



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE
NAME

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CO-ORDINATED SCIENCES

0654/51

Paper 5 Practical Test

October/November 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 pen.

You may use a 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.

Chemistry practical notes for this paper are printed on page 12.

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	
3	
Total	

This document consists of **12** printed pages.



- 1 You are going to do three experiments to investigate the digestion of starch in the alimentary canal. First you will set up the experiments. When they have been set up, you will then carry out the tests and answer the questions.

Setting up the 1st experiment

- Stir the starch solution provided and then transfer some of it into a test-tube, so that the tube is about one-third full.
- Add about the same amount of amylase solution to the tube, and mix the contents with a clean glass rod.
- Label this test-tube **A**, and keep it for later.

2nd experiment

An experiment has been set up for you as in Fig. 1.1. This is a model of the digestion and absorption of starch in the alimentary canal.

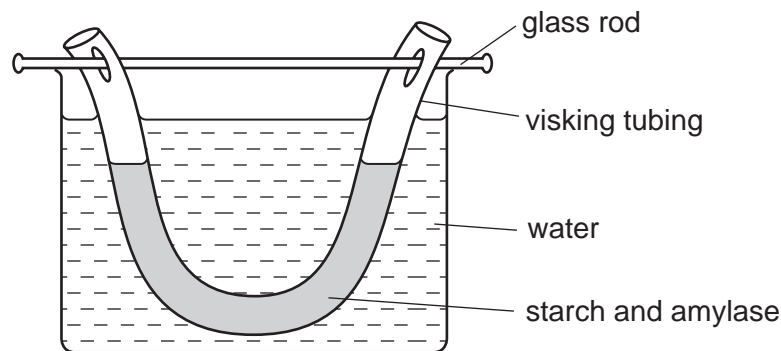


Fig. 1.1

The piece of “visking tubing” represents the alimentary canal. It was set up one hour ago, with a mixture of starch and amylase inside it. The visking tubing forms a selectively permeable membrane – it allows smaller molecules to pass through it, but not larger molecules.

Setting up the 3rd experiment

Use the apparatus you have been given to set up your own model of the alimentary canal, similar to the one that was set up for you (and similar to the one shown in Fig. 1.1).

- Set up a beaker of warm water, approximately 30-40 °C.
- You are provided with a section of visking tubing, with holes cut near the ends. Soften the piece of visking tubing under running water, so that the tubing opens.
- Holding the tubing in a U-shape, use a pipette to put some starch solution into the visking tubing.
- Rinse the outside of the visking tubing, to make sure that none of the starch solution is on the outside of it.
- Put a glass rod through the holes in the visking tubing, and hang it in the beaker of warm water, as shown in Fig. 1.1.
- Now add enough iodine solution to the water in the beaker for the brown colour of the iodine to be visible.
- Leave your beaker for at least 15 minutes. Meanwhile, you can continue with parts **(a)** and **(b)** below.

(a) Tests and questions about the 1st experimentFor
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- (i)
- Divide the liquid in test-tube **A** approximately equally between two test-tubes, and label these **A1** and **A2**.
 - Test the liquid in tube **A1** for starch, by adding iodine solution. Record the result in Table 1.1, and in the last column say whether or not starch is present.
 - Test the liquid in tube **A2** for reducing sugar, by adding Benedict's solution and placing the tube in a hot water bath for about three minutes. Record the result in Table 1.1, and in the last column say whether or not sugar is present.

Table 1.1

test-tube	result	conclusion
A1		
A2		

[3]

- (ii) Explain what the results and conclusions from tubes **A1** and **A2** in Table 1.1 tell you about the effect of amylase on starch solution.

results and conclusions from tube **A1**

.....

results and conclusions from tube **A2**

.....

[2]

(b) Tests and questions about the 2nd experiment

- (i)
- Use a pipette to remove two samples of water from the beaker in the second experiment. This is the one that has been set up for you.
 - Place each sample in a clean test-tube. You will need 1-2 cm depth of liquid in each tube.
 - Label these test-tubes **B1** and **B2**.
 - Test the liquid in tube **B1** for starch and the liquid in tube **B2** for reducing sugar, using the same methods as in part (a). Record your results in Table 1.2, and say whether or not starch or sugar is present.

Table 1.2

test-tube	result	conclusion
B1		
B2		

[3]

- (ii) Explain what the results and conclusions from tubes **B1** and **B2** in Table 1.2 suggest about the ability of sugar molecules to pass through the visking tubing.

.....

[1]

(c) Tests and questions about the 3rd experiment

- (i) Examine the beaker that you set up earlier. Make a note of the colours of the liquids inside the visking tubing and outside (in the water). Record your results in Table 1.3, and say whether starch is present or not.

Table 1.3

test-tube	result	conclusion
inside the visking tubing		
outside the visking tubing		

[3]

(ii) Use your observations to **explain** whether or not starch can pass through the visking tubing.

