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

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

0756041585

BIOLOGY **9700/35**

Advanced Practical Skills 1 **October/November 2012**

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, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

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 **12** printed pages.

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

For Examiner's Use

You should:

- Read carefully through **the whole** of Question 1 and Question 2
- 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 contain an enzyme, catalase, which catalyses the hydrolysis (breakdown) of hydrogen peroxide into oxygen and water with the transfer of heat to the surroundings.

The progress of this enzyme-catalysed reaction can be followed by measuring the temperature at intervals of time.

You are required to:

- make different concentrations of the copper sulfate solution, **C**
- investigate the effect of different concentrations of **C** (the independent variable).

You are provided with:

labelled	**contents**	**hazard**	**volume / cm^3**
C	3% copper sulfate solution	harmful irritant	25
H	hydrogen peroxide solution	harmful irritant	50
W	distilled water	none	50
Y	yeast suspension	low	20

You are required to make a serial dilution of 3% copper sulfate solution, **C** which reduces the concentration of **C** by a factor of ten between each successive dilution.

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You will need to make up 10 cm^3 of each concentration of solution **C**.

(a) (i) Complete Fig. 1.1 to show how you will make **two** further concentrations of **C**, starting with the 3% solution, **C**.

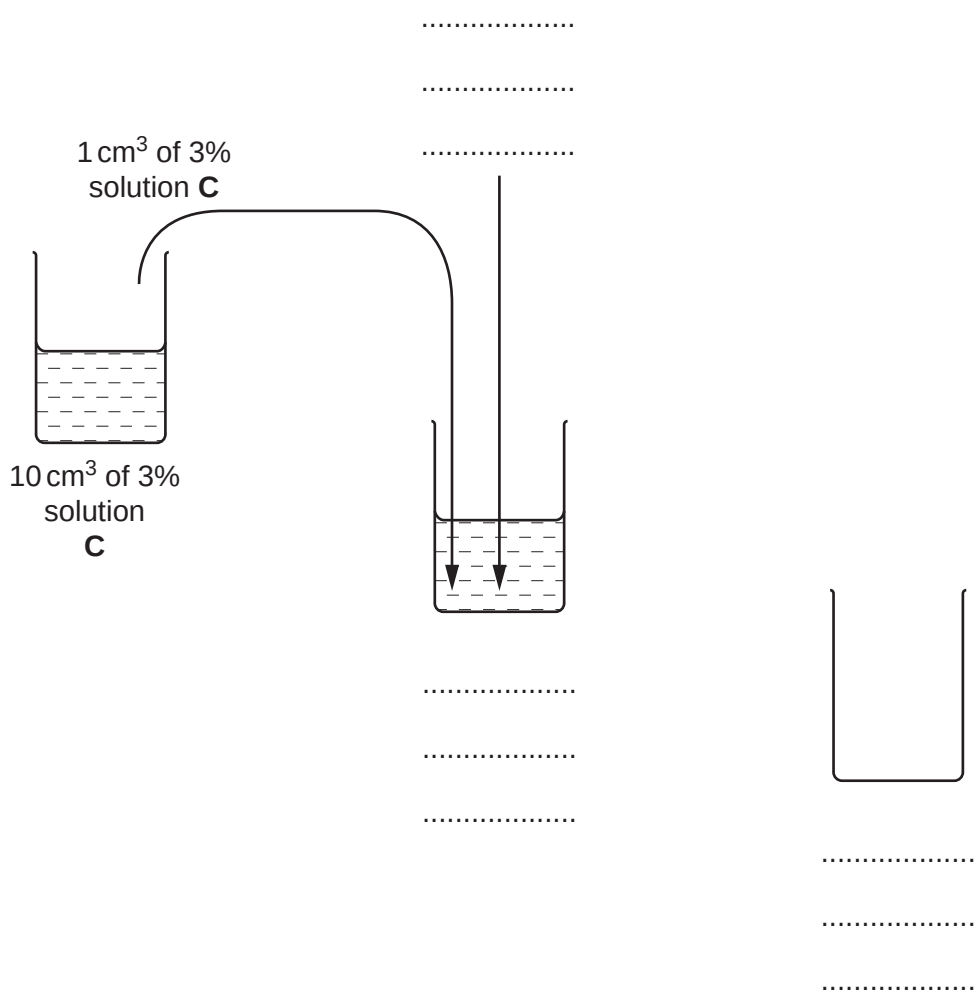

Fig. 1.1

[3]

Proceed as follows:

1. Make the concentrations of **C** as stated in **(a)(i)**.
2. Label test-tubes with **W** and with the concentrations of **C**.
3. Put 1 cm^3 of **W** into the test-tube labelled **W** and put 5 cm^3 of **H** into the same test-tube. Mix well.
4. Put a thermometer into the contents of the test-tube. Record the temperature.
5. Stir **Y** and put 1 cm^3 of **Y** into the same test-tube. Mix well.
6. Start timing and record the temperature of the contents of the test-tube every 30 seconds up to 210 seconds.

