Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

COMBINED SCIENCE   **0653/51**

Paper 5 Practical Test   **May/June 2016**

                                                                  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 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 8.

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 **8** printed pages.

CAMBRIDGE International Examinations

[Turn over

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^3 of distilled water to beaker **A** and 2 cm^3 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 **A**	cylinder **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.
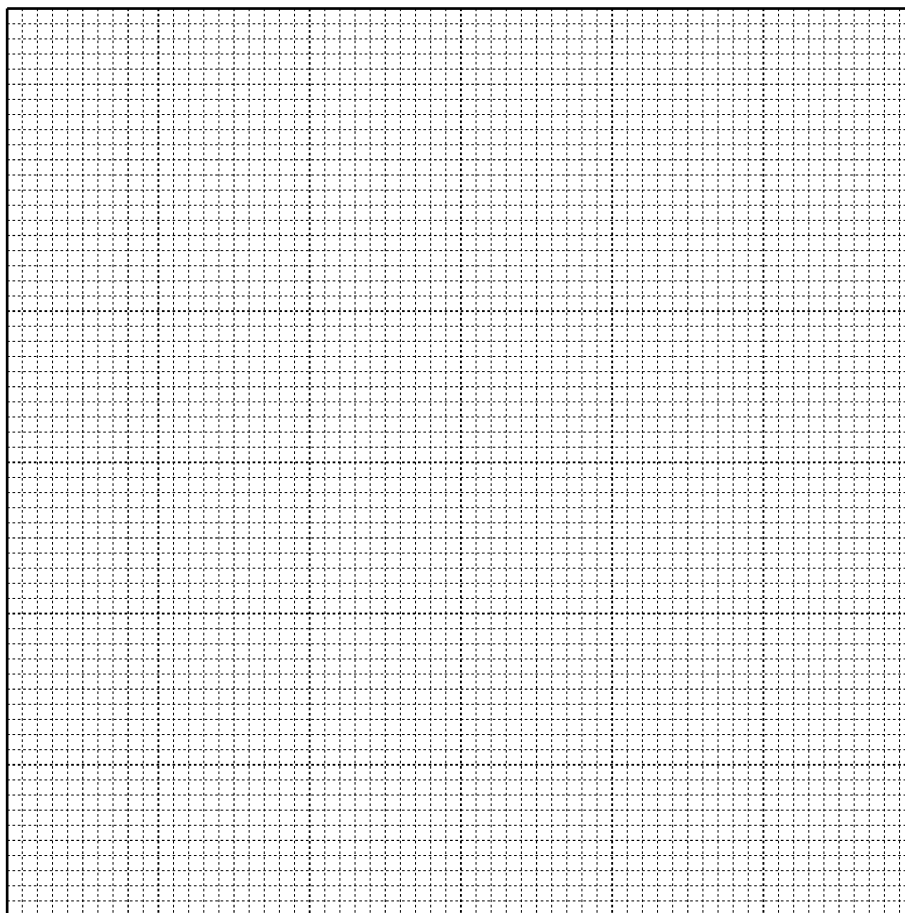
Clean the stirring rod and use it to help remove apple from the beakers if necessary.

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]

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

Their concentrations are:
$0.50\,mol/dm^3$ (least concentrated)
$1.00\,mol/dm^3$
$2.00\,mol/dm^3$ (most concentrated).

It is not known which is which.

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

- Using a measuring cylinder place $5\,cm^3$ 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 **X**	time / s
C	
D	
E	

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

C has a concentration of .... mol/dm^3

D has a concentration of .... mol/dm^3

E has a concentration of .... mol/dm^3

[2]

(b) Plan, in detail, another experiment to find out which acid solution has which concentration. The experiment must be different from the one in **(a)**.

You will **NOT** be carrying out your plan.

You may use any of the chemicals in the following list but **you do not have to use all of them**.

Choose a chemical or chemicals which you know will react with acids:
    barium chloride solution
    limewater
    magnesium ribbon
    marble chips
    silver nitrate solution
    sodium hydroxide solution
    Universal Indicator

State clearly:
  • what you will do to carry out a fair test
  • what apparatus you will use
  • what observations and measurements you will make
  • how you will use your observations and measurements to make conclusions.

....

....

....

....

....

....

....

....[4]

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

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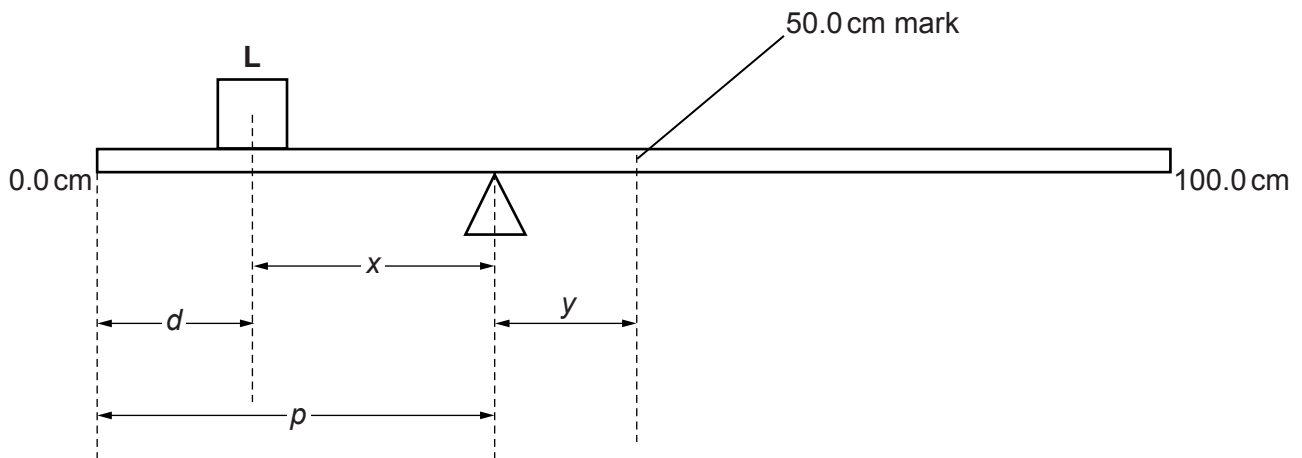

