UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6193688676

BIOLOGY **9700/34**

Advanced Practical Skills 2 **May/June 2013**

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, paperclips, highlighters, 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 **15** printed pages and **1** blank page.

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You are reminded that you have **only one hour** for each question in the practical examination.

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You should:

- read carefully through **the whole** of Question 1 and Question 2
- then plan your use of **the time** to make sure that you finish all the work that you would like to do.

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 hypothesis that:

The rate of release of carbon dioxide from yeast cells will decrease with time.

Carbon dioxide reacts with water to form a weak acid. The indicator, **P**, can be used to show the change in pH.

The pink indicator, **P**, will become colourless when carbon dioxide is added. This is the end-point as shown in Fig. 1.1.

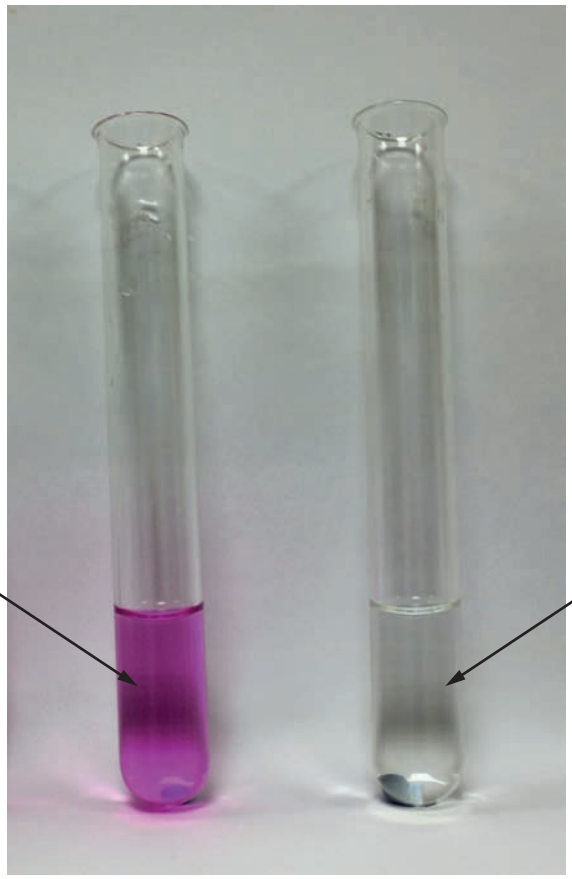


Fig. 1.1

You are provided with:

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labelled	contents	hazard	volume / cm^3
Y	yeast cell suspension	none	20
P	indicator solution	flammable	10
A	alkali solution	irritant	20
W	distilled water	none	100

You will need to standardise the pink colour before you start the readings.

Proceed as follows:

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

For steps 2 and 3, you must use **one** pipette to add the drops of **P** and a **different** pipette to add the drops of **A**.

2. Put 2 drops of **P** into the same test-tube. The solution should remain colourless. Insert the bung and with your finger holding the bung in place, mix the solution.

3. You are required to put drops of **A** into the solution until it becomes a pink colour. The colour should not be darker than the pink colour shown in Fig. 1.1.

(a) (i) Decide how you will use this test-tube to standardise the five other test-tubes you require.

State the **variables** which you will standardise when setting up these test-tubes to take the readings.

.....

..... [1]

4. Set up the five test-tubes as you have described in **(i)**.

(ii) Describe how you standardised the colour in these five test-tubes.

.....

..... [1]

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[Turn over

Fig. 1.2 shows how to use the apparatus provided.

