



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

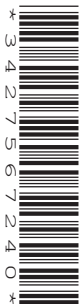
CANDIDATE  
NAME

CENTRE  
NUMBER

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**CO-ORDINATED SCIENCES**

**0654/51**

Paper 5 Practical Test

**May/June 2016**

**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 an HB 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.

Notes for Use in Qualitative Analysis 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	
<b>1</b>	
<b>2</b>	
<b>3</b>	
<b>Total</b>	

This document consists of **11** printed pages and **1** blank page.

- 1 You are going to investigate the effectiveness of an enzyme in the extraction of apple juice from fruit.

You are provided with two beakers, each containing 50 g of apple pulp and a third beaker containing an enzyme solution. The beakers are at a temperature of 35 °C in a water-bath.

- Remove the beakers containing apple pulp from the water-bath. Label the beakers **A** and **B**.
- Using the syringes add 2 cm<sup>3</sup> of distilled water to beaker **A** and 2 cm<sup>3</sup> of enzyme solution to beaker **B**.
- Using the stirring rod provided, mix the contents of beaker **A**. Rinse and dry the stirring rod. Then mix the contents of beaker **B** using the stirring rod.
- Return beakers **A** and **B** to the water-bath and immediately start the stopclock.
- You now need to wait at least five minutes. During this time read the rest of the question and complete part (a).
- Label the two measuring cylinders **A** and **B**.
- Place a filter funnel in the top of each measuring cylinder.
- Fold the two filter papers and place one in each filter funnel.

- (a) Insert headings, including units, in Table 1.1.

[2]

**Table 1.1**

..... / .....	..... / .....	
	cylinder <b>A</b>	cylinder <b>B</b>
2		
4		
6		
8		
10		

- (b) After at least five minutes have elapsed on the stopclock, stop and reset the stopclock. Empty the contents of beaker **A** into the filter funnel in cylinder **A** and empty the contents of beaker **B** into the filter funnel in cylinder **B**. Start the stopclock.

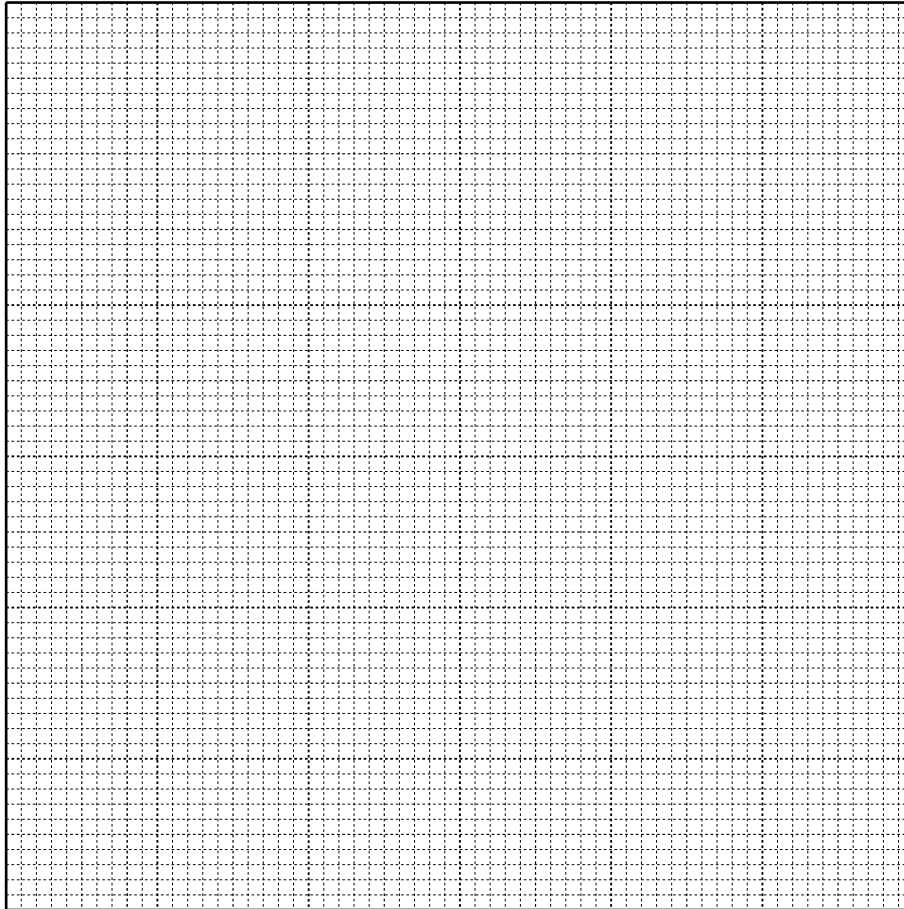
Clean the stirring rod and use it to help remove apple from the beakers if necessary.

