CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

7064564100

CO-ORDINATED SCIENCES **0654/52**

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.

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1 You are provided with four Petri dishes, **A**, **B**, **C** and **D**, each set up as shown in Fig. 1.1. The dishes contain a starch-agar mixture. This is a gel to which starch solution has been added.

This experiment uses barley grains that have been germinated. Some of the barley grains have been killed by being placed in boiling water.

Barley grains have been placed on the starch-agar mixture in each of the four dishes, and left for a few days.

- In dishes **A** and **B**, the barley grains are living.
- In dishes **C** and **D**, the barley grains are dead.

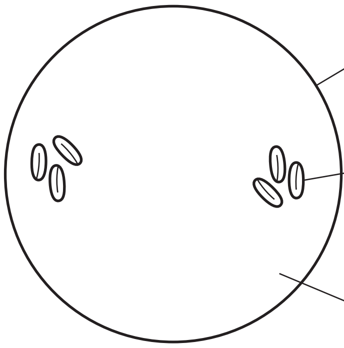
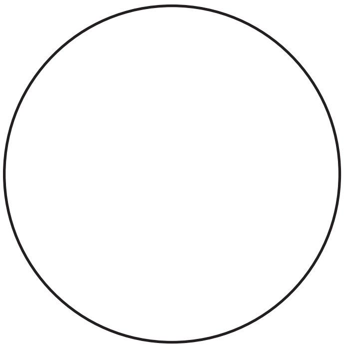
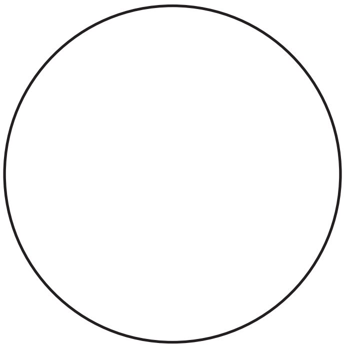


Fig. 1.1

(a) You are going to look for evidence of starch-digesting enzymes being produced by the barley grains.

(i) Remove the lids from Petri dishes **A** and **C**, and make drawings in Table 1.1 to show the positions of the barley grains in each dish.

Table 1.1

dish **A**	dish **C**
	

[1]

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(ii) Remove the barley grains from each of the dishes **A** and **C**.

Test the gel in the Petri dishes for starch, by covering the gel with iodine solution, and then waiting for a minute to let any colour changes happen.

Pour away the excess iodine solution, and then place the dishes onto two white tiles. Make drawings in Table 1.2 to show the distribution of the colours in each dish. Label the colours.

Table 1.2

dish **A**	dish **C**

[2]

(iii) Compare the two drawings that you made of dish **A**.

....

.... [1]

(iv) Write a conclusion based on this comparison.

....

.... [1]

(v) In dish **C**, dead barley grains were used. What is the purpose of dish **C**?

....

.... [1]

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(b) Now test the gel in dishes **B** and **D** for the presence of reducing sugar.

- Label two test-tubes, **B** and **D**.
- From dish **B**, use a knife or a spatula to take a small piece of starch-agar gel from underneath each of the groups of barley grains. Put these two pieces of gel into the test-tube labelled **B**.
- Repeat the procedure for Petri dish **D**, putting your pieces of starch-agar gel into the test-tube labelled **D**.
- Add five drops of Benedict's solution to each test-tube.
- Place both test-tubes into a hot water bath for three minutes.

(i) Record your results in Table 1.3.

Table 1.3

	test-tube **B**	test-tube **D**
colour of Benedict's solution before heating		
colour of Benedict's solution after heating		

[2]

(ii) Explain the results you obtained in

tube **B**, ...

....

tube **D**. ....

....

[4]

(c) Explain why several barley grains were used in each Petri dish, rather than just one.

....

....

.... [1]

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(d) Suggest how the results of the iodine experiment would have been different if

(i) the barley grains in the Petri dishes had been left for a longer period of time,

....

.... [1]

(ii) the Petri dishes had been kept at a lower temperature.

....

.... [1]

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2 You are going to find the mass and volume of a metre rule, and hence determine the density of the material from which the rule is made.

(a) (i) Place the knife edge directly under the 55.0 cm mark of the metre rule so that the distance *d* = 55.0 cm. Place the load **M** on the metre rule and adjust its position carefully until the rule is just balanced, as shown in Fig. 2.1.