Fig. 3.1

(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 and 20.0 cm. [1]

(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/cm	p/cm	$x = (p - d)$/cm	$y = (50 - p)$/cm
5.0			
10.0			
15.0			
20.0			

(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. [3]

y/cm

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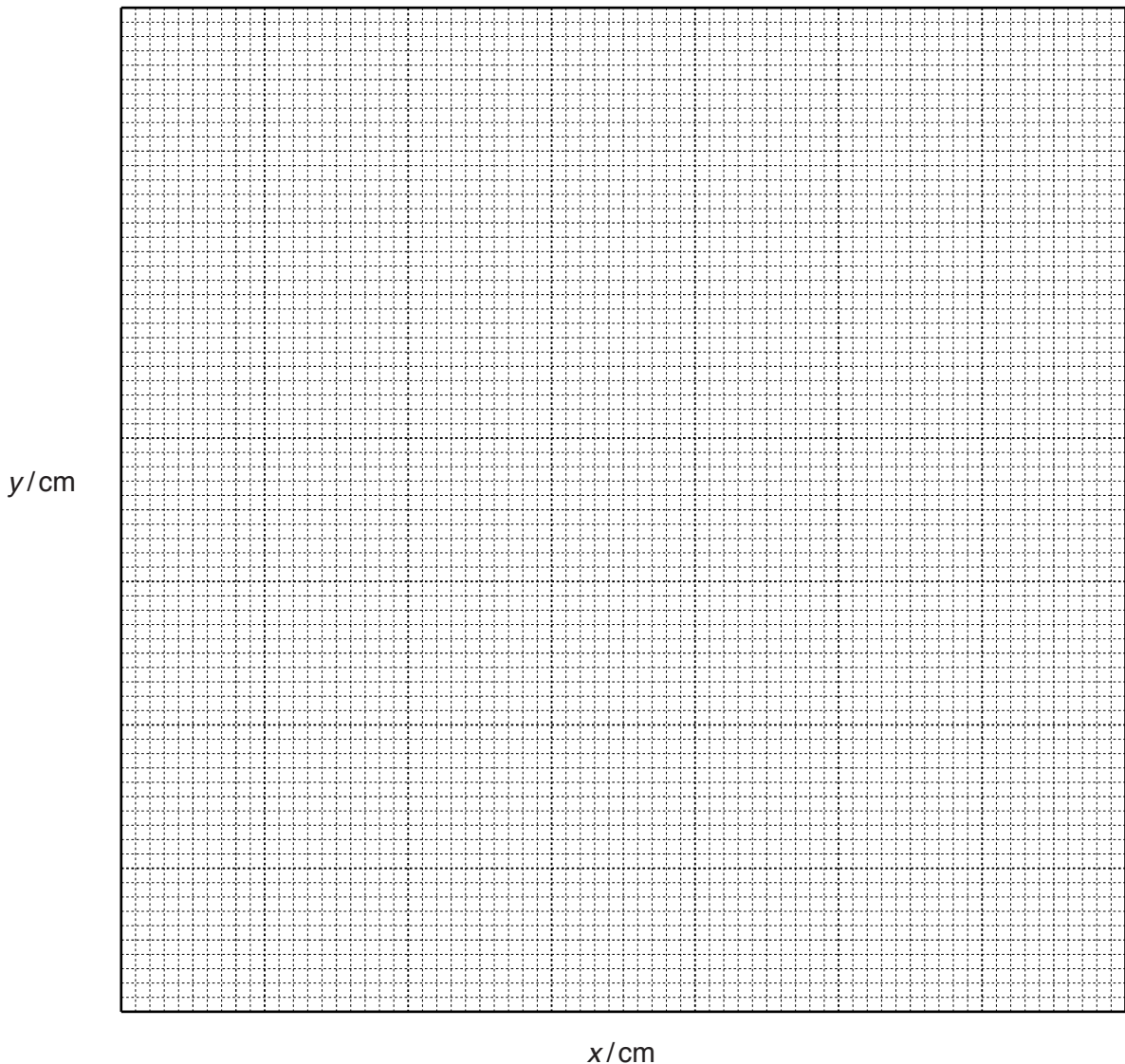
(ii) Calculate the gradient of your line. Show all working and indicate on your graph the values you chose to enable the gradient to be calculated.

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 of rule = ... g [1]

NOTES FOR USE IN QUALITATIVE ANALYSIS

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