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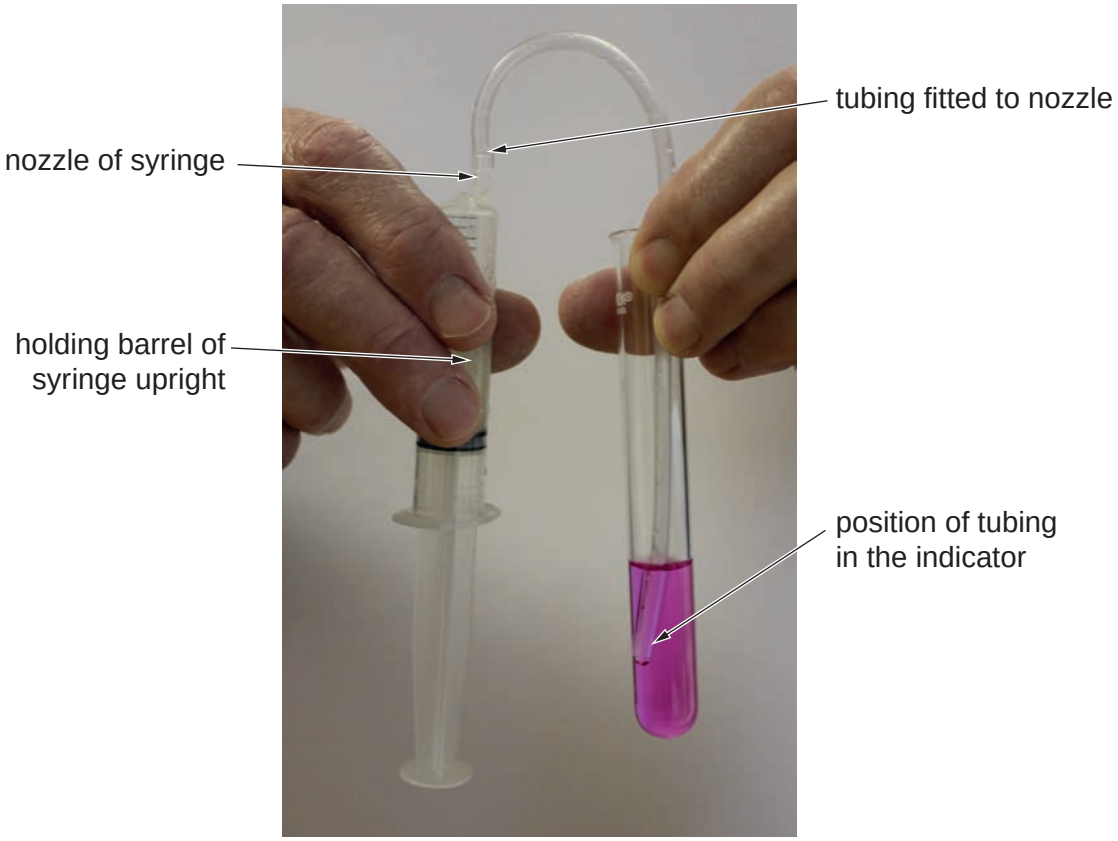


Fig. 1.2

The tubing from the syringe needs to reach into the test-tube so that it is below the surface of the indicator solution as shown in Fig. 1.2.

(iii) Decide how you will standardise the position of the tubing in each test-tube, without cutting the tubing. You may find Fig. 1.2 helpful.

Describe how you standardised the position of the tubing.

.....[1]

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You are required to:

- take five readings as shown in Fig. 1.3
- leave **Y** in the syringe for 10 minutes
- take another five readings as shown in Fig. 1.3.

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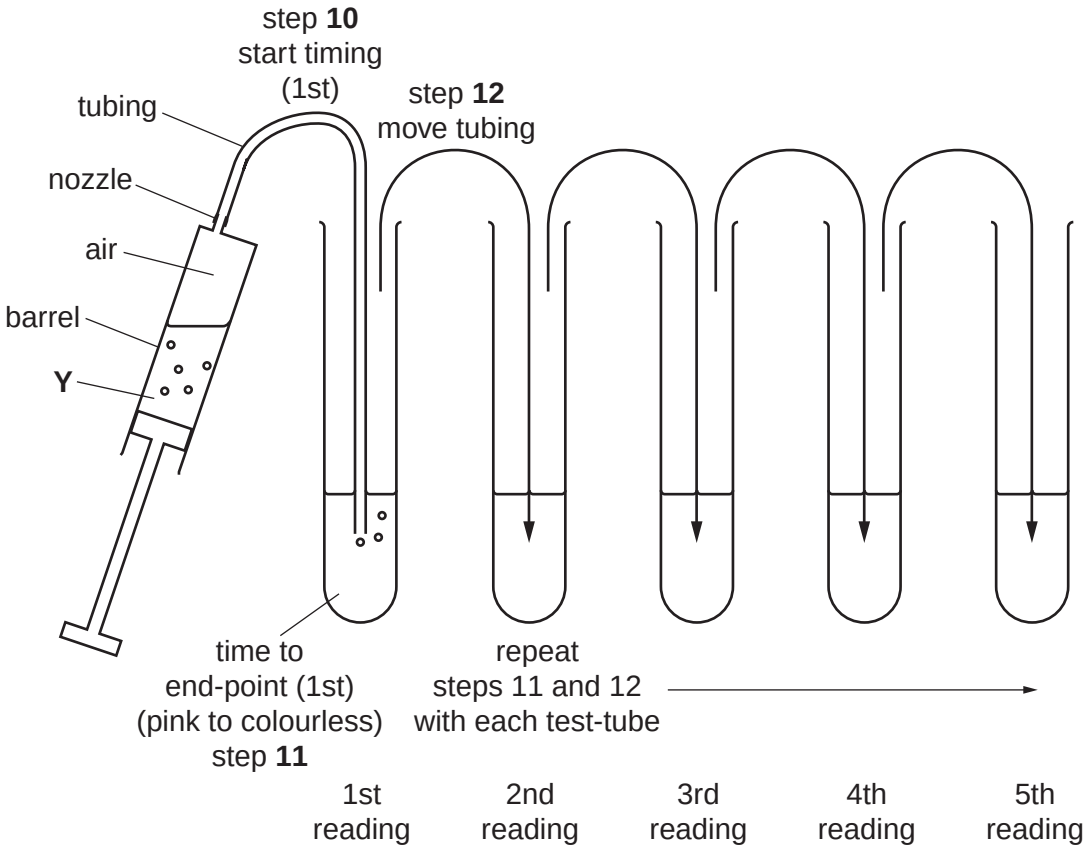


