Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

4088133241

BIOLOGY **9700/33**

Advanced Practical Skills 1 **May/June 2014**

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 ink.
You may use a pencil for any diagrams, graphs or rough working.
Do **not** use red ink, 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 **15** printed pages and **1** blank page.

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[Turn over

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 one or more additional measurements.

You will **gain marks** for recording your results according to the instructions.

1 You are provided with a blue solution, labelled **C**, which is alkaline.

C is blue because it contains an indicator.

Carbon dioxide reacts with **C** when bubbled into it. When enough carbon dioxide reacts with **C**, the indicator will change from blue to yellow (even if the solution is cloudy). This is the end-point.

Hydrochloric acid, **H**, can also turn indicator **C** clear. If only a small volume of carbon dioxide is bubbled into **C** then the indicator will remain blue. Hydrochloric acid, **H**, can then be added slowly until the indicator turns from blue to yellow.
The **volume** of **H** is then recorded.

The greater the volume of **H** that needs to be added to reach the end-point, the less carbon dioxide has reacted with **C**.

You are provided with:

labelled	**contents**	**hazard**	**volume / cm^3**
Y	yeast cell suspension	none	50
C	alkaline solution (blue)	irritant	70
H	hydrochloric acid	irritant	30

You are now required to find the volume of **H** needed to reach the end-point, when **no** carbon dioxide has been bubbled into **C**.

When no carbon dioxide has been bubbled into **C**, the greatest volume of **H** will need to be added to get the end-point.

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Proceed as follows:

1. Put 5 cm^3 of **C** into a test-tube.

2. Use a syringe, containing 2 cm^3 of **H**, to put drops of **H** into **C** as shown in Fig. 1.1.
Mix well as you add **H**, until the end-point is reached. You may need to fill the syringe again.

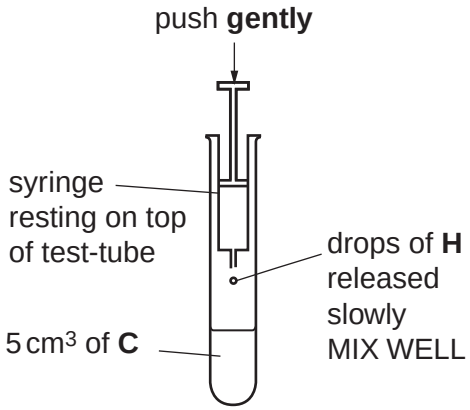


Fig. 1.1

(a) (i) Record the volume of **H** needed to reach the end-point.

volume of **H** ..... [1]

Yeast cells release carbon dioxide from some of their metabolic reactions.

A student investigated the release of carbon dioxide from a yeast cell suspension, using the apparatus shown in Fig. 1.2.

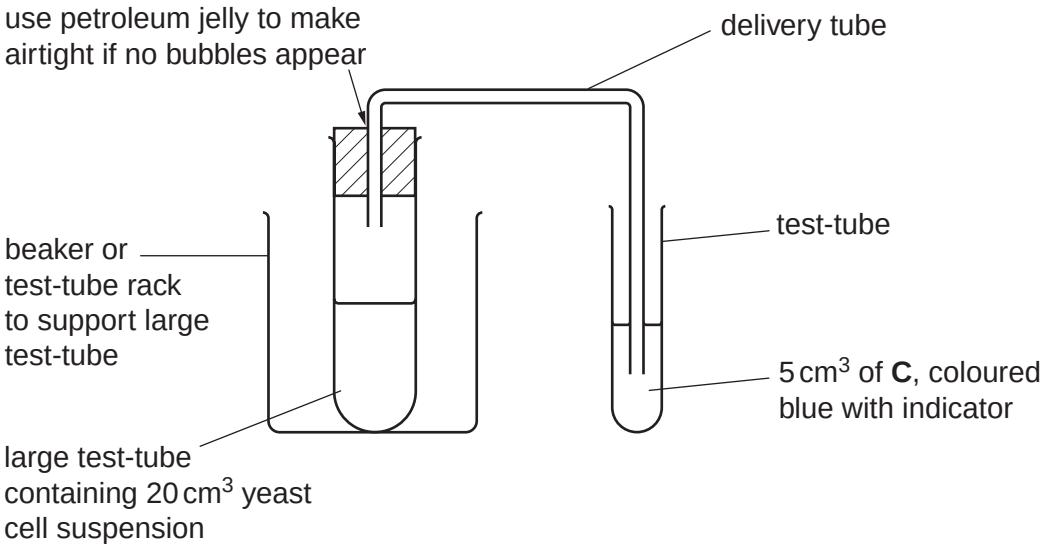


Fig. 1.2

The student set up this apparatus and left it for 10 minutes.

The student observed that during the 10 minutes the bubbles of carbon dioxide were not released at a constant rate.

You are required to investigate the release of carbon dioxide bubbles during 10 minutes using apparatus set up as in Fig. 1.2.

You will move the delivery tube to different test-tubes containing **C**, at different times during 10 minutes.

(ii) Decide the length of time you will leave the delivery tube in each test-tube containing **C**. State the length of time.

time ..... [1]

(iii) State **one** significant source of error that may occur when the delivery tube is moved from one test-tube to the next.