7. Repeat steps 3 to 6 replacing the 1 cm^3 of **W** with 1 cm^3 of the lowest concentration of **C**.

8. Repeat step 7 with the other concentrations of **C**.

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

[5]

(iii) Explain the effect of the 3% copper sulfate solution on the enzyme-catalysed reaction.

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.....[1]

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

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.....[2]

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

For Examiner's Use

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..... [3]

(vi) Describe how you would set up a control for this investigation.

.....

..... [1]

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

smallest division .....

State the actual error in measuring a temperature of 30 °C using this thermometer.

30 °C ± ..... °C
[1]

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

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The student stopped the reaction after one minute by adding a high concentration of sodium azide.

A dye was added which reacted with the hydrogen peroxide that had not been hydrolysed. This produced different intensities of colour depending on the quantity of the remaining hydrogen peroxide in the solution.

A colorimeter was used to measure the absorbance of light by the coloured solution.

Other variables were considered and kept to a standard.

The results of the student's investigation are shown in Table 1.1.

Table 1.1

concentration of catalase solution / arbitrary units	**absorbance of light by the coloured solution / arbitrary units**
10	1.34
14	1.12
30	0.66
50	0.04
100	0.02

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

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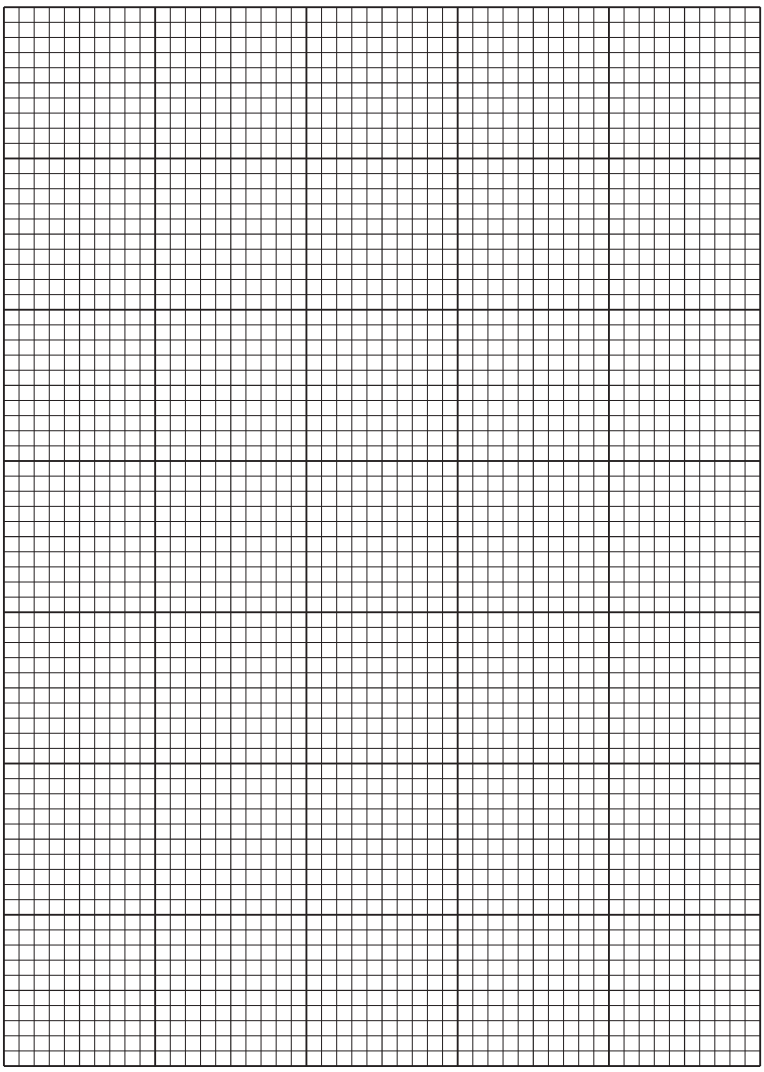

[4]

(ii) Explain the relationship between the concentration of catalase solution and the hydrolysis of hydrogen peroxide.

