Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

0689614296

CO-ORDINATED SCIENCES **0654/51**

Paper 5 Practical Test **May/June 2018**

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	
1	
2	
3	
Total	

This document consists of **12** printed pages.

DC (LK/JG) 150104/2

CAMBRIDGE International Examinations

1 You are going to investigate an enzyme-catalysed reaction.

Hydrogen peroxide is broken down by catalase, an enzyme found in living cells such as the cells of many types of bean. Oxygen gas is released during the reaction.

You are provided with a measuring cylinder containing bean puree and a supply of hydrogen peroxide solution of concentration 1.5%.

(a) **(i)** Read through the whole of **(a)** and then complete the headings in Table 1.1 by adding the units. [2]

(ii)
- Use the syringe to add 5 cm^3 of hydrogen peroxide solution by carefully running it down the inside of the measuring cylinder.
- Start the stopclock.

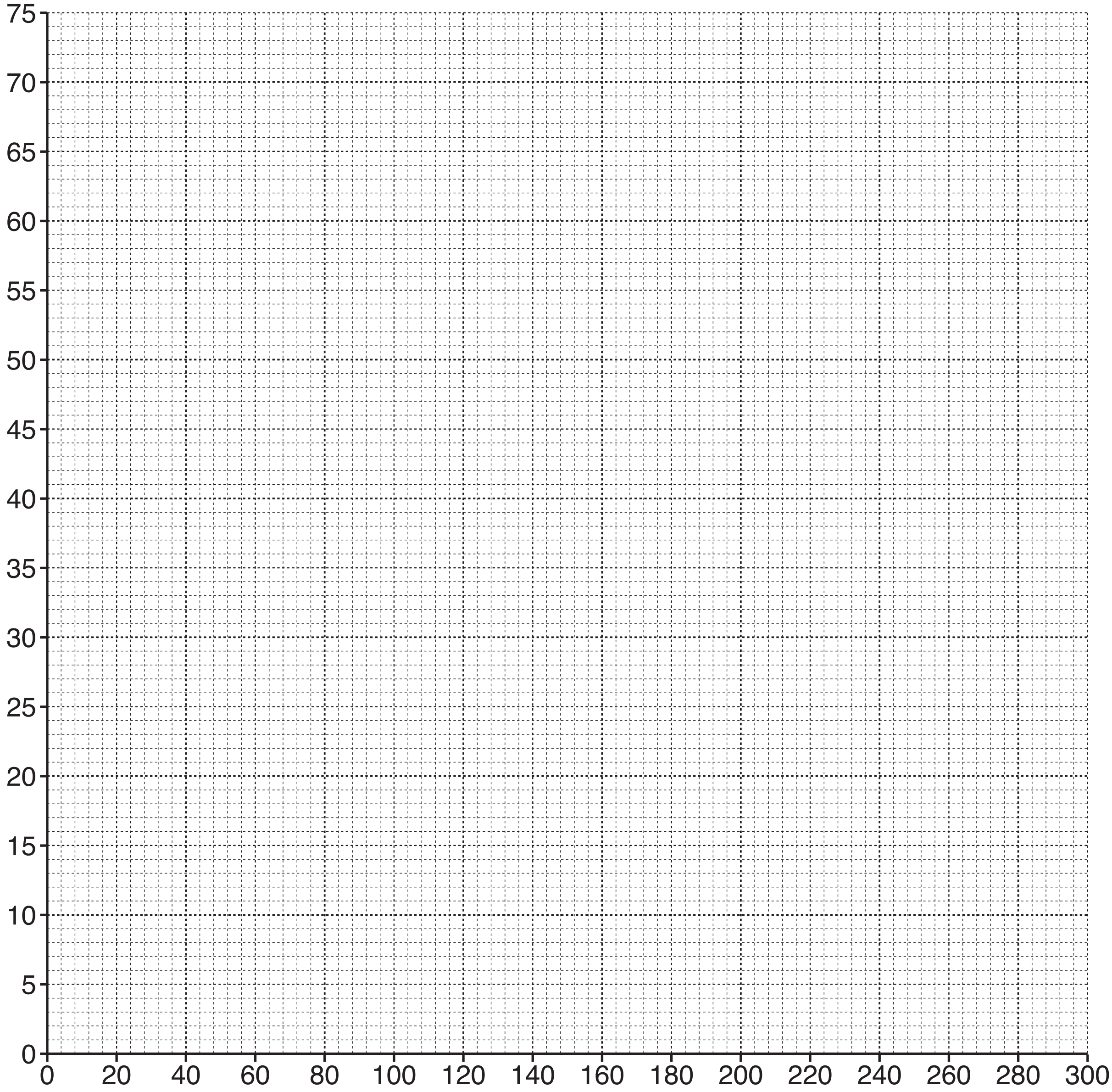
Record, in Table 1.1, the volume of the mixture in the measuring cylinder to the nearest division every 30 seconds for 5 minutes. [3]

Table 1.1

time /	volume of mixture / ....
30	
60	
90	
120	
150	
180	
210	
240	
270	
300	

(b) **(i)** On the grid provided, plot a graph of volume of mixture (vertical axis) against time.

