Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8681232640

BIOLOGY **9700/33**

Paper 3 Advanced Practical Skills 1 **May/June 2016**

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 **10** printed pages and **2** 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 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 Plant cells contain an enzyme, catalase, which catalyses the hydrolysis (breakdown) of hydrogen peroxide into oxygen and water. An extract of plant tissue contains catalase.

You are required to investigate the effect of temperature (independent variable) on catalase in a plant extract solution.

You are provided with:

labelled	contents	hazard	volume / cm^3
P	plant extract solution	none	100
H	hydrogen peroxide solution	harmful irritant	100

You are advised to wear suitable eye protection, especially when using the hydrogen peroxide solution, **H**. If **H** comes into contact with your skin, wash off with cold water.

(a) When carrying out a practical procedure the hazards of using the solutions need to be considered. Then the level of risk needs to be assessed as low or medium or high.

State the hazard with the greatest level of risk when using the solutions then state the **level** of risk of the procedure: low or medium or high.

hazard .....

level of risk .....[1]

(b) You are required to keep a sample of 10 cm^3 of the solution in **P** to test at the temperature of the room.

Then heat the remaining solution in **P** and remove 10 cm^3 samples of the solution at different temperatures including a sample at the **maximum** temperature of 70 °C.

(i) Use the thermometer to measure the temperature of the room.

temperature .....[1]

(ii) You will need to test a sample of the solution in **P** which has been heated to 70 °C.

State the other temperatures at which you will remove each sample.

.....

.....[2]

Proceed as follows:

1. Put 10 cm^3 of the solution in **P** into a petri dish labelled with the temperature of the room you recorded in **(b)(i)**.

2. Gently heat the beaker labelled **P**, containing the remaining solution.

3. When the temperature of the solution in **P** reaches the lowest temperature stated in **(b)(ii)**, remove the Bunsen burner.

4. Remove 10 cm^3 of the solution in **P** and put it into a labelled petri dish.

5. Replace the Bunsen burner.

6. Repeat step 2 to step 5 for each of the temperatures stated in **(b)(ii)**.

7. When the solution reaches 70 °C, remove the last sample and put it into a labelled petri dish.

8. Turn off the Bunsen burner.

9. Leave the solutions to cool while you cut squares of filter paper, 1 cm × 1 cm. You will need to decide how many squares to cut to give you confidence in your results.

10. Put a mark on the test-tube 2 cm from the top.

11. Put **H** into the test-tube up to this mark.

12. Use forceps to pick up one square of filter paper and dip the whole square into the solution in the petri dish that is labelled with the temperature of the room.

13. Wipe the square against the petri dish to remove excess solution from both sides of the square.

14. Hold the square just below the surface of **H** so that the top of the square is level with the surface of **H** as shown in Fig. 1.1.

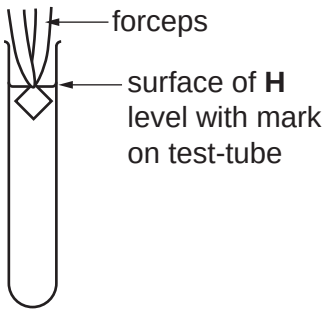

Fig. 1.1

15. Immediately release the square (you may need to shake the forceps) and start timing.

16. Measure the time taken for the square to return to the surface. Record the time in **(b)(iii)**.

    If the time is more than 120 seconds, stop timing and record ‘more than 120’.

17. Remove the square from the test-tube.

*Note: if the square remains at the bottom of the test-tube, pour off **H** into the container labelled **H**. Use water in the beaker labelled 'for washing' to rinse out the square from the test-tube. Then repeat step 11.*

18. Repeat step 12 to step 17 with each of the samples removed at the different temperatures.

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

[6]

(iv) Identify **two** significant sources of error in this investigation.

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.....[2]

(v) Explain how the enzyme catalase was affected by the change in temperature.

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.....[2]

(vi) This procedure investigated the effect of temperature on the activity of catalase in the plant extract.

To modify this procedure for investigating another variable, the independent variable (temperature) would need to be standardised.

Describe how the temperature could be standardised.

.....

.....

Now consider how you could modify this procedure to investigate the effect of the **concentration of catalase** in the plant extract on the breakdown of hydrogen peroxide.

Describe how this independent variable, **concentration of catalase**, could be investigated.

.....

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.....[3]

(c) A student investigated the activity of catalase in plant extracts from different species of plants, **R**, **S**, **T**, **U** and **V**, by measuring the initial rate of activity.

