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

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

BIOLOGY **9700/32**

Advanced Practical Skills 2 **May/June 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 **13** printed pages and **3** blank pages.

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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.
- Plan your use of **the time** to make sure that you finish all of the work that you would like to do.

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

1 Enzyme **E** catalyses the hydrolysis of starch. Starch can be found on the surface of some types of paper.

The end-point of this hydrolysis is the change of stained paper from blue/black to a light blue or white.

You are required to:

- make different concentrations of the enzyme solution, **E**
- investigate the effect of different concentrations of **E**, by finding the time taken for the blue/black colour of a square of paper to change to light blue or white.

You are provided with:

labelled	**contents**	**hazard**	**percentage concentration**	**volume / cm^3**
E	enzyme solution	irritant harmful	1.0	50
W	distilled water	none	–	50
iodine	iodine in potassium iodide solution	irritant harmful	diluted	–

(a) (i) Decide on the concentrations of **E** you will use in your investigation.

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

Prepare the space provided on page 3 to show:

- the concentrations of **E**
- the volumes of **E**
- the volumes of **W**.

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Use this space:

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[3]

You are advised to read steps 1 to 12 before proceeding.

Proceed as follows:

1. Prepare the concentrations of enzyme solution as stated in **(a)(i)**.
2. Cut one piece of white paper 1 cm × 1 cm, from the grid on **page 15**.
3. Make a single cut, 1 cm long, in the end of a wooden splint as shown in Fig. 1.1.
4. Fit the piece of paper into the cut as shown in Fig. 1.2.

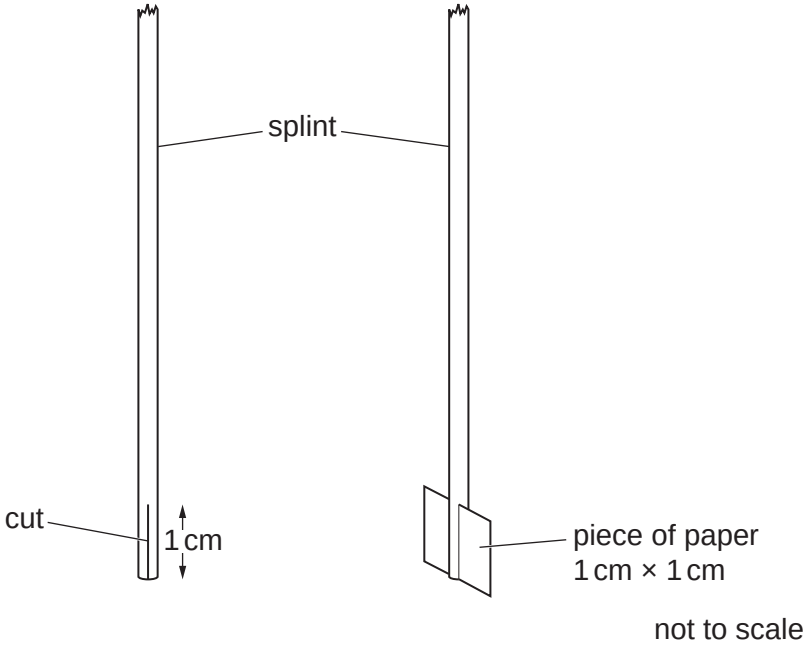


Fig. 1.1 **Fig. 1.2**

5. Put the piece of paper into the **iodine** solution, as shown in Fig. 1.3, for at least 30 seconds so that the paper is evenly stained.

   This should be used as the colour standard.