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.....[2]

[Total: 22]

2 **L1** is a slide of a transverse section showing a tubular part of the digestive system of a mammal.

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You are not expected to have studied this material.

(a) Draw a large plan diagram showing only the features of the wall of the tube as in the sector shaded in Fig. 2.1.

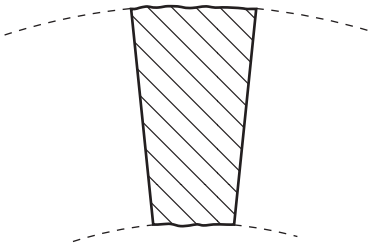

Fig. 2.1

On your diagram, use a label line and label to show the position of the lumen.

Annotate your diagram to describe one difference between the innermost layer and outermost layer.

[5]

Fig. 2.2 shows a diagram of a view of a stage micrometer scale that is being used to calibrate an eyepiece graticule.

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One division, on either the stage micrometer scale or the eyepiece graticule, is the distance between two adjacent lines.

The length of one division on this stage micrometer is **0.1 mm**.

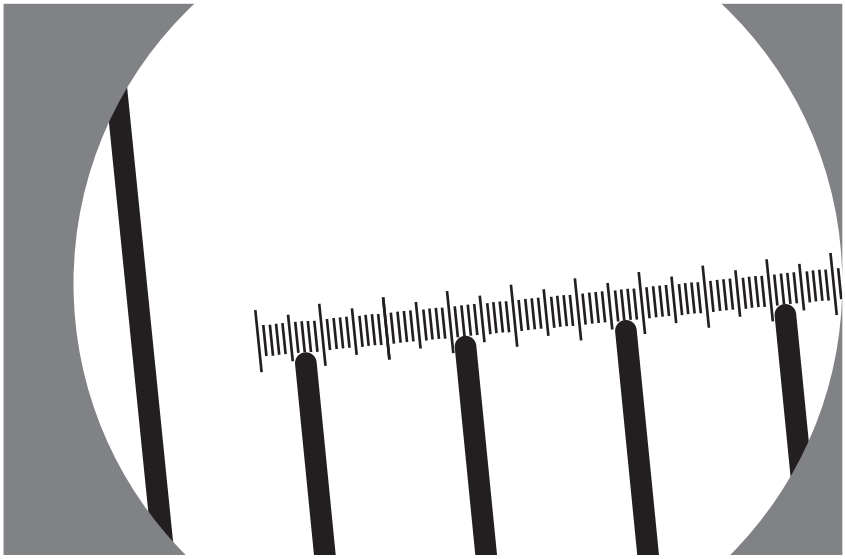

Fig. 2.2

(b) (i) Using this stage micrometer, where one division is **0.1 mm**, calculate the actual length of one eyepiece graticule unit using Fig. 2.2 by completing Fig. 2.3.

Step 1

1 eyepiece graticule unit = [ ] divided by [ ] = ... mm

Step 2

Convert the answer to a measurement with the unit most suitable for use in light microscopy.

[ ] multiplied by [ ] = ...

Fig. 2.3

[3]

Fig. 2.4 is a photomicrograph showing a transverse section through a part of the specimen on slide **L1**.

