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0653/51

October/November 2013

1 hour 30 minutes

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

DO **NOT** WRITE IN ANY BARCODES.

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

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.

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

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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.

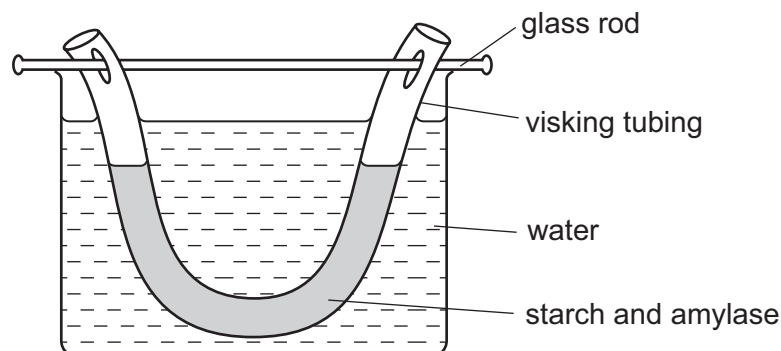


Fig. 1.1

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 the 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 by a converging lens using the experimental set-up shown in Fig. 2.1.

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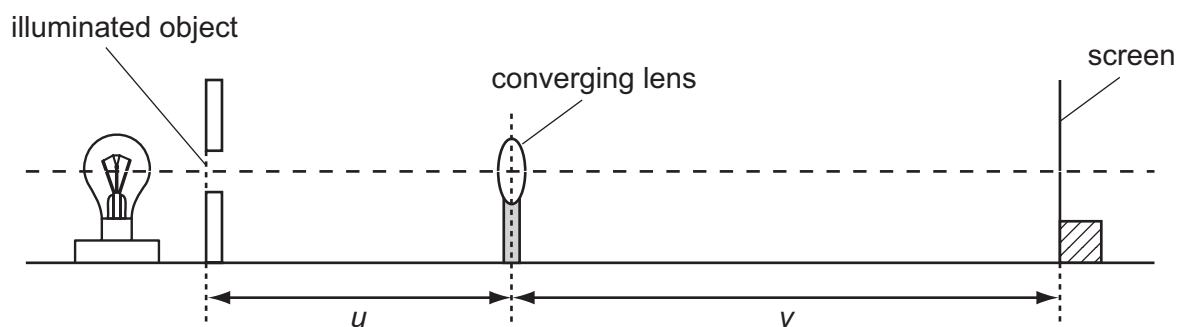


Fig. 2.1

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		

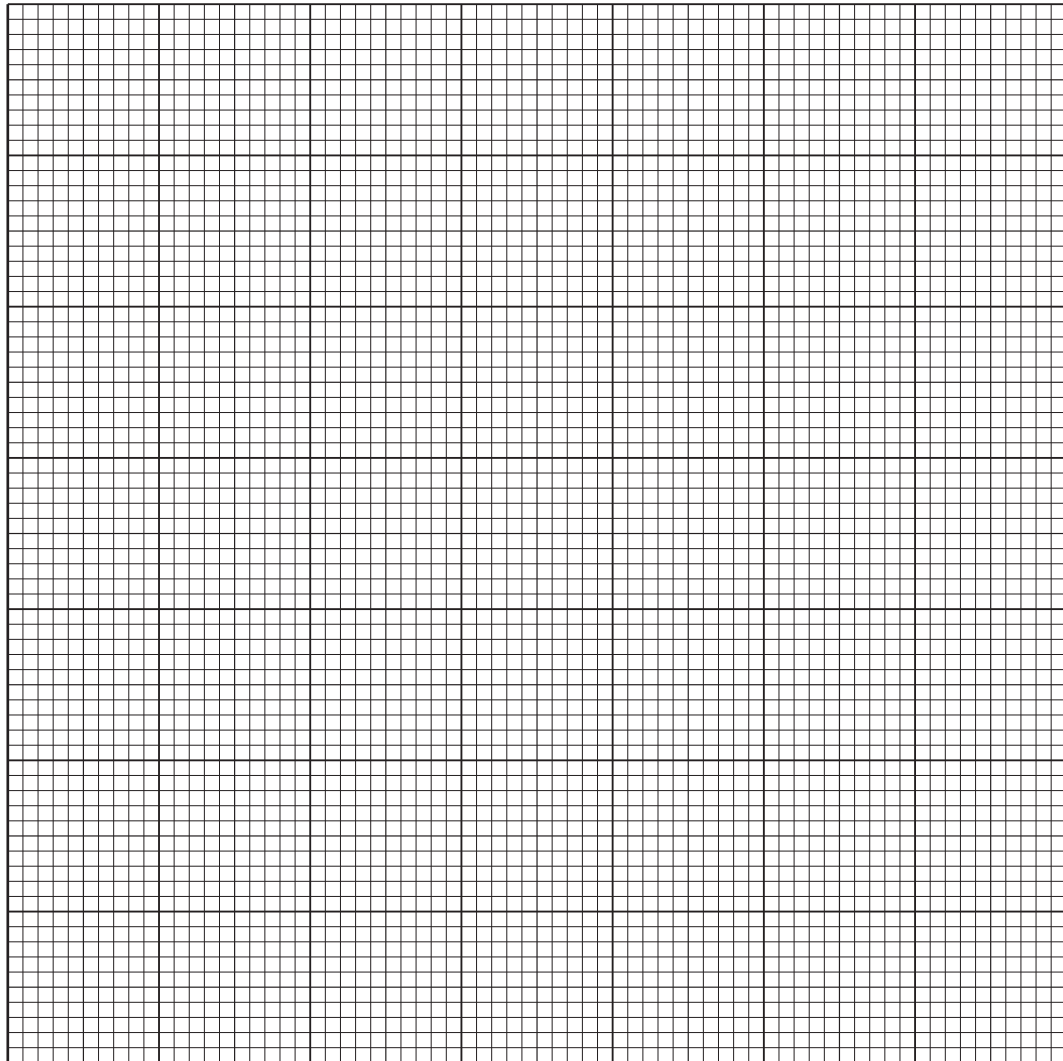
- (ii) Repeat the procedure described in (i) for values of $u = 30.0$ cm, 25.0 cm, and 20.0 cm. [2]
- (iii) Complete the remaining boxes in the table by filling in the values of the ratio v/u , the ratio of image distance to object distance. [1]

- (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]

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

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- (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 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) The hard glass test-tube and its contents from (a) should now have cooled. Add about 4 cm³ dilute nitric acid, stir and wait for 2 minutes. Then filter the mixture into a test-tube.

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

<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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