Describe how you will reduce this error.

source of error .....

description .....

.....

.....
[2]

Read steps **3** to **11** before proceeding:

3. Put 5 cm^3 of **C** into a test-tube. Repeat for the number of test-tubes you need to use for your times in **(a)(ii)**.

4. Remove **Y** by placing the nozzle of a large syringe below any froth on the surface.

5. Put 20 cm^3 of **Y** into the large test-tube.

6. Put the bung containing the delivery tube into the large test-tube. It **must** be airtight.

7. Hold the large test-tube as shown in Fig. 1.3.

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Fig. 1.3

8. Put the end of the delivery tube into the first test-tube containing **C**. Immediately start timing.

9. After the time you decided in **(a)(ii)**, move the delivery tube to the next test-tube containing **C**.

10. Repeat step 9 for all the test-tubes which you set up in step 3.

11. After removing the delivery tube from the last test-tube, repeat step 2 with any of the test-tubes where there is still a blue colour.
    Record your results in **(a)(iv)** on page 6.
    For any test-tubes where **C** is yellow (even if the solution is cloudy) record '0'.

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[Turn over

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

[5]

(v) Identify **one** significant source of error in measuring the dependent variable in this investigation.

.....

.....

..... [1]

(vi) A systematic error occurs when apparatus with scales are used, since the scales may be slightly different.
For example, when measuring the same line, two rulers may give different lengths. However, as long as the same ruler is used for all the measurements, the trend is **not** affected because the error is consistent.

State **one** piece of apparatus used in this investigation that may have a systematic error.

Suggest whether this affected your results and give a reason for your answer.

apparatus .....

reason .....

.....
[1]

(b) Increasing concentrations of carbon dioxide in the atmosphere have been recorded by scientists for over one hundred years and can be used to predict future increases.

Scientists have studied the effect of carbon dioxide on the leaf area of two different types of plants, **R** and **T**, after 60 days.

A large sample of each type of plant was grown in air containing one of the following concentrations of carbon dioxide:

- $280\,\mu mol\,mol^{-1}$ (the concentration measured in the atmosphere around the year 1900)
- $380\,\mu mol\,mol^{-1}$ (the concentration measured in the atmosphere now)
- $719\,\mu mol\,mol^{-1}$ (the concentration which is predicted in the atmosphere for the year 2100).

All other variables were standardised.

On day 60 the mean leaf area per plant was calculated.

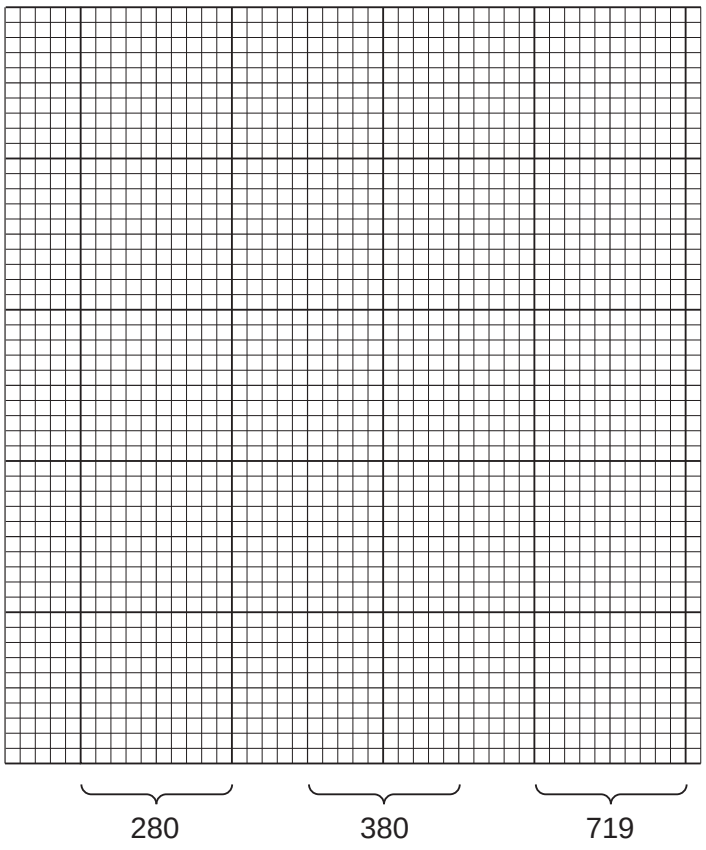
The results are shown in Table 1.1.

Table 1.1

concentration of CO_2 / $\mu mol\,mol^{-1}$	**mean leaf area / $cm^2\,plant^{-1} \times 10^3$**	
	plant R	**plant T**
280	1.00	1.50
380	2.55	3.35
719	4.20	3.90

(i) Complete Fig. 1.4 by plotting a chart of the data in Table 1.1.

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[3]

Fig. 1.4

(ii) Describe the trends shown on the chart for **R** and **T**.

.....

.....

.....

.....

..... [2]

(iii) Suggest how the differences in the leaf area in plant **R** may affect transport in this plant.