Fig. 1.3

The tubing must be transferred from one test-tube to the next as quickly as possible, after reaching the end-point.

Read up to the end of step 17 before proceeding.

To avoid the time delay in stopping and starting the timing, you must **not** stop the timer at any of the end-points, just record the time.

From your readings you will be required to calculate the time taken to reach the end-point in each test-tube.

(iv) Consider the units of the values recorded on your timer or clock.

State the:

- smallest value which your timer shows .....
- smallest unit of time you have decided to record ..... .

[1]

(v) Complete Table 1.1 with the raw data, recording the time when the tubing is put into the indicator and the time when the end-point is reached.
Repeat for each test-tube.
After 10 minutes, complete Table 1.2 with the second set of raw data.

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Table 1.1 – first five readings

		time		time		time		time		time
start of reading	1st		2nd		3rd		4th		5th	
end-point	1st		2nd		3rd		4th		5th	
space for any processing of the results										

Table 1.2 – readings after 10 minutes

		time		time		time		time		time
start of reading	1st		2nd		3rd		4th		5th	
end-point	1st		2nd		3rd		4th		5th	
space for any processing of the results										

[3]

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5. Remove the tubing from the syringe nozzle.

6. Use this syringe to take up 5 cm^3 of **Y** from below the froth.

7. Clean the outside of the syringe to remove any of **Y**.

8. Holding the barrel of the syringe with the nozzle pointing upwards, pull out the plunger to the 10 cm^3 mark. There is now 5 cm^3 of air in the syringe.
   The syringe should be kept upright to avoid **Y** from entering the tubing.
   Do **not** press the plunger.

9. Holding the barrel of the syringe upright, fit the tubing onto the nozzle of the syringe.

10. As shown in Fig. 1.2 and Fig. 1.3, put the end of the tubing into **P** in the first test-tube and start timing.
    Both the syringe and the test-tube contents need to be gently mixed by shaking until the end-point is reached.

11. Record in Table 1.1 the time shown on the timer when the end-point is reached. The colourless end-point can be compared with the contents of **E**.
    Do **not** stop the timer.

12. Immediately, transfer the tubing into **P** in the next test-tube and record in Table 1.1 the start time shown on the timer (start of second reading).
    Both the syringe and the test-tube contents need to be gently mixed by shaking until the end-point is reached.

13. Repeat steps 11 and 12 with the remaining three test-tubes.

14. After the 5th reading, stop timing. Remove the syringe with the tubing from the test-tube.

15. Leave **Y** in the syringe for 10 minutes. (The syringe should be kept upright so that **Y** is not able to enter the tubing).

16. During the 10 minutes, repeat step 4. You are provided with a container labelled, '**for waste**' and a container labelled '**for washing**', so you can re-use your test-tubes.

17. After 10 minutes, repeat steps 10 to 14 and record the results in Table 1.2.

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[Turn over

Depending on the timer or clock which you have used you may find the following examples helpful, so that you can process your results to find the time taken to reach the end-point.

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Example 1: using stop clock or stopwatch

	minutes:seconds	
start time	1:54	= 114 seconds
end-point time	2:18	= 138 seconds
time taken to reach end-point		= 24 seconds

Example 2: using clock times

	hours:minutes:seconds	
start time	9:10:50	difference in time
end-point time	9:11:14	24 seconds
time taken to reach end-point		= 24 seconds

(vi) Using your results from Table 1.1, complete Table 1.3 below to show the calculation to find the time taken to reach the end-point in your first test-tube.

Table 1.3

1st start time	
1st end-point time	
time taken to reach end-point	=

[1]

Question 1 continues on page 10

(vii) Combining the processed results from Table 1.1 and Table 1.2, prepare the space below to record **only** the processed results. This will enable the trend to be observed.

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[4]

(b) Identify **three** significant sources of error in this investigation.

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..... [3]

(c) Describe **three** modifications to this investigation which would improve the confidence in your results.

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.....[3]

The original hypothesis was:

The rate of release of carbon dioxide from yeast cells will decrease with time.

(d) State whether your results support this hypothesis.
Use your results to explain your answer.