Record in Table 1.1 the volume of the juice collected in each measuring cylinder every 2 minutes for 10 minutes.

[3]

(c) On the grid provided, plot a graph of your results from beaker **B only** (vertical axis) against the values in column 1 of Table 1.1.

Draw the best-fit line.



[4]

(d) Enzymes are used for juice extraction in the fruit juice industry. Use your results to suggest an advantage to manufacturers in using this enzyme for the production of fruit juice.

.....[1]

(e) State and explain **one** precaution you took to make sure the procedure was carried out safely.

.....[1]

(f) Explain how beaker **A** acts as a control.

.....[1]



2 You are provided with three solutions **C**, **D** and **E** of acid **X**.

Their concentrations are:

0.50 mol/dm<sup>3</sup> (least concentrated)

1.00 mol/dm<sup>3</sup>

2.00 mol/dm<sup>3</sup> (most concentrated).

It is not known which is which.

You will identify acid **X**.

(a) (i) You are going to carry out an investigation to find out the concentration of each solution.

- Using a measuring cylinder place 5 cm<sup>3</sup> of solution **C** in a test-tube.
- Add a 1 cm piece of magnesium ribbon to this test-tube and start the stopclock.
- Use the stirring rod to keep the magnesium ribbon in the acid.
- When the magnesium ribbon has completely reacted and disappeared stop the stopclock and record in Table 2.1 the time in seconds.
- If the magnesium ribbon is still present after 3 minutes, record the time as >180 s.
- Repeat the above procedure for solutions **D** and **E**.

[4]

**Table 2.1**

solution of acid <b>X</b>	time / s
<b>C</b>	
<b>D</b>	
<b>E</b>	

(ii) Use your results in Table 2.1 to conclude which solution of **X** has which concentration.

**C** has a concentration of ..... mol/dm<sup>3</sup>

**D** has a concentration of ..... mol/dm<sup>3</sup>

**E** has a concentration of ..... mol/dm<sup>3</sup>

[2]



- (c) (i) Acid **X** is either hydrochloric acid or sulfuric acid.

Identify **X** by carrying out two tests on solution **C**. Use only solutions from the list in (b).

Record in Table 2.2 the tests used and the observations.

**Table 2.2**

test	observations

[3]

- (ii) Use your observations in Table 2.2 to identify acid **X**. Explain your answer.

acid **X** is .....

explanation .....

.....[1]

- (d) A student suggests that the experiment in (a) would not work for very low concentrations of acid (less than  $0.001 \text{ mol/dm}^3$ ).

Explain why the student is correct.