Label the axes.



[2]

(ii) Draw the best-fit smooth curve. [1]

(c) **(i)** Use your graph to predict the volume of the mixture at 200 seconds.

.... [1]

(ii) Use your graph to state how the rate of reaction changes during the 5 minutes.

.... [1]

(d) State **and** explain a safety precaution you took when carrying out the procedure in **(a)(ii)**.

....

.... [1]

(e) Plan an experiment, using the same method as in **(a)(ii)**, to investigate the effect of changing the temperature of the hydrogen peroxide solution on the volume of the mixture.

You should **not** carry out this experiment.

In your answer, you should include

- variables you need to keep constant,
- suggestions for values of the variable you are going to change,
- how you would present your results on a graph.

....

....

....

....

....

....[4]

Please turn over for Question 2.

2 Notes for use in Qualitative Analysis for this question are printed on page 12.

You are going to identify three solutions, **H**, **J** and **K**. The three solutions are each one of the halide solutions shown.

sodium bromide solution
sodium chloride solution
sodium iodide solution

(a) (i) Steps

- Place about 2 cm depth of solution **H** in a test-tube.
- Add a few drops of silver nitrate solution.
- Record your observations in Table 2.1.
- Then add ammonia solution until the test-tube is nearly full.
- Stir the mixture carefully.
- Record your observations in Table 2.1. Holding the question paper behind the test-tube will help you determine any colour.

Repeat the steps for solution **J**.

Repeat the steps for solution **K**.

Table 2.1

	observations		
test	solution **H**	solution **J**	solution **K**
add silver nitrate solution			
then add ammonia solution and stir			

[6]

(ii) Use your observations in Table 2.1 to identify which solution, **H**, **J** or **K**, is sodium chloride solution.

Explain how you reached your identification.

sodium chloride solution is solution ....

explanation ....

....
[1]

(iii) State **and** explain whether the addition of silver nitrate solution followed by ammonia solution can be used to distinguish between the three halide solutions, **H**, **J** and **K**.

....

....

....[1]

(iv) Nitric acid is usually added to the unknown solution before adding silver nitrate solution.

Explain why adding nitric acid first is not necessary in this test for this investigation.

....

....[1]

(b) (i) Steps

- Place about 2 cm depth of solution **H** in a test-tube.
- Add an equal volume of chlorine water.
- Record your observations in Table 2.2.
- Then add a few drops of starch solution.
- Record your observations in Table 2.2.

Repeat the steps for solution **J**.

Repeat the steps for solution **K**.

Table 2.2

	observations		
test	solution **H**	solution **J**	solution **K**
add chlorine water			
then add a few drops of starch solution			

[3]

(ii) Identify the substance made in **(b)(i)** which causes the starch to change colour.

Your knowledge of the food test for starch may help you answer this question.

....[1]

(iii) State what type of reaction has taken place between solution **J** and chlorine water.

....[1]

(c) Use your observations in Table 2.1 and Table 2.2 to identify solutions **H**, **J** and **K**.

H is ....

J is ....

K is ....
[1]

3 You are going to measure the length l of a spring when different loads L are added to it, and plot a graph.

A spring has been set up in a clamp for you, as shown in Fig. 3.1.

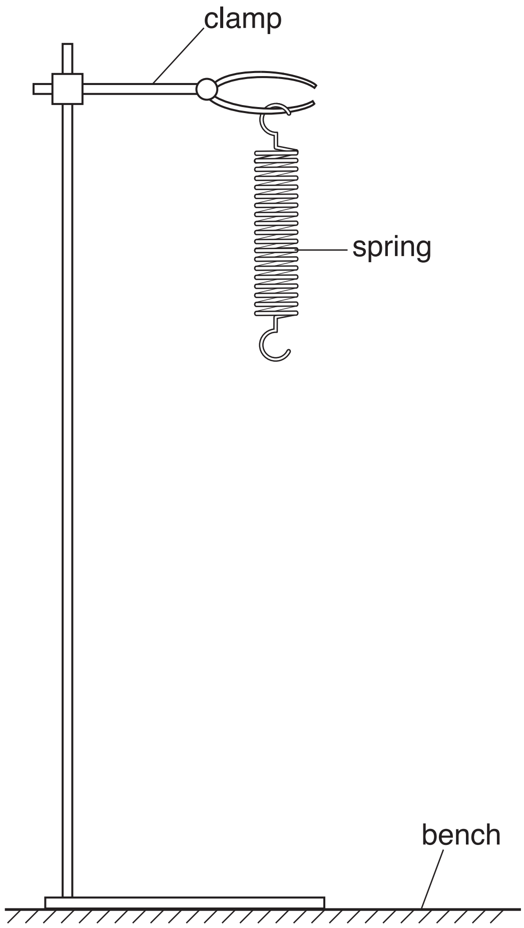


Fig. 3.1

(a) **(i)** Measure and record the length l_0 of the unstretched spring to the nearest millimetre.

