Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **9700/33**

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.

CAMBRIDGE International Examinations

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 contain an enzyme, catalase, which catalyses the hydrolysis (breakdown) of hydrogen peroxide into oxygen and water with the transfer of heat to the surroundings. Sodium chloride solution can affect this reaction in yeast cells.

The effect of sodium chloride solutions on yeast cells can be measured by the increase in temperature.

You are required to:

- prepare different concentrations of the sodium chloride solution, **S**
- investigate the effect of different concentrations of sodium chloride solution (independent variable) on the yeast cells by finding the highest increase in temperature.

You are provided with:

labelled	**contents**	**hazard**	**volume / cm^3**
S	10% sodium chloride solution	none	60
W	distilled water	none	60
Y	yeast cell suspension	none	60
H	hydrogen peroxide solution	harmful irritant	60

It is recommended that you wear safety glasses/goggles.

When carrying out a practical procedure, the hazards of the use of all the apparatus and the 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 apparatus and solutions and state the **level** of risk of the procedure: low or medium or high.

hazard .....

level of risk .....[1]

You are required to change the concentration of the sodium chloride solution.

Table 1.1 shows how to make up two of the sodium chloride concentrations you will use.

Table 1.1

volume of 10% sodium chloride solution **S** / cm^3	volume of distilled water **W** / cm^3	percentage concentration of sodium chloride solution **S**
0	10	0
10	0	10

During the investigation you will mix 10 cm^3 of each concentration of sodium chloride solution with 10 cm^3 of yeast cell suspension to make a mixture, **SY**.

This will result in the concentration of the sodium chloride solution in **SY** being halved as shown in Table 1.2.

Table 1.2

volume of 10% sodium chloride solution **S** / cm^3	volume of distilled water **W** / cm^3	percentage concentration of sodium chloride solution **S**	percentage concentration of sodium chloride solution in **SY**
0	10	0	0
10	0	10	5

(b) (i) Decide which concentrations of sodium chloride solution to prepare:

- using simple dilution
- using 10% sodium chloride solution, **S**.

Complete the table to show how you will prepare these concentrations.

volume of 10% sodium chloride solution **S** / cm^3	volume of distilled water **W** / cm^3	percentage concentration of sodium chloride solution **S**	percentage concentration of sodium chloride solution in **SY**
0	10	0	0
10	0	10	5

[3]

Read step 1 to step 13 before proceeding.

To help you answer **(b)(ii)***, you should consider how to record the temperatures (raw results) and then process your raw results to find the temperature rise.*

Proceed as follows:

1. Prepare the concentrations of **S** as stated in **(b)(i)** in the beakers provided.

2. Stir the yeast cell suspension, **Y**.

3. Use a clean syringe to collect 10 cm^3 of **Y** from below the froth.

4. Put 10 cm^3 of **Y** into each of the beakers used in step 1 to make a mixture, **SY** in each beaker.

5. Stir well.

6. Leave for at least 5 minutes.

While you are waiting continue with Question 1.

7. Label test-tubes with the concentration of sodium chloride solution in the mixture **SY** you prepared in step 4.

8. Put 5 cm^3 of **H** into each of these test-tubes.

9. Record the temperature of **H** in each test-tube.

10. After leaving **SY** for at least 5 minutes (step 6), put 1 cm^3 of the mixture **SY** with 0% sodium chloride solution into the appropriate test-tube. Stir well.

11. Time for 2 minutes and record the **highest** temperature of the contents of the test-tube during the 2 minutes.

12. Repeat step 10 and step 11 using the mixture of **SY** with the next lowest concentration of sodium chloride solution.

13. Repeat step 12 with the remaining concentrations.

(ii) Prepare the space below to record your raw results and your processed results.

[6]

(iii) Explain why it is necessary to collect a result for the 0% sodium chloride solution and yeast mixture, **SY**.

.....

.....[1]

(iv) State the value of the smallest division on the scale of your thermometer.

smallest division ..... °C

State the actual error in measuring an **increase in temperature** of 6 °C using this thermometer.

actual error 6 °C ± ..... [1]

(v) The actual error of using the thermometer is the same for each measurement. The trend in the results is not affected and it is not a **significant** source of error.

Due to the procedure, the highest temperature recorded may be inaccurate (not close to the true temperature).

Suggest how step 9 and step 11 (on page 4) introduced an error which caused the highest temperature recorded to be inaccurate.

.....

.....[1]

(vi) This procedure investigated the effect of the concentration of sodium chloride solution on the activity of catalase in yeast cells.