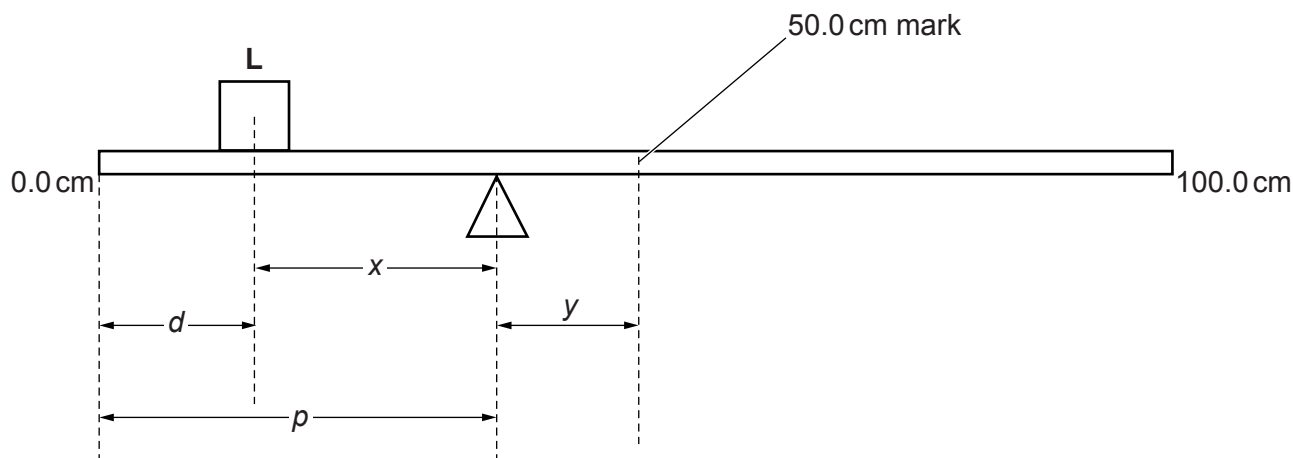
.....

.....

.....[1]

3 You are going to measure the mass of a metre rule using a balancing method.

You are provided with a 100g load labelled **L**, a metre rule and a pivot.



**Fig. 3.1**

- (a) (i) • Set up the apparatus as shown in Fig. 3.1.  
 • Place the load **L** on the rule so that its centre is at a distance  $d = 5.0$  cm from the zero end of the rule.  
 • Adjust the position of the pivot so that the rule balances on it.  
 • Record, to the nearest 0.1 cm, in Table 3.1, the distance  $p$  from the pivot to the zero end of the rule.

[1]

- (ii) Repeat the procedure in (a)(i) for values of  $d$  of 10.0 cm, 15.0 cm, 20.0 cm and 25.0 cm.

[2]

- (b) For each value of  $d$ , calculate the distances  $x$  and  $y$  as shown in Table 3.1. Use the equations shown.

$$x = (p - d)$$

$$y = (50 - p)$$

Record in Table 3.1 your calculated values of  $x$  and  $y$ .

[2]