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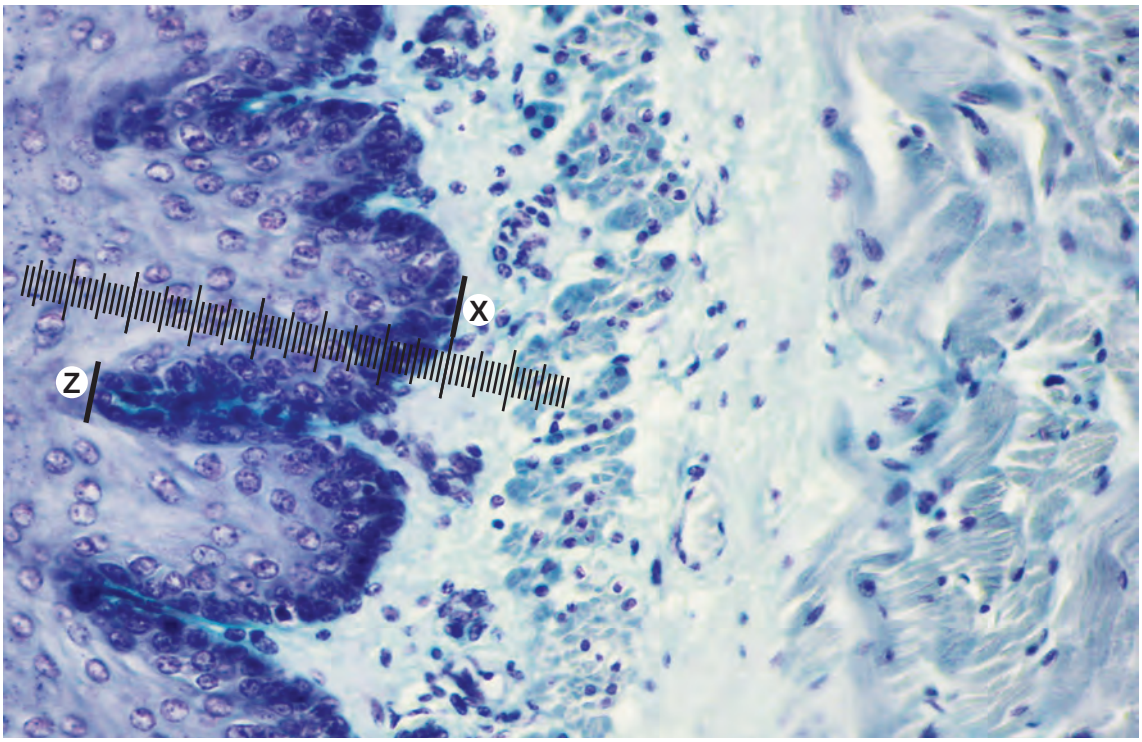


Fig. 2.4

(ii) Fig. 2.4 shows a photomicrograph taken using the same microscope with the same lenses as Fig. 2.2.
Use the calibration of the eyepiece graticule unit from **(b)(i)** and Fig. 2.4 to calculate the actual length of the fold shown by **X** to **Z**.

You will lose marks if you do not show all the steps in your calculation and do not use the appropriate units.

[2]

Fig. 2.5 is a photomicrograph showing a transverse section through a part of the specimen on slide L1.