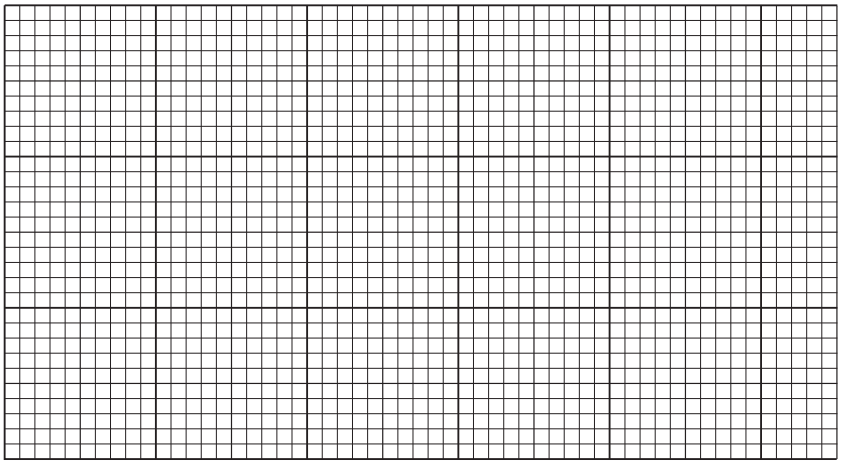
Table 1.1 shows the results for this investigation.

Table 1.1

different plant species	initial rate of activity of catalase / s^{-1}
R	0.0750
S	0.1275
T	0.0900
U	0.0325
V	0.0625

You are required to use a sharp pencil for charts.

Plot a chart of the data shown in Table 1.1.



[4]

[Total: 21]

2 **K1** is a slide of a stained transverse section through a plant leaf.

You are not expected to be familiar with this specimen.

You are required to use a sharp pencil for drawings.

(a) **(i)** Draw a large plan diagram of the part of the leaf as shown by the shaded area in Fig. 2.1, to include observable features and **two** vascular bundles.

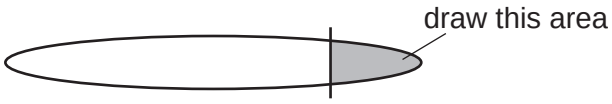


Fig. 2.1

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

[4]

(ii) Observe the epidermis in **K1**. These cells are not identical.

Select **one** group of **four** adjacent (touching) cells which show some of the differences between these cells.

Make a large drawing of this group of **four** cells.
Each cell of the group must touch at least one other cell.

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

[5]

(b) Fig. 2.2 is a photomicrograph of a stained transverse section through part of a leaf from a different type of plant.

You are not expected to be familiar with this specimen.

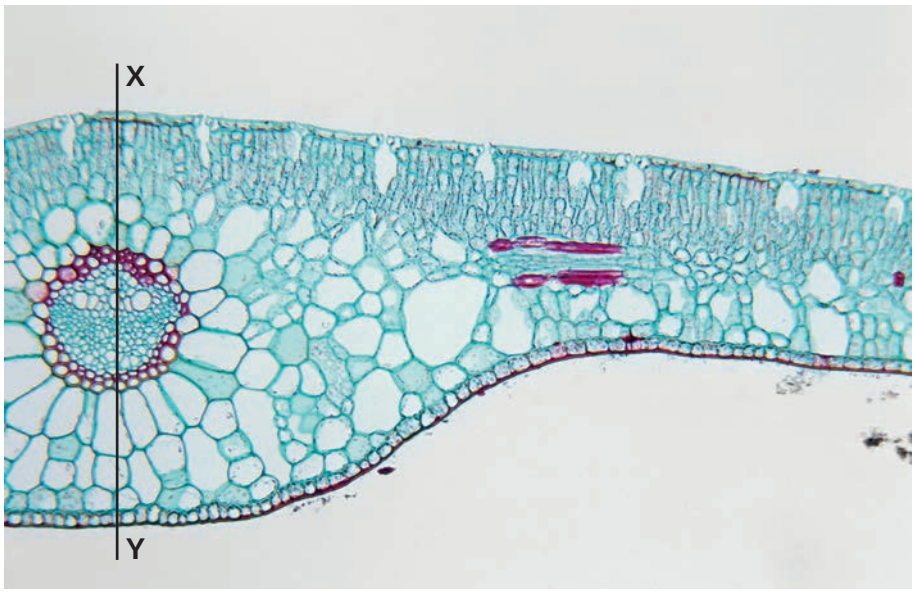


Fig. 2.2

(i) Use the line **X**–**Y** to determine the simplest ratio of the depth of the midrib to the diameter of the vascular bundle.

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

simplest ratio .....[5]

(ii) Suggest a habitat where this plant might grow and **one** observable feature, shown in Fig. 2.2, which adapts it to this habitat.

habitat .....

feature .....[1]

(c) Prepare the space below so that it is suitable for you to record observable differences between the leaf on **K1** and the leaf in Fig. 2.2.

Record your observations in the space you have prepared.

[4]

[Total: 19]

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