Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

1144410897

COMBINED SCIENCE **0653/51**

Paper 5 Practical Test **October/November 2017**

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 action of four different concentrations of an enzyme on milk protein.

Milk contains a protein that makes it look white (opaque). When the protein is broken down the milk becomes clear.

Read through the whole question before starting.

(a) (i)
- Label three syringes **E** (for enzyme), **M** (for milk) and **W** (for water).
- Label two test-tubes **A** and **B**.
- Use syringe **E** to add 4 cm^3 enzyme solution to test-tube **A**.
- Use the same syringe to add 2 cm^3 enzyme solution to test-tube **B**.
- Use syringe **M** to add 2 cm^3 milk to test-tube **B** and immediately start the stopclock.
- Using the stirring rod, mix the contents of test-tube **B** well.
- Time how long it takes for the protein to break down by observing test-tube **B** until it is clear. Use test-tube **A** as a comparison to help you.

Record in row two of Table 1.1 your result to the nearest second. [1]

(ii)
- Rinse out test-tube **B**.
- Use syringe **W** to add 0.5 cm^3 distilled water to test-tube **B**.
- Use syringe **E** to add 1.5 cm^3 enzyme solution to test-tube **B** and mix well.
- Use syringe **M** to add 2 cm^3 milk to test-tube **B** and immediately start the stopclock.
- Mix well.
- Time how long it takes for the protein to break down by observing test-tube **B** until it is clear. Use test-tube **A** as a comparison to help you.
- Record in Table 1.1 your result to the nearest whole second.
- Rinse out test-tube **B**.
- Repeat the experiment twice more, using the volumes of water and enzyme shown in the rest of Table 1.1.

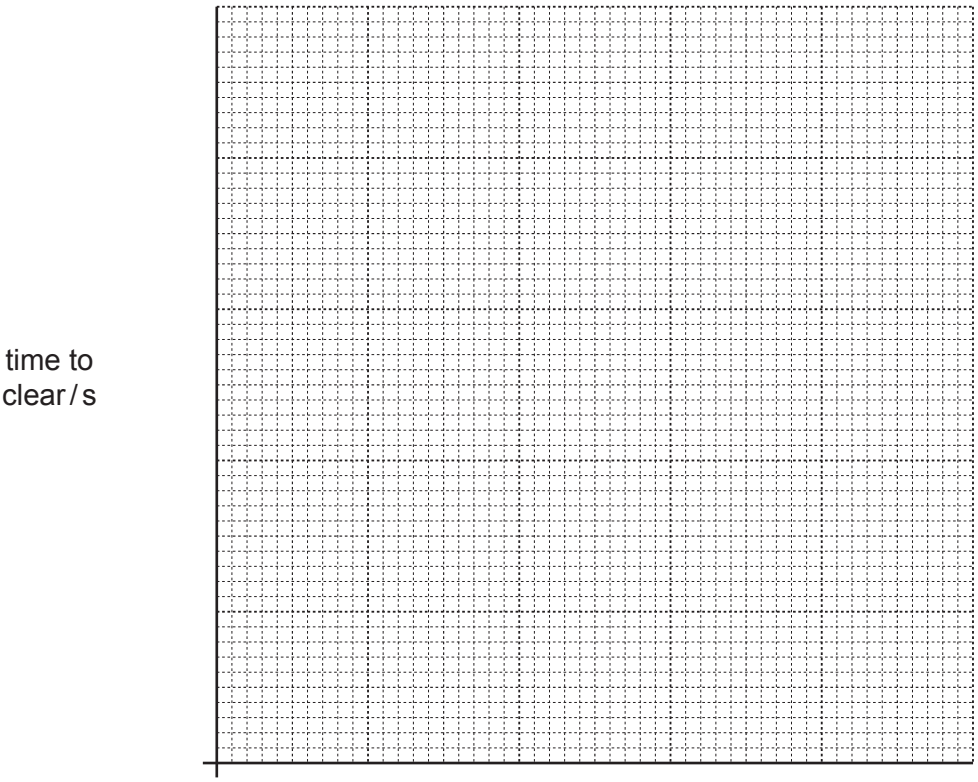
Record in Table 1.1 your results to the nearest second. [3]

Table 1.1

volume of enzyme solution / cm^3	volume of distilled water / cm^3	concentration of enzyme / %	time taken to clear / s
2.0	0.0	4	
1.5	0.5	3	
1.0	1.0	2	
0.5	1.5	1	

(b) **(i)** On the grid below, plot a graph of time to clear against enzyme concentration.

Draw a line of best fit. [3]



(ii) Use your graph to describe the relationship between the concentration of enzyme and the time taken for the milk to clear.

.....[1]

(c) A student uses a similar method to investigate how the rate of this enzyme-catalysed reaction varies with temperature.

Suggest suitable temperatures for the student to use.

.....[2]

[Turn over

2 Notes for use in Qualitative Analysis for this section are printed on page 8.

You are going to identify compounds **H** and **J**.

H is an oxide. **J** is a nitrate salt.

(a) (i) You must wear safety glasses for this experiment.

- Place 15 cm^3 distilled water into a beaker.
- Add the sample of solid **H** to the water in the beaker.
- **Stir the mixture well.**
- Filter the mixture into a large test-tube as shown in Fig. 2.1. This produces filtrate **F**.