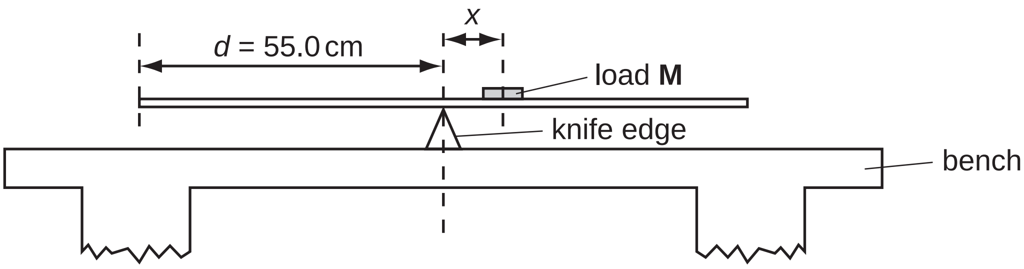

Fig. 2.1

Measure the distance *x* from the centre of the load to the knife edge.

Record this distance in Table 2.1. [1]

Table 2.1

distance *d* / cm	*x* / cm
55.0	
60.0	
65.0	
70.0	
75.0	

(ii) Describe how you located the position of the centre of the load **M** before you measured the distance *x*.

....

....

.... [1]

(iii) Repeat the procedure to balance the load when the knife edge is placed at distances *d* of 60.0 cm, 65.0 cm, 70.0 cm and 75.0 cm from the end of the metre rule.

Record the corresponding distances *x* in Table 2.1. [2]

(b) (i) On the grid provided on page 7, plot a graph of *d* (vertical axis) against *x* (horizontal axis). You do not need to start both axes from the origin.

Draw the best fit straight line. [4]

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(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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(c) The gradient of your line is related to the mass *m* in grams of the metre rule by the equation

$$m = \frac{150}{\text{gradient}}$$

Determine the mass of the metre rule.

m = ... g [1]

(d)

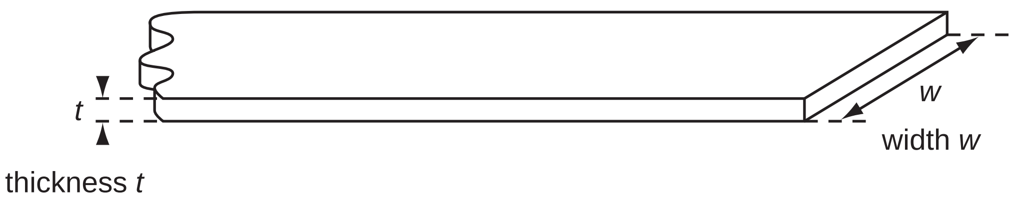

Fig. 2.2

(i) Measure the thickness *t* and the width *w* of the rule. Record your answers in the spaces below.

t = ... cm

w = ... cm [2]

(ii) Calculate the density of the material from which the rule is made using the formula

$$\text{density} = \frac{m}{100 \times w \times t}$$

density = ... g/cm^3 [2]

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Please turn over for Question 3.

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3 Solution **X** is a mixture containing two cations and two anions. You are going to carry out the tests below to help you identify these ions.

(a) (i) Place about 2 cm^3 of solution **X** in a test-tube and add an equal volume of dilute nitric acid. Retain this mixture for **(a)(ii)** and **(a)(iii)**.

Record in Table 3.1 your observations and conclusion about any ions present.

(ii) To half of the mixture from **(a)(i)** add an equal volume of barium chloride solution.

Record in Table 3.1 your observations and conclusion about any ions present.

(iii) To the other half of the mixture from **(a)(i)** add an equal volume of silver nitrate solution.

Record in Table 3.1 your observations and conclusion about any ions present.

Table 3.1

test	observations	conclusion
(i) dilute nitric acid	[1]	[1]
(ii) barium chloride solution	[1]	[1]
(iii) silver nitrate solution	[1]	[1]

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(b) **(i)** Place about 1 cm^3 of solution **X** in a test-tube and add sodium hydroxide solution until the test-tube is three quarters full.

Filter the mixture.

Record in Table 3.2 your observations and conclusion about any ions present.

(ii) Place about 1 cm^3 of solution **X** in a test-tube and add ammonia solution until the test-tube is three quarters full.

Filter the mixture.

Record in Table 3.2 your observations and conclusion about any ions present.

(iii) Place about 1 cm^3 of solution **X** in a test-tube and add sodium carbonate solution until the test-tube is three quarters full.

Record in Table 3.2 your observations.

Table 3.2

test	observations	conclusion
(i) sodium hydroxide solution	[2]	[1]
(ii) ammonia solution	[2]	[2]
(iii) sodium carbonate solution	[1]	

(c) Use the observations and conclusions that you have recorded in Tables 3.1 and 3.2 to suggest names for the compounds that might be contained in mixture **X**.

compounds in **X** ....

....

.... [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

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