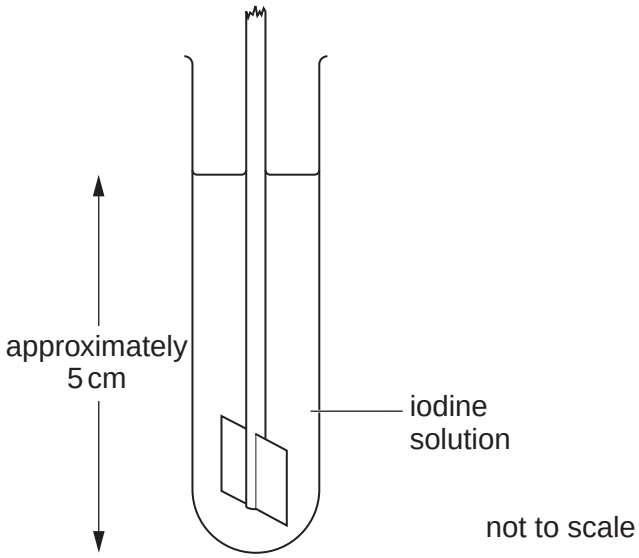


Fig. 1.3

6. Put one of the concentrations of **E** into a test-tube to a depth of 2 cm.

7. Repeat steps 2 to 5.

8. Put this splint and its piece of stained paper into the test-tube containing **E**, as shown in Fig. 1.4.

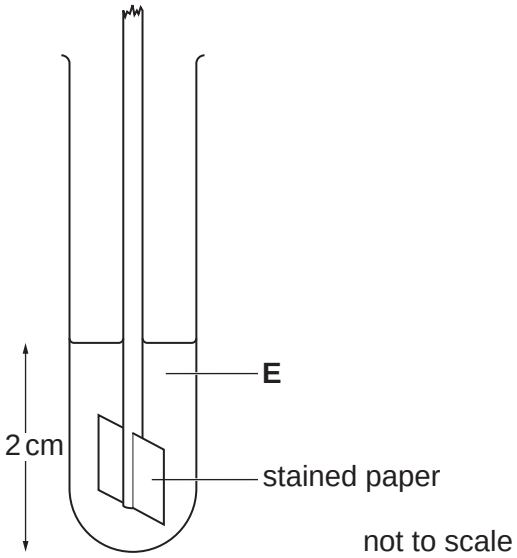


Fig. 1.4

9. Start timing.

10. Occasionally mix the contents by moving the test-tube.

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11. Record the time taken for the stained paper to reach the end-point.

    If the end-point is not reached at three minutes, stop timing. Record this as 'more than 180'.

12. Repeat steps 6 to 11 with each of the other concentrations of **E**.

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

[5]

(iii) Describe how you would set up a control using the apparatus provided.

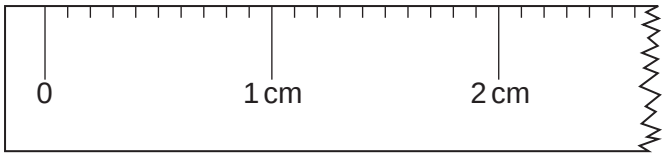
.....

.....

..... [1]

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(iv) Fig. 1.5 shows the ruler used by a student in step 6 to measure the depth of **E**.



magnification × 3

Fig. 1.5

State the degree of uncertainty of the measurements using this ruler.

..... [1]

(v) Identify **two** significant sources of error in your investigation.

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..... [2]

(vi) Suggest how you would make **two** improvements to this investigation.

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..... [2]

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Question 1 continues on page 8

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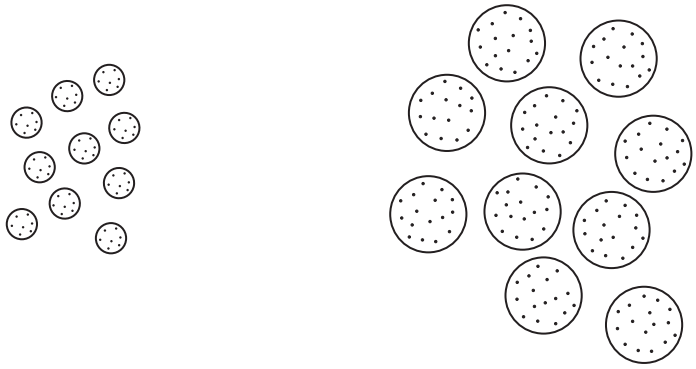
Lactase is an enzyme which catalyses the hydrolysis of lactose.

Lactase can be held on the surface of alginate beads (immobilised) and put into lactose solution.

A student investigated the effect of varying the size of alginate beads on the rate of reaction of lactase on lactose.

Other variables were considered and kept to a standard. There were 10 beads of each diameter.

Fig. 1.6 shows two of the sets of beads and the distribution of the lactase molecules.