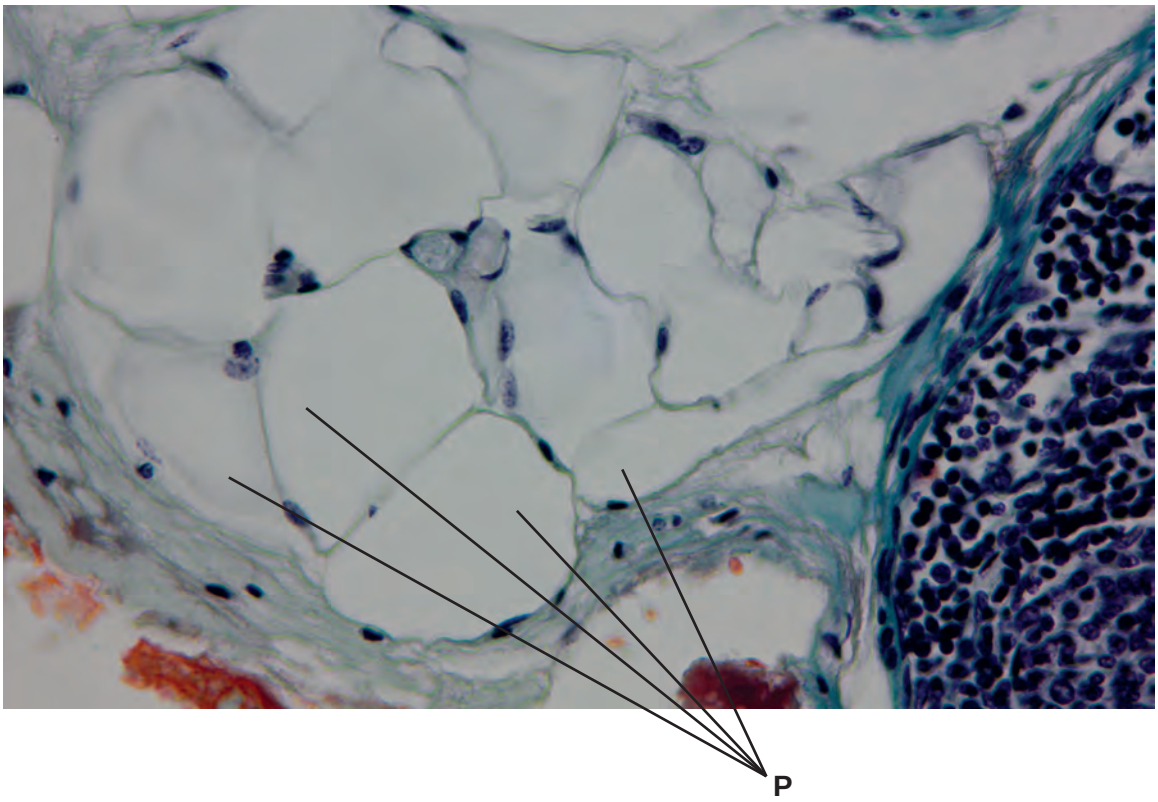


Fig. 2.5

(c) Make a large drawing of the four cells, labelled **P**, on Fig. 2.5.

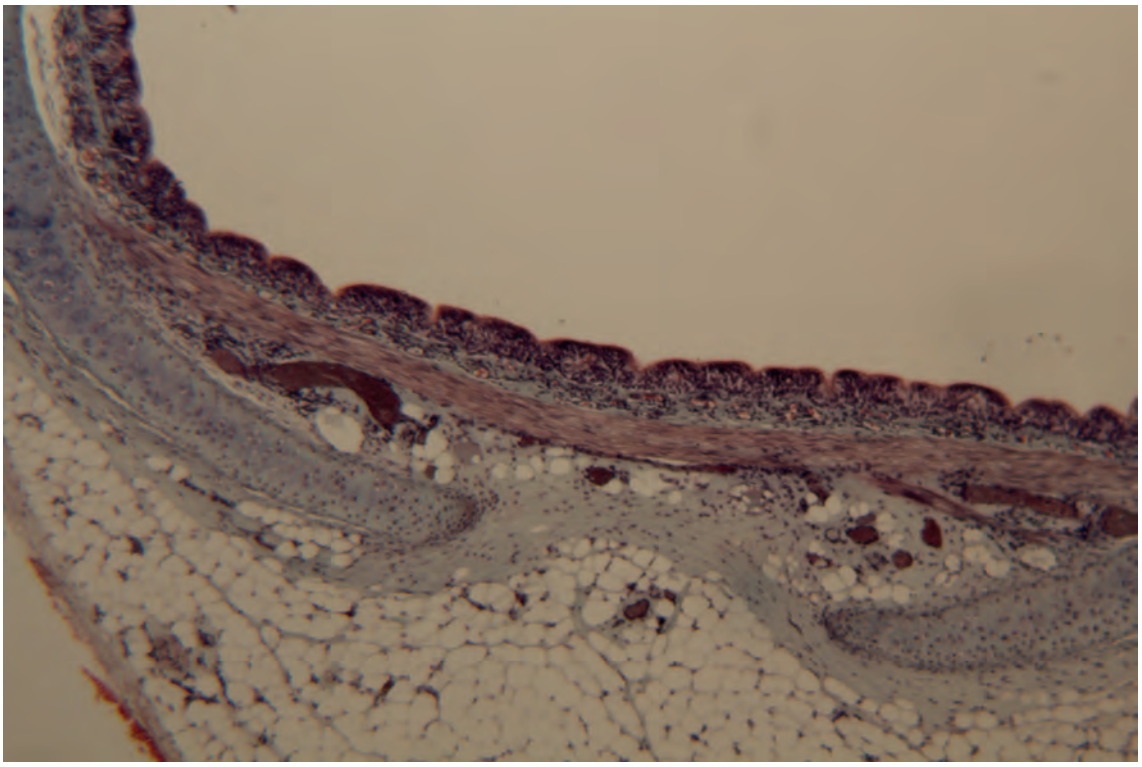
On your drawing, use a label line and label to show one nucleus.

[4]

Question 2 continues on page 12

[Turn over

Fig. 2.6 is a photomicrograph showing a transverse section through a different organ in the same mammal.



×40

Fig. 2.6

(d) Prepare the space below so that it is suitable for you to record **two** observable differences between the specimen on slide **L1** and in Fig. 2.6.

[4]

[Total: 18]