial 4	trial 5	mean
4	46	48	48	47	45	47
6	28	28	20	27	26	27
8	21	17	18	17	21	19
12	12	13	14	9	14	
16	11	9	10	9	11	10
20	8	9	9	8	10	9

(i) **Two** of the values in Table 1.1 are anomalous.

Draw a circle around each of these values. [1]

(ii) Complete Table 1.1 by calculating the missing value. [1]

(iii) Plot a graph of the data shown in Table 1.1.



[4]

(iv) Using the data in Table 1.1 and your graph, explain the results for the investigation.

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..... [2]

[Total: 22]

2 **J1** is a slide of a stained transverse section through a plant root. This plant genus grows widely throughout the world.

You are not expected to be familiar with this specimen.

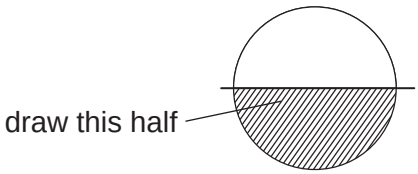

Fig. 2.1

(a) **(i)** Draw a large plan diagram of half of the root as shown in Fig. 2.1.

Use **one** ruled label line and the letter **T** to identify the tissue that is made up of cells adapted for the transport of water.

[5]

(ii) Suggest **one** observable feature which supports the identification of the tissue **T** as being made up of cells that are adapted for the transport of water.

..... [1]

(b) Observe **J1** and select one group of **six** cells from the tissue (cortex) between the epidermis and the endodermis.

Each cell in the group should touch two of the other cells.

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

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

[5]

An eyepiece graticule scale can be used to measure cells. To obtain an actual length the eyepiece graticule scale must be calibrated against a stage micrometer.

However, to obtain values for calculating a ratio, it is **not** necessary to calibrate the eyepiece graticule scale.

(c) Observe **J1** using the ×40 objective lens.

Use the eyepiece graticule scale to find the **mean width** of the

- cells between the epidermis and the endodermis
- cells in the centre of the root.

State the ratio of the mean width of the cells between the epidermis and the endodermis to the mean width of the cells in the centre of the root.

You may lose marks if you do not show all the steps in finding the ratio.

ratio ..... [3]

Fig. 2.2 is a photomicrograph of a stained transverse section through a stem of the same plant species.

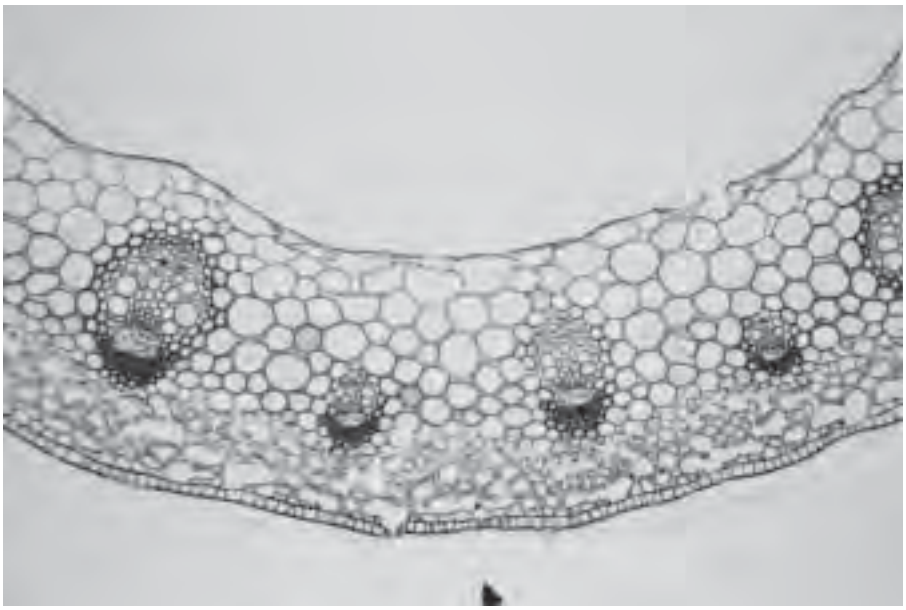

Fig. 2.2

(d) Prepare the space below so that it is suitable for you to record observable differences between the specimen on slide **J1** and the specimen in Fig. 2.2 to include:

- the vascular tissue
- at least two other tissues.

[4]

[Total: 18]

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