UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

*4715197697*

**COMBINED SCIENCE** **0653/51**

Paper 5 Practical Test **October/November 2013**

**1 hour 30 minutes**

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.

| For Examiner's Use | |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| Total | |

This document consists of **10** printed pages and **2** blank pages.




UNIVERSITY of CAMBRIDGE International Examinations

1 You are going to carry out tests on two experiments to investigate the digestion of st
the alimentary canal. One of these experiments is set up for you and you will set up
other yourself. When it has been set up, you will then carry out the tests and answer th
questions.

**1st 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.

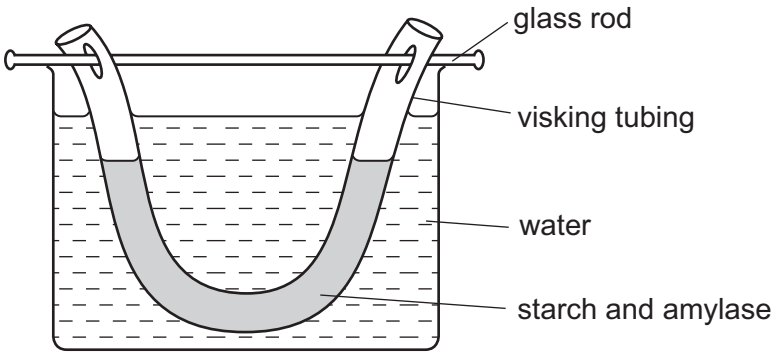



**Fig. 1.1**

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 2nd experiment**

- Label two test-tubes **P** and **Q**.
- Stir the starch solution provided and then transfer some of it into the two test-tubes, so that each test-tube is about one-third full.
- Add about the same amount of amylase solution to test-tube **P**, and mix the contents with a clean glass rod.
- Add an equivalent volume of distilled water to test-tube **Q** and mix the contents with a clean glass rod.
- Keep test-tubes **P** and **Q** for later.

**(a) Tests and questions about the 1st experiment**

**(i)**
- Use a pipette to remove two samples of water from the beaker in th apparatus that was set up for you.
- Place each sample in a clean test-tube. You will need 1-2 cm depth of liquid in each test-tube.
- Label these test-tubes **R1** and **R2**.
- Test the liquid in test-tube **R1** for starch by adding iodine solution. Record the results in Table 1.1 and in the last column say whether or not starch is present.
- Test the liquid in test-tube **R2** for reducing sugar by adding Benedict's solution and placing the test-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 |
|---|---|---|
| **R1** | | |
| **R2** | | |

[3]

**(ii)** Explain what the results and conclusions from test-tubes **R1** and **R2** in Table 1.1 suggest about the ability of sugar molecules to pass through the visking tubing.

.....

.....

..... [1]

**(b) Tests and questions about the 2nd experiment**

**(i)**
- Divide the liquid in test-tube **P** approximately equally between two test-tubes and label these **P1** and **P2**.
- Test the liquid in test-tube **P1** for starch, and the liquid in **P2** for reducing sugar, using the same method as in part **(a)**. Record your results in Table 1.2 and in the last column say whether or not starch or sugar is present.
- In the same way, divide the liquid in test-tube **Q** approximately equally between two test-tubes, **Q1** and **Q2**.
- Test the liquid in test-tube **Q1** for starch and the liquid in **Q2** for reducing sugar. Complete the remainder of Table 1.2.

**Table 1.2**

| test-tube | result | conclusion |
|---|---|---|
| **P1** | | |
| **P2** | | |
| **Q1** | | |
| **Q2** | | |

[4]

**(ii)** Amylase digests starch. Explain what the results and conclusions in Table 1.2 tell you about the effect of amylase on starch solution.

.....

.....

..... [1]

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

.....

.....

.....

..... [1]

**Please turn over for Question 2.**

**2** You will follow a series of instructions to investigate the formation of an image converging lens using the experimental set-up shown in Fig. 2.1.

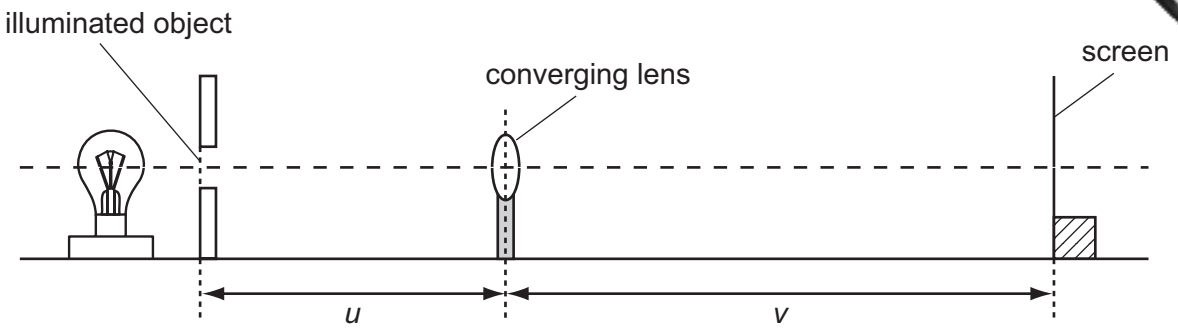



**Fig. 2.1**

A converging lens is thicker in the middle and refracts light so that an image is formed on a screen some distance away. You will move the lens to vary the object distance $u$ and move the screen to vary the image distance $v$.