.....
.....
..... [1]

(d) (i) These experiments are modelling the alimentary canal. State which part of the alimentary canal is represented by the visking tubing.

.....
..... [1]

(ii) With reference to the results of these experiments, explain why starch needs to be digested in the alimentary canal.

.....
.....
.....
..... [1]

- 2 You will investigate the formation of an image by a converging lens using the experimental set-up shown in Fig. 2.1.

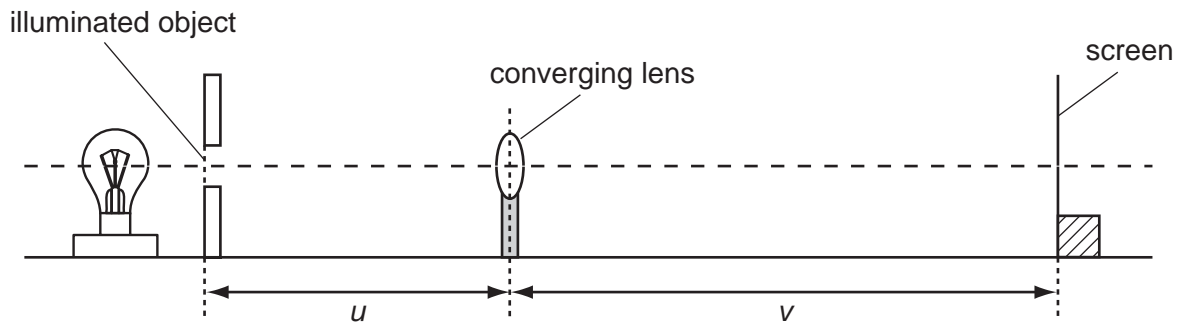


Fig. 2.1

- (a) (i)
- Place the lens a distance $u = 45.0$ cm from the illuminated object (the triangular hole in the card).
 - Switch on the lamp so that an image of the illuminated object can be seen on the screen.
 - Adjust the position of the screen by moving it backwards and forwards along the bench, until a sharp image of the illuminated object is formed on the screen.
 - Measure, to the nearest 0.1 cm, the image distance v from the screen to the lens.
 - Record the distance v in Table 2.1. [1]

Table 2.1

object distance u /cm	image distance v /cm	image distance/object distance = v/u
45.0		
35.0		
30.0		
25.0		
20.0		

- (ii) Repeat the procedure described in (i) for values of $u = 35.0$ cm, 30.0 cm, 25.0 cm, and 20.0 cm. [3]
- (iii) Complete the remaining boxes in the table by filling in the values of the ratio v/u , the ratio of image distance to object distance. [1]

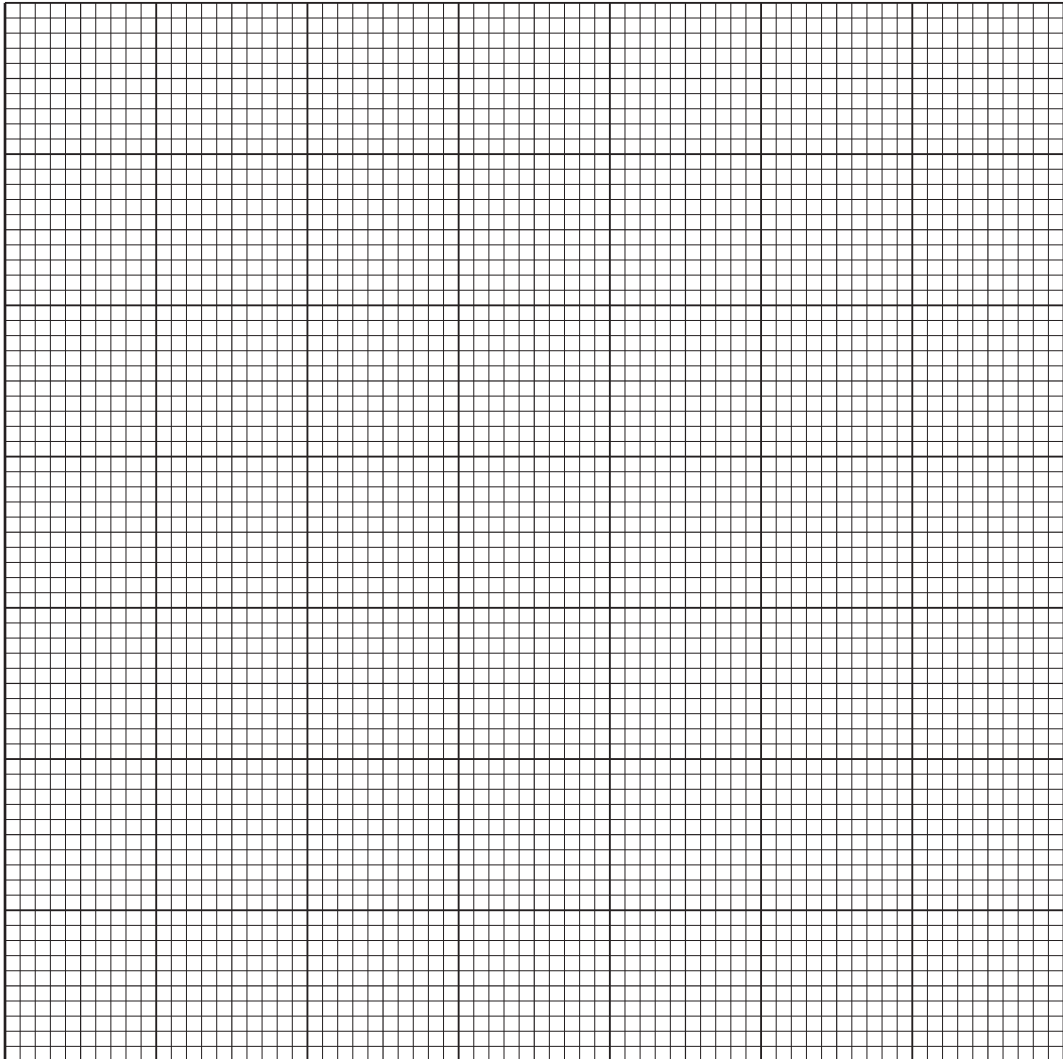
- (b) State **one** precaution that you took whilst carrying out the experiment to ensure that the readings you obtained were reliable.