l_0 = ... mm [1]

(ii) **Mark on Fig. 3.1** the length l_0 you measured. [1]

(iii) Describe how you avoided a parallax (line-of-sight) error when measuring the length of the spring.

....

....[1]

(b) **(i)** Hang a load L of 1.0 N on the spring. Measure the new length l of the spring to the nearest millimetre.

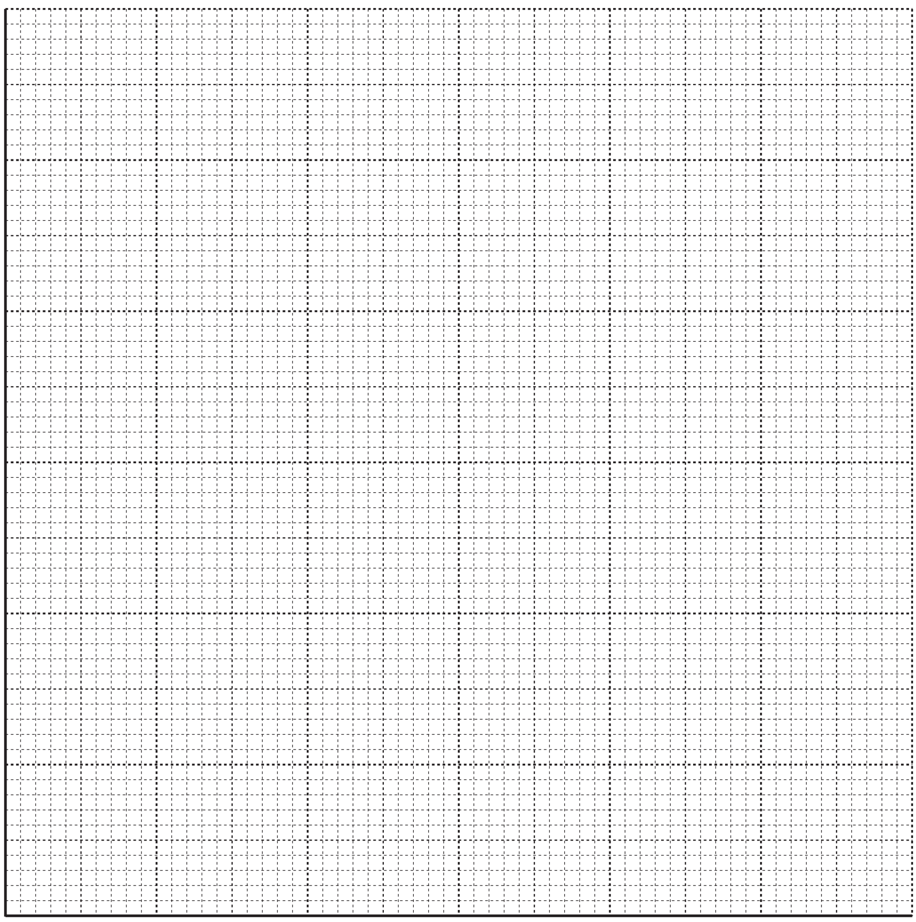
Record the length l in Table 3.1. [1]

(ii) Repeat the steps in **(b)(i)** using loads of 2.0 N, 3.0 N, 4.0 N and 5.0 N and complete Table 3.1. [2]

Table 3.1

load L / N	spring length l / mm
1.0	
2.0	
3.0	
4.0	
5.0	

(c) **(i)** On the grid provided, plot a graph of L against l. Start both axes from the origin (0, 0).



[2]

(ii) Draw the best-fit straight line. [1]

(iii) Use your graph to determine the length l_0 of the unstretched spring.

l_0 = ... mm [1]

(iv) Compare your answer in **(a)(i)** with your answer in **(c)(iii)**.

State whether the answers agree within the limits of experimental accuracy.

Give a reason for your statement.

....

....[1]

(d) **(i)** 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 = ... N/mm [2]

(ii) The gradient of your line measures the force constant of the spring. This is a measure of the elastic stiffness of the spring. The greater the force constant, the harder it is to stretch the spring.

On your graph, draw a line to represent the behaviour of a spring with the same unstretched length as your spring, but with a greater force constant. Label this line **D**.
[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