not to scale

Fig. 1.6

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

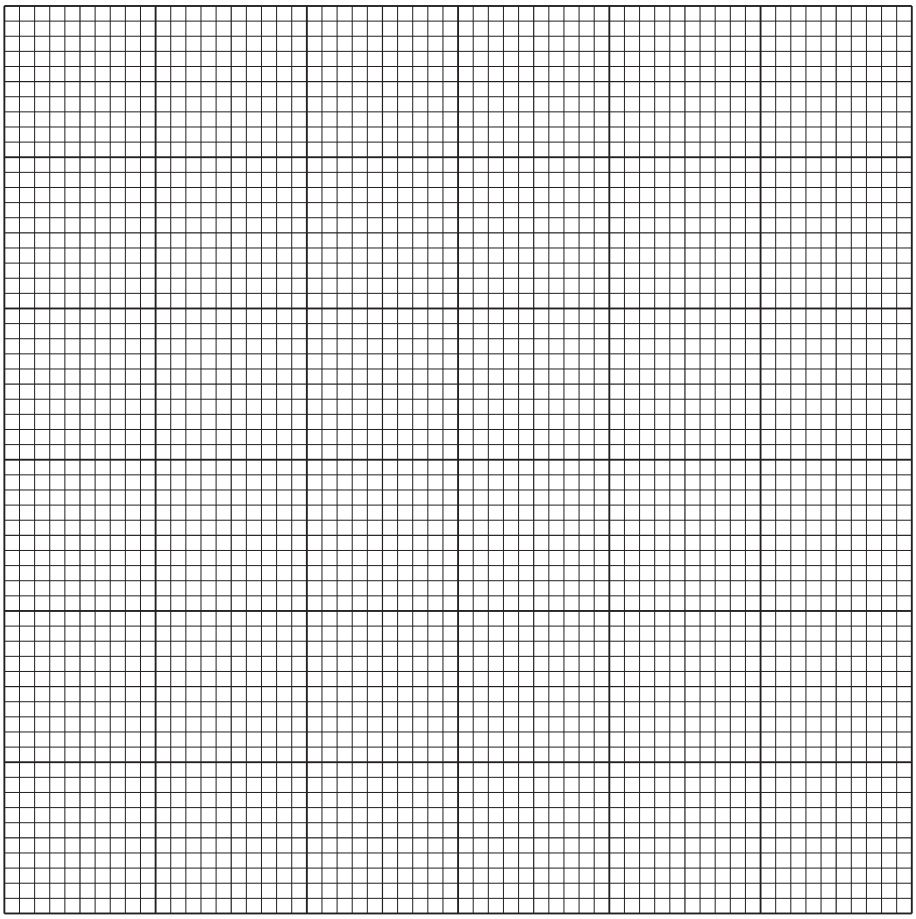
Table 1.1

bead diameter / mm	**mass of product in a minute / mg min^{-1}**
1.0	24.0
1.5	30.5
3.0	42.0
4.5	50.0
6.0	52.5

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

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[4]

(ii) From your graph state the mass of product formed in a minute for immobilised lactase beads of 2 mm diameter.

..... [1]

(iii) Explain the effect of immobilised lactase bead diameter on the mass of product formed in a minute, using the data and Fig. 1.6.

.....

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.....

.....

..... [3]

[Total: 22]

2 **J1** is a slide of a stained transverse section through a mammalian lung.

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(a) Make a large drawing to show the walls of **two** whole alveoli.

Label a nucleus.

[5]

Fig. 2.1 is a photomicrograph of a transverse section through an artery which shows the lumen partially blocked. A grid has been placed over the photomicrograph to help you answer **(b)(i)** and **(ii)**.

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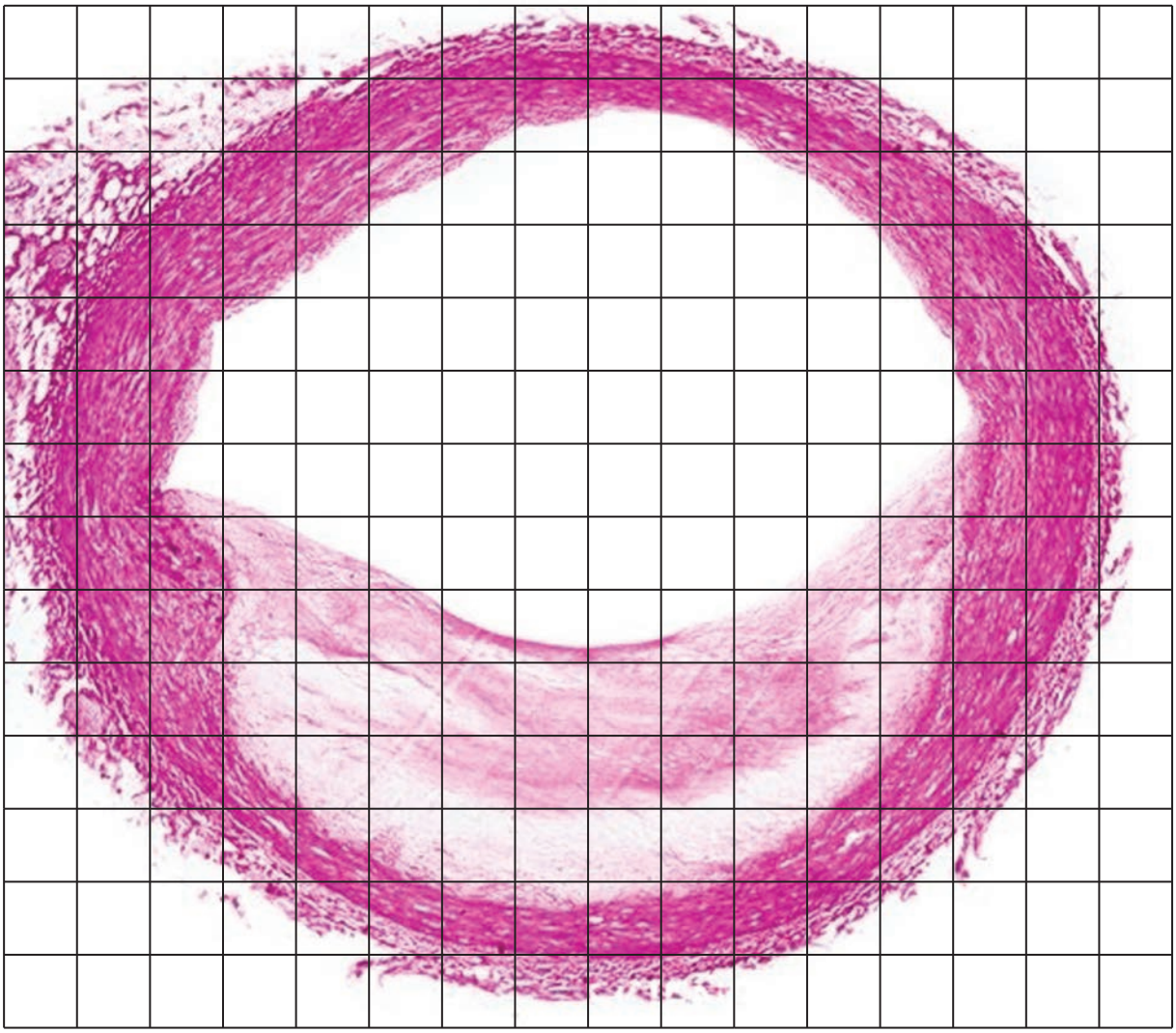