precaution

..... [1]

- (c) (i) On the grid provided, plot a graph of v/u (vertical axis) against v (horizontal axis).

Draw the best fit straight line. [4]



- (ii) Calculate the gradient of your line. Show all working and indicate on your graph the values you chose to enable the gradient to be calculated.

gradient = [2]

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(iii) The focal length, f , of the lens is given by the formula

$$f = \frac{1}{\text{gradient}}$$

Determine the focal length of the lens.

$f =$ cm [2]

(d) This experiment is unsuitable for values of u close to the value of f .

Use your observations from the experiment to explain this.

.....
..... [1]

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Please turn over for Question 3.

3 You are going to carry out a series of tests to identify compound **X**.

(a) Heat the hard glass test-tube containing **X** until there is no further visible change.

Record your observation below and leave this test-tube to cool. You will be using the contents of this test-tube in (c)(i).

observation

..... [1]

(b) (i) Place two spatula loads of **X** into a test-tube and add about 4 cm³ of dilute hydrochloric acid. Pass the gas produced through limewater in another test-tube. Keep the mixture of **X** and acid for (b)(ii).

Record your observations, identify the gas produced, and the anion in **X**.

observations

.....

.....

name of gas

name of anion [4]

(ii) Transfer the contents of the test-tube from (b)(i) to the small beaker and add excess dilute sodium hydroxide.

Record your observations and suggest the name of the metal cation in **X**.

observations

.....

name of metal cation [2]

(c) (i) The hard glass test-tube and its contents from (a) should now have cooled. Add about 8 cm³ dilute nitric acid, stir and wait for 2 minutes. Then filter the mixture into two test-tubes for use in (c)(ii) and (c)(iii).

State the colour of the filtrate.

..... [1]

- (ii) To one of the test-tubes containing the filtrate, slowly add ammonia solution until there is no further change.

Record your observations and suggest the **formula** of the cation in **X**.

observations

.....

.....

formula of cation [3]

- (iii) Carefully pour off some of the filtrate from the other test-tube from (c)(i), leaving behind about 1 cm depth of filtrate. Add a piece of magnesium ribbon which is about 1 cm in length.

Record your observations.

observations

.....

..... [2]

- (iv) Suggest what type of reaction has taken place in (c)(iii).

.....

..... [1]

- (d) Using your observations for (a), (b) and (c), identify compound **X**.

compound **X** is [1]

CHEMISTRY PRACTICAL NOTES

Test for anions

<i>anion</i>	<i>test</i>	<i>test result</i>
carbonate (CO_3^{2-})	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulfate (SO_4^{2-}) [in solution]	acidify then add aqueous barium chloride <i>or</i> aqueous barium nitrate	white ppt.

Test for aqueous cations

<i>cation</i>	<i>effect of aqueous sodium hydroxide</i>	<i>effect of aqueous ammonia</i>
ammonium (NH_4^+)	ammonia produced on warming	-
copper(II) (Cu^{2+})	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) (Fe^{2+})	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe^{3+})	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc (Zn^{2+})	white ppt., soluble in excess giving a colourless solution	white ppt., soluble in excess giving a colourless solution

Test for gases

<i>gas</i>	<i>test and test results</i>
ammonia (NH_3)	turns damp red litmus paper blue
carbon dioxide (CO_2)	turns limewater milky
chlorine (Cl_2)	bleaches damp litmus paper
hydrogen (H_2)	"pops" with a lighted splint
oxygen (O_2)	relights a glowing splint

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