**Table 3.1**

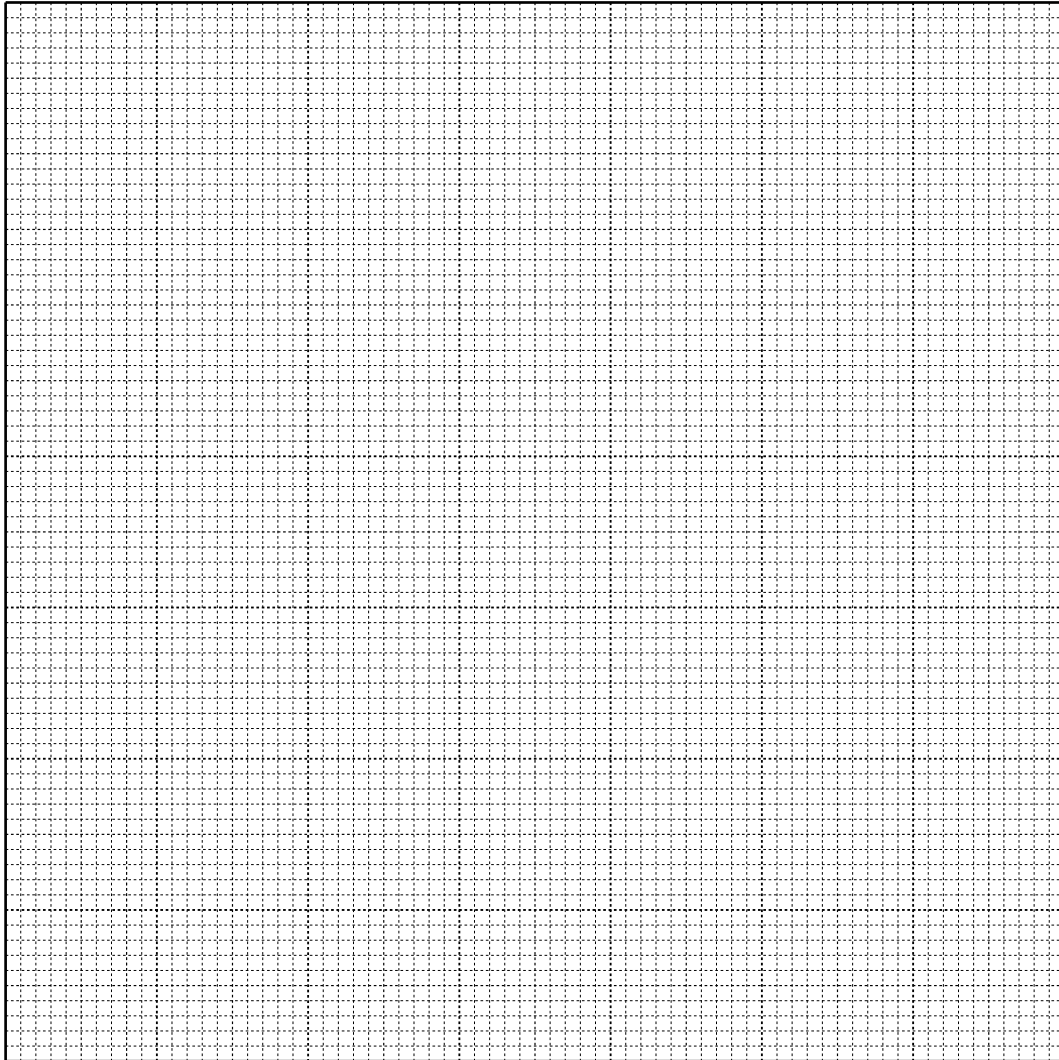
$d/\text{cm}$	$p/\text{cm}$	$x = (p - d)/\text{cm}$	$y = (50 - p)/\text{cm}$
5.0			
10.0			
15.0			
20.0			
25.0			



- (c) (i) On the grid provided, plot a graph of  $y$  (vertical axis) against  $x$ . You do **not** need to start your axes from the origin  $(0, 0)$ .

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 of line = ..... [2]

- (d) The mass in grams of the metre rule is given by the equation shown.

$$\text{mass} = \frac{100}{\text{gradient}}$$

Use this equation to calculate the mass of the rule, giving your answer to an appropriate number of significant figures.

mass = ..... g [1]

- (e) Measure the mass,  $m_1$  of the rule **to the nearest gram** using the balance provided.

$m_1$  = ..... g [1]

- (f) Suggest **two practical** reasons why, despite carrying out the experiment with care, the values for your masses given in (d) and (e) may differ. Assume that the balance used in (e) is accurate.

1 .....

.....

2 .....

..... [2]



## NOTES FOR USE IN QUALITATIVE ANALYSIS

## Test for anions

<i>anion</i>	<i>test</i>	<i>test result</i>
carbonate ( $\text{CO}_3^{2-}$ )	add dilute acid	effervescence, carbon dioxide produced
chloride ( $\text{Cl}^-$ ) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
nitrate ( $\text{NO}_3^-$ ) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulfate ( $\text{SO}_4^{2-}$ ) [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 ( $\text{NH}_4^+$ )	ammonia produced on warming	-
copper(II) ( $\text{Cu}^{2+}$ )	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) ( $\text{Fe}^{2+}$ )	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) ( $\text{Fe}^{3+}$ )	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc ( $\text{Zn}^{2+}$ )	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 ( $\text{NH}_3$ )	turns damp red litmus paper blue
carbon dioxide ( $\text{CO}_2$ )	turns limewater milky
chlorine ( $\text{Cl}_2$ )	bleaches damp litmus paper
hydrogen ( $\text{H}_2$ )	“pops” with a lighted splint
oxygen ( $\text{O}_2$ )	relights a glowing splint

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