Fig. 2.1

(b) (i) Describe how you will use the grid to find the total area of the lumen and the area of the lumen that is blocked.

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.....

..... [1]

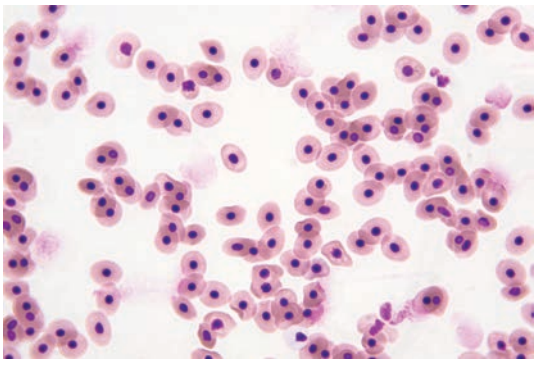
(ii) Calculate the percentage change in area of the lumen caused by the blockage.

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

.....% [4]

Fig. 2.2 and Fig. 2.3 are photomicrographs of red blood cells from a fish species and a frog species respectively.



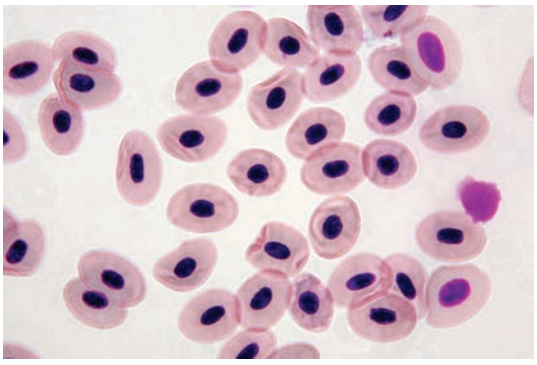


Fig. 2.2 magnification ×630 **Fig. 2.3**

(iii) Make a large drawing of two red blood cells from each species.

Label the cell membrane of one red blood cell.

Fish cells

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Frog cells

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[4]

(iv) Prepare the space below so that it is suitable for you to show the observable differences between the specimens in Fig. 2.2 and 2.3.

Record your observations in the space you have prepared.

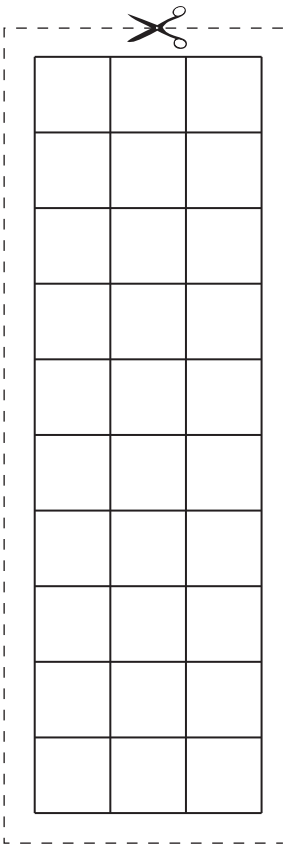
[4]

[Total: 18]

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Grid for use in Question 1:



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Question 2, Fig. 2.3 EDWARD KINSMAN/SCIENCE PHOTO LIBRARY

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