**(a) (i)**
- Place the lens a distance $u$ = 35.0 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 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 = $v/u$ |
|---|---|---|
| 35.0 | | |
| 30.0 | | |
| 25.0 | | |
| 20.0 | | |

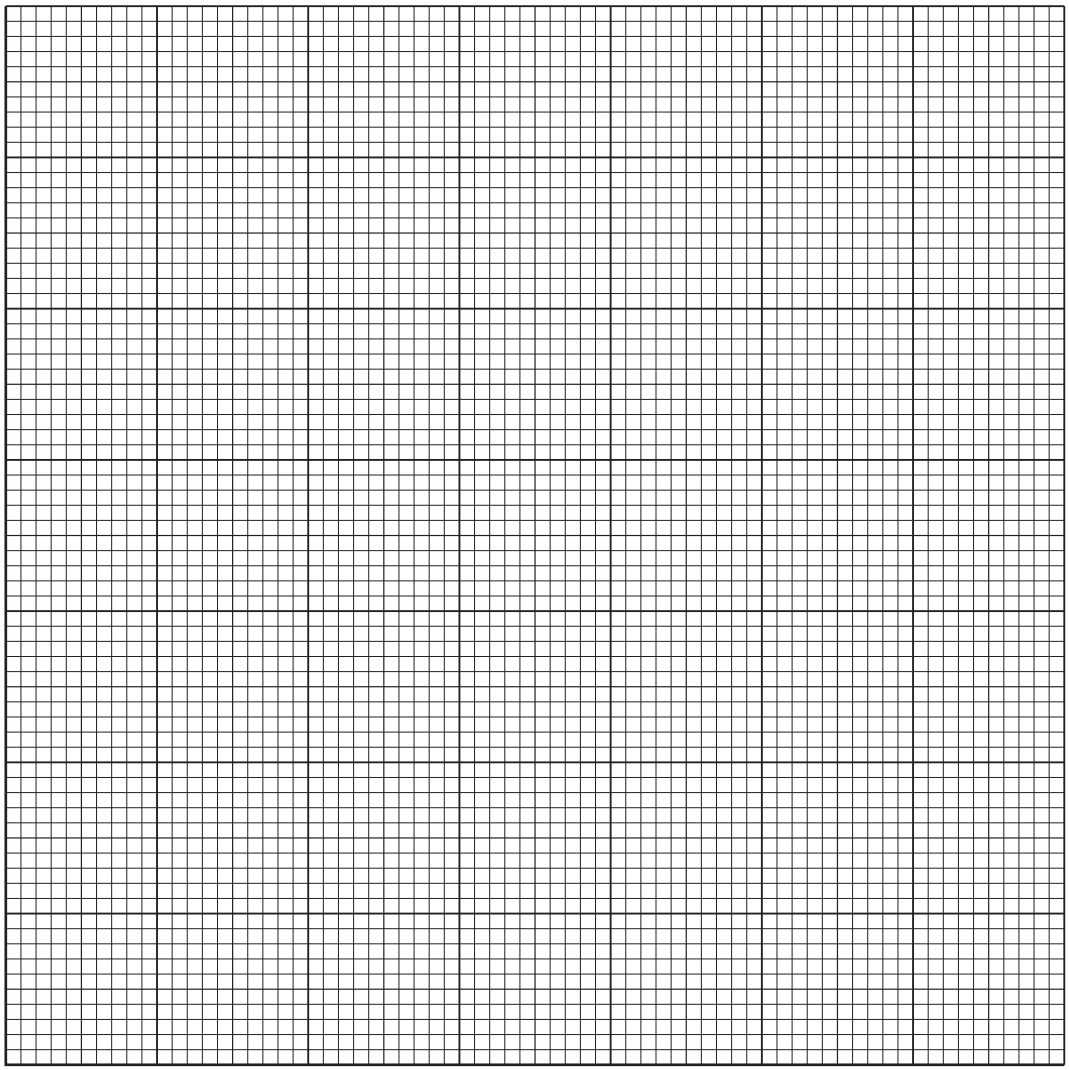
**(ii)** Repeat the procedure described in **(i)** for values of $u$ = 30.0 cm, 25.0 cm, and 20.0 cm. [2]

**(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) (i)** On the grid provided, plot a graph of $v$ against $v/u$.

Draw the best fit straight line. [3]

$v$ / cm



$v/u$

**(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]

**(c)** This experiment is unsuitable for values of $u$ close to 15.0 cm.

Use your observations from the experiment to suggest why this is so.

.....

..... [1]

**3** You are going to carry out a series of tests to identify compound **X**. You may wish to r
the Chemistry Practical Notes on page 12 to help you with your interpretations of the re
of the tests.

**(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)**.

observation .....

..... [1]

**(b) (i)** Place two spatula loads of **X** into a test-tube and add about 4 $cm^3$ 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)** The hard glass test-tube and its contents from **(a)** should now have cooled. Add
4 $cm^3$ dilute nitric acid, stir and wait for 2 minutes. Then filter the mixture into a test-tu

To the test-tube containing the filtrate, slowly add ammonia solution until there is no further change.

Record your observations.

observations .....

.....

..... [2]

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

compound **X** is ..... [1]

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# CHEMISTRY PRACTICAL NOTES

## Test for anions

| *anion* | *test* | *test result* |
|---|---|---|
| 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 *or* aqueous barium nitrate | white ppt. |

## Test for aqueous cations

| *cation* | *effect of aqueous sodium hydroxide* | *effect of aqueous ammonia* |
|---|---|---|
| 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

| *gas* | *test and test results* |
|---|---|
| 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 |