To modify this procedure for investigating another variable, the independent variable (concentration of sodium chloride) would need to be standardised.

Describe how the independent variable (concentration of **sodium chloride solution**) will be standardised.

.....

.....

Consider how you would modify this procedure to investigate the effect of the concentration of **hydrogen peroxide** on the activity of the catalase in yeast cells.

Describe how the independent variable (concentration of **hydrogen peroxide**) will be investigated.

.....

.....

.....

.....

.....[3]

(c) In a similar investigation, a student investigated how changing the concentration of copper sulfate solution (independent variable) affected the hydrolysis of hydrogen peroxide.

The release of oxygen was measured by counting the bubbles when the oxygen was released through a delivery tube into a test-tube of water.

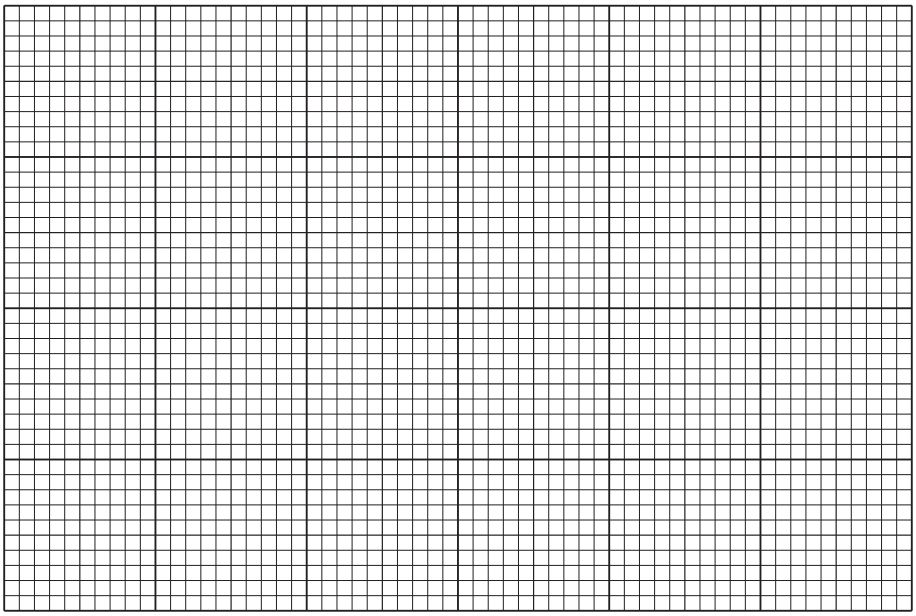
The results are shown in Table 1.3.

Table 1.3

percentage concentration of copper sulfate solution	**rate of catalase activity / number of bubbles released min^{-1}**
0.3000	0
0.1500	1
0.0750	2
0.0375	37
0.0000	39

You are required to use a sharp pencil for graphs.

(i) Plot a graph of the data shown in Table 1.3.



[4]

(ii) Explain the relationship between the concentration of copper sulfate solution and the activity of the catalase.

.....

.....[2]

[Total: 22]

Check that you have finished the whole of Question 1.

2 (a) **K1** is a slide of a stained transverse section through a plant stem.

You are not expected to be familiar with this specimen.

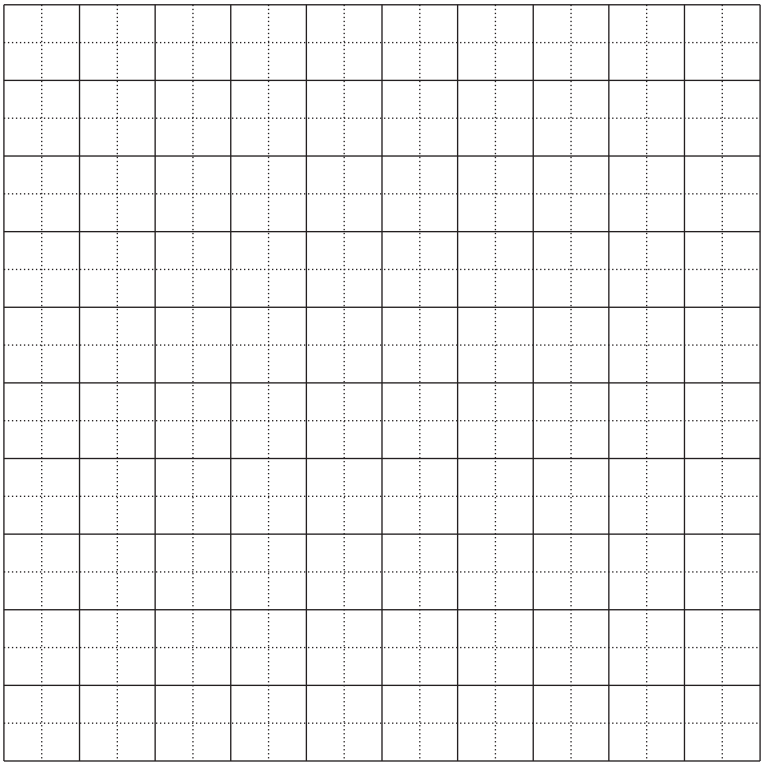
An eyepiece graticule scale can be used to measure the layers of tissues and to help draw a plan diagram with the correct shape and proportions of the tissues, without needing to calibrate the eyepiece graticule scale.