.....

.....

.....

.....

.....

.....

..... [2]

Fig. 1.5 is a photomicrograph of a stained transverse section through part of a plant leaf. This plant species is native to part of Asia.

You are not expected to have studied this leaf.



Fig. 1.5

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(c) Draw a large plan diagram of the part of the leaf shown in Fig. 1.5.

On your diagram, use a ruled label line and label to show the vascular bundle.

[4]

[Total: 22]

2 Methylene blue stains dead cells blue.
Living cells are **not** stained blue so they will appear white or clear.

You are provided with:
- methylene blue solution, **M**, (handle carefully as it will stain your skin)
- suspensions of yeast cells, labelled **S1**, **S2** and **S3**.

Each suspension, **S1**, **S2** and **S3** has been heated for ten minutes at 45 °C or 80 °C or 100 °C.

You are required to:
- use the microscope to observe the colour of the yeast cells from **S1**, **S2** and **S3**, after **M** has been added
- record your observations by using annotated drawings of three yeast cells from each of **S1**, **S2** and **S3**
- identify the temperature at which each of **S1**, **S2** and **S3** was heated.

1. Label three microscope slides **S1**, **S2** and **S3**.

2. Place **one drop** of **S1** onto slide **S1** and add **one drop** of **M**. Mix carefully using a glass rod. (If **M** comes into contact with your skin rinse with cold water.)

3. Repeat step 2 with **S2** and **S3**.

4. Leave for five minutes.

5. Add a coverslip to each slide.

6. Use the paper towel to dry off any excess liquid around the coverslip.

7. Use the microscope to observe the yeast cells on each slide, then select cells which you can draw and annotate to describe the effect of the methylene blue, **M**.

(a) (i) Prepare the space below and record your observations by:

- making drawings of **three** cells from **each** of the slides in the boxes provided
- annotating your drawings to describe the effect of methylene blue, **M** on the cells.

S1

S2

S3

[4]

(ii) Use your observations to identify the temperature that was used to heat each of the suspensions **S1**, **S2** and **S3**.
Complete the table.

suspension	temperature / °C
S1	
S2	
S3	

[1]

(iii) Explain how you identified the yeast cells that had been heated at 100 °C.

.....

.....[1]

(iv) A student was provided with a suspension of yeast cells which had been heated at a temperature between 45 °C and 80 °C.

Describe how you could modify this investigation to provide **quantitative** measurements that can be used to estimate this temperature.

.....

.....

.....

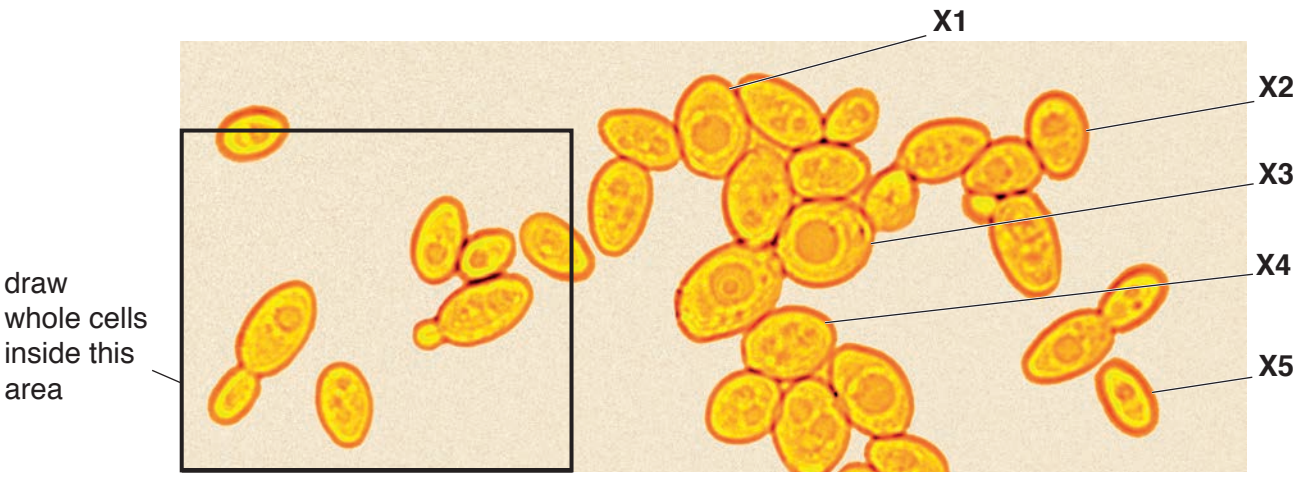
.....

.....

.....

..... [3]

Fig. 2.1 is a photomicrograph of yeast cells.



magnification × 1200

Fig. 2.1

(b) (i) Make a large drawing of the whole cells shown in the area on Fig. 2.1.

On your drawing, use a label line and label to show one observable feature of these cells which identify them as being similar to animal cells.

[5]

(ii) Use the magnification to calculate the mean maximum actual length, in μm, of yeast cells, **X1**, **X2**, **X3**, **X4** and **X5**.

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

..... μm [4]

[Total: 18]

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