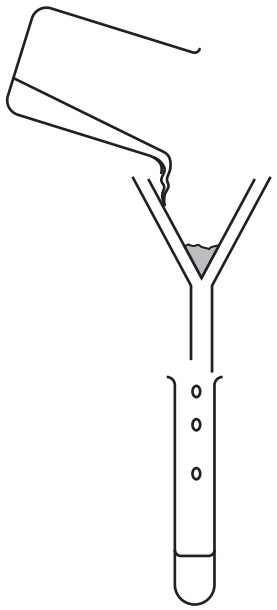


Fig. 2.1

Label the filtrate and the residue on Fig. 2.1. [1]

(ii)
- Test filtrate **F** with Universal indicator paper.
- Keep filtrate **F** for **(a)(iii)** and **(b)(ii)**.

Record the final colour of the paper and the pH of the filtrate.

final colour .....

pH .....

[1]

(iii)
- One-third fill a test-tube with filtrate **F**. Keep the remainder of **F** for **(b)(ii)**.
- Place ten marble chips (calcium carbonate) in another test-tube.
- Add about one-third of a test-tube of dilute hydrochloric acid to the marble chips.
- Immediately attach a delivery tube to the test-tube containing acid and marble chips and pass any gas produced into the test-tube containing filtrate **F**.

Record your observations of the filtrate.

.....[1]

(b) (i) Test a small amount of solution **J** in a test-tube with ammonia solution.

Remember to add the ammonia solution slowly until it is in excess.

Record your observations and identify **J**.

observations .....

.....

J is ..... nitrate.

[3]

(ii) Place about 2 cm^3 of solution **J** in a test-tube and slowly add filtrate **F** until there is no further change.

Record your observations.

.....

.....[1]

(c) (i) In **(b)(ii)**, filtrate **F** is behaving like a reagent used in Qualitative Analysis.

Name this reagent.

.....[1]

(ii) Use all of the evidence in **(a)** and **(b)** to suggest a chemical name for **H**.

State how you have used the evidence to arrive at your answer.

H is ..... oxide.

reason .....

.....

.....

[2]

3 You are going to investigate how the power output P of a filament lamp depends upon the current I flowing through it.

The circuit shown in Fig. 3.1 has been set up for you.

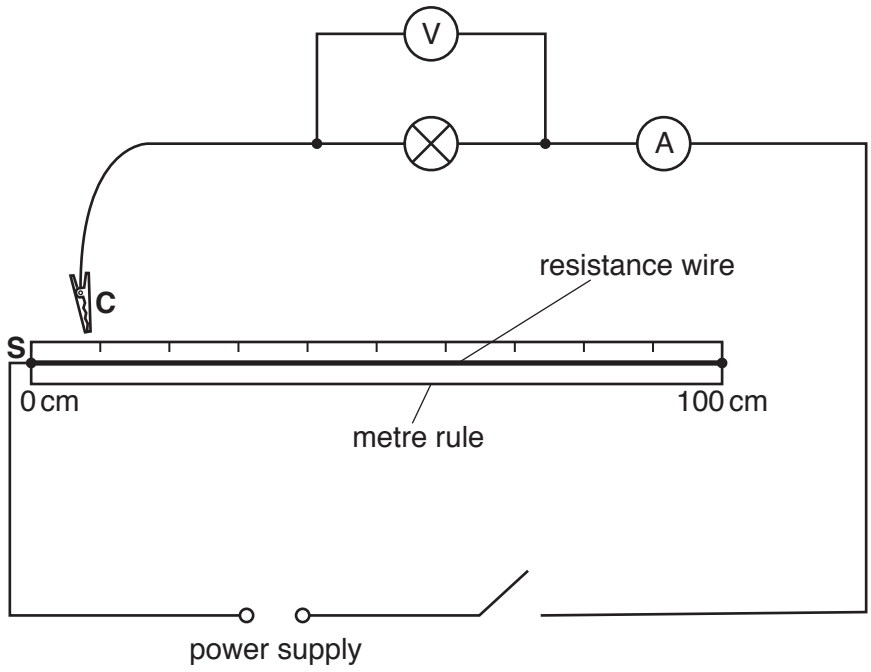


Fig. 3.1

(a) (i) Connect the crocodile clip **C** to the end **S** (0 cm) of the resistance wire. Switch on.

Use the voltmeter and the ammeter to measure the potential difference V across the lamp and the current I flowing through the lamp.

Record in Table 3.1 your values of V and I. Switch off. [2]

Table 3.1

position of sliding contact **C** / cm	potential difference V / V	current I / A	power P / W
0			
20.0			
40.0			
60.0			
80.0			

(ii) Repeat step **(a)(i)** for different positions of the crocodile clip, by connecting it at 20.0 cm, 40.0 cm, 60.0 cm and 80.0 cm from end **S**.

Record in Table 3.1 your values of V and I. Remember to switch off between readings. [4]

(b) Calculate the power output P of the filament lamp for each pair of readings using the equation

$$P = V \times I.$$

Record in Table 3.1 your values of P.

[2]

(c) A student suggests that the power output P of the filament lamp is directly proportional to the current I flowing through it.

State whether your experimental results support this suggestion and justify your statement **by reference to your results** in Table 3.1.

statement .....

justification .....

.....

.....

[2]

NOTES FOR USE IN QUALITATIVE ANALYSIS

Tests 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 with dilute nitric acid, then add aqueous barium nitrate	white ppt.

Tests 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

Tests 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