You are required to use a sharp pencil for drawings.

(i) Select one vascular bundle from one of the **corners** of the specimen on **K1**.

The grid and your eyepiece graticule should help you draw the vascular bundle with the correct shape and proportions of the tissues.

Draw on the grid below a large plan diagram of the vascular bundle you have selected.



Use **one** ruled label line and label to identify the xylem. [5]

(ii) Observe the tissue (cortex) between the epidermis and the vascular bundle.

Select one group of four cells made up of:

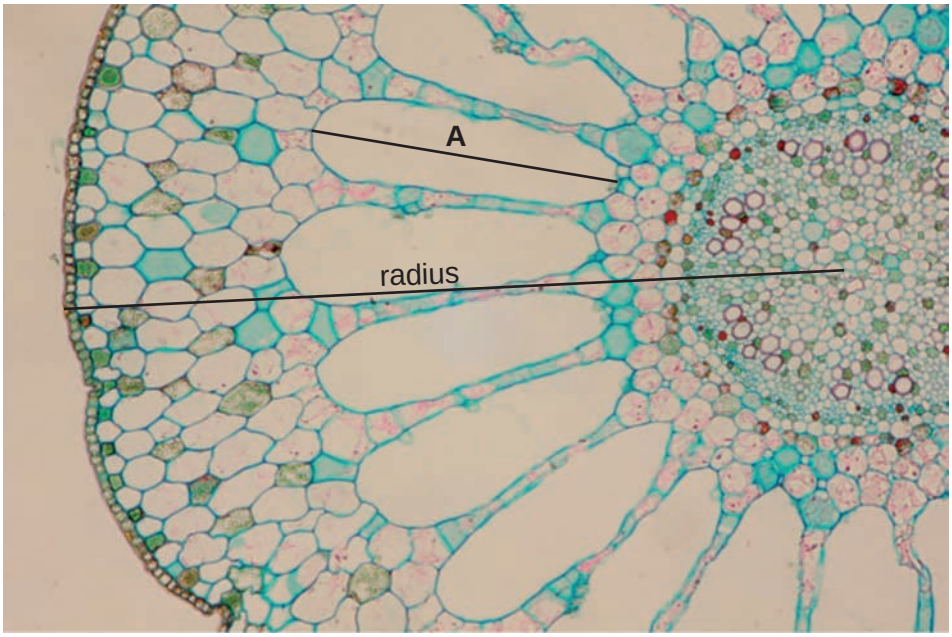
- two cells from the epidermis
- two cortex cells which touch each other and at least one of the epidermis cells.

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

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

[5]

(b) Fig. 2.1 is a photomicrograph of a stained transverse section of a stem of a different plant species.



magnification ×125

Fig. 2.1

(i) Calculate the **actual** length of the line **A** shown on Fig. 2.1.

You may lose marks if you do not show your working.

actual length ..... μm [2]

(ii) A student observed a different plant of the same species shown in Fig. 2.1. The student determined the ratio of the radius of the stem to the length of one air space as 266:82.

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

In this example, both sides of the ratio 266:82 are divisible by 2, so the simplest ratio for the measurements taken by the student is 133:41.

The actual radius of the stem in Fig. 2.1 is 825 μm.
Determine the simplest ratio of the radius of the stem in Fig. 2.1 to the length of an air space (line **A**).

ratio .....[1]

(iii) Suggest a habitat where this plant might grow and one observable feature shown in Fig. 2.1, which enables it to live in this habitat.

habitat .....

feature .....[1]

(c) Prepare the space below so that it is suitable for you to record observable differences between the specimen on **K1** and Fig. 2.1.

Record your observations in the space you have prepared.

[4]

[Total: 18]

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