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.....[2]

[Total: 20]

2 **N1** is a slide of a transverse section through a plant leaf. This plant grows mainly in Spain.

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(a) Draw a large plan diagram of the whole section of the plant leaf on **N1.**

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

[5]

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The vascular bundle is surrounded by a ring of large cells.

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(b) Make a large drawing of **one** group of adjacent (touching) cells, as observed on the specimen on **N1**, made up of four whole cells from this ring of large cells.

[4]

(c) Use the eyepiece graticule scale to measure the:

- diameter of the vascular bundle including the ring of cells
- width of the xylem tissue.

State the ratio of the diameter of the vascular bundle to the width of the xylem.

Note: You are **not** required to calibrate the eyepiece graticule scale with a stage micrometer.

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

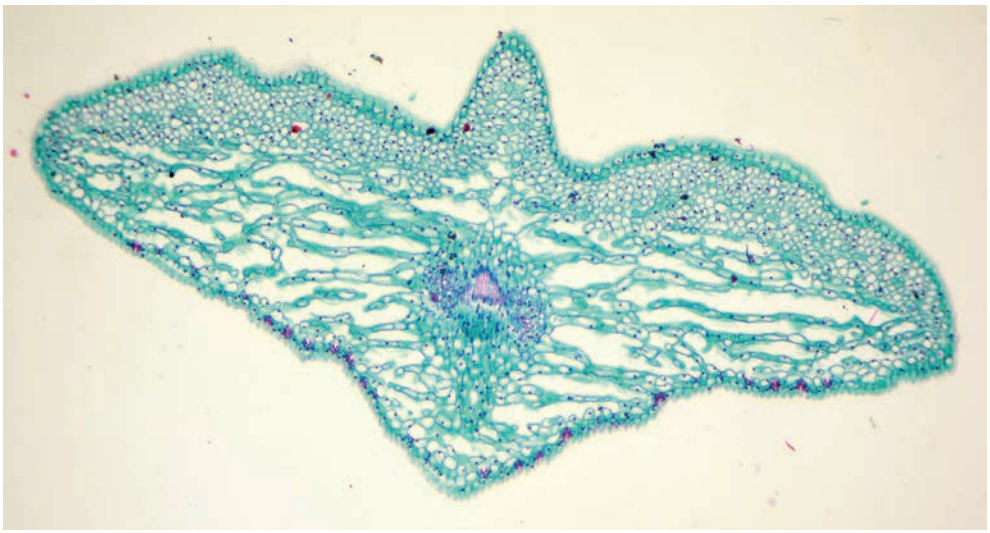
[2]

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Fig. 2.1 shows a photomicrograph of a transverse section through a leaf from a different species. This plant grows mainly in China.



magnification ×100

Fig. 2.1

(d) Prepare the space below so that it is suitable for you to record observable differences between the specimens on slide **N1** and in Fig. 2.1.

[4]

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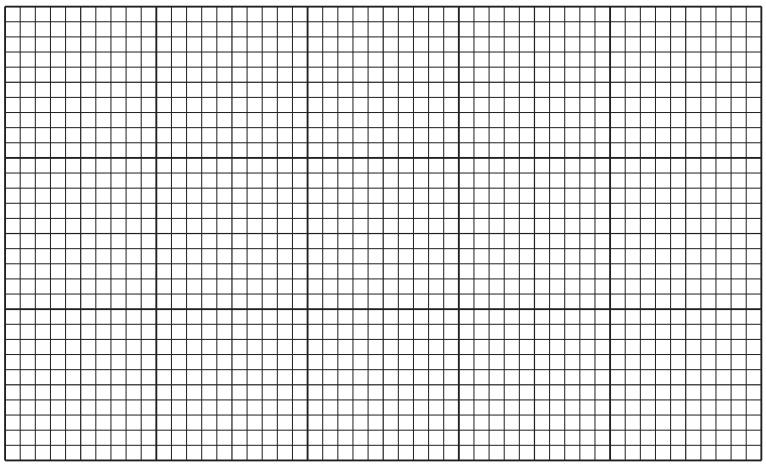
Both the specimen on **N1** and Fig. 2.1 are from plants which are adapted to survive in dry conditions.
Some scientists investigated the water potential in the leaf cells of a tree living in dry conditions over a period of 22 hours.
The results are shown in Table 2.1.

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Table 2.1

time of day / hours	water potential in the leaf cells / MPa
00:00	–1.0
02:00	–1.1
06:00	–1.5
08:00	–2.0
12:00	–3.0
18:00	–1.7
22:00	–1.4

(e) (i) Plot a graph of the data shown in Table 2.1.



[4]

(ii) Suggest how transpiration may explain the difference in the water potential in the leaf cells between 12:00 hours and 22:00 hours.

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.....[1]

[Total: 20]

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