MINISTRY OF EDUCATION, SINGAPORE
in collaboration with
CAMBRIDGE ASSESSMENT INTERNATIONAL EDUCATION
General Certificate of Education Ordinary Level

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SCIENCE (PHYSICS, CHEMISTRY) 5086/05

Paper 5 Practical Test

For examination from 2024

SPECIMEN PAPER

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Please check that your name, Centre/index number and school name are printed **CORRECTLY** on the barcode label.
Give details of the practical shift and laboratory, where appropriate, in the boxes provided.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, glue, correction fluid or highlighters.
The use of an approved scientific calculator is expected, where appropriate.
DO **NOT** WRITE ON ANY BARCODES.

Shift
Laboratory

Answer **both** questions.
You are advised to spend 45 minutes on each question.
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.

For Examiner's Use	
1	
2	
Total	

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

Singapore Examinations and Assessment Board

Cambridge Assessment International Education

1 In this experiment, you will investigate the oscillations of a simple pendulum.

(a) • Set up the apparatus as shown in Fig. 1.1.

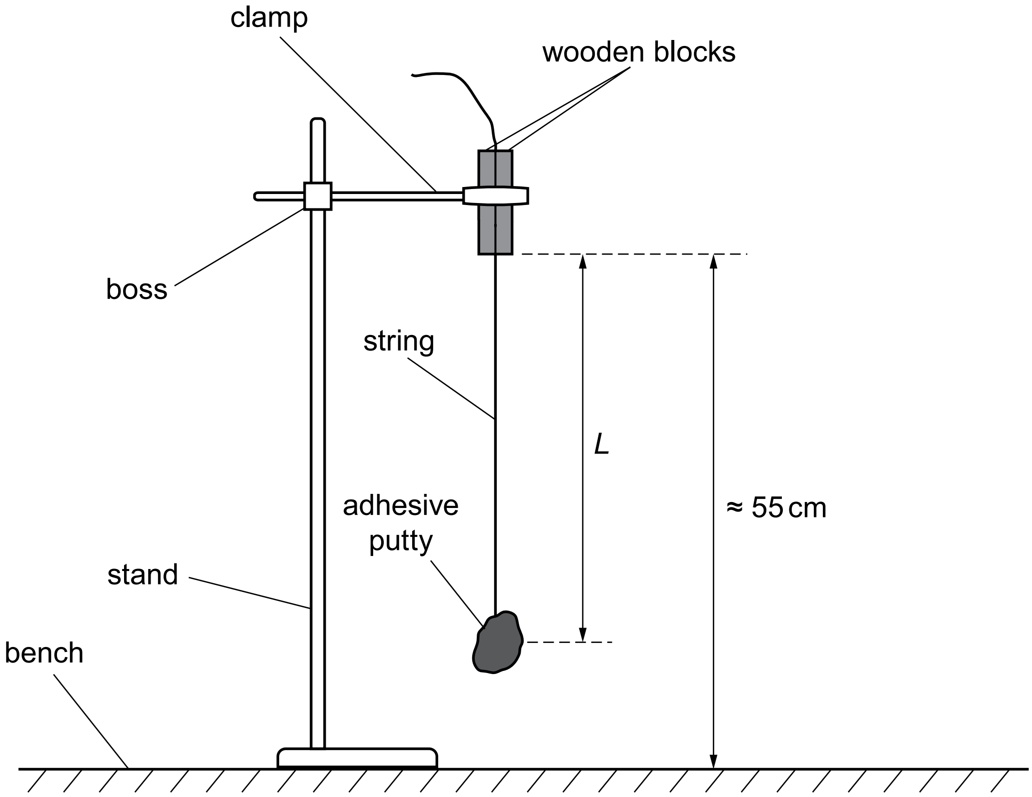

Fig. 1.1

- Adjust the clamp so that the distance between the bottom of the two wooden blocks and the bench is approximately 55 cm.
- Adjust the string by pulling the string through the wooden blocks so that the length *L* from the bottom of the wooden blocks to the middle of the putty is approximately 42 cm.
- Measure and record *L* to the nearest 0.1 cm.

L = ... cm

- Gently move the adhesive putty by about 3 cm towards the stand.

- Release the putty and start the stop-watch.

- Measure and record the time t_1 for **ten** oscillations to the nearest 0.01 s.

t_1 = ...

- Repeat the measurement of time t_2 for **ten** oscillations.
  Record t_2 to the nearest 0.01 s.

t_2 = ...

- Calculate the mean time t for **ten** oscillations, giving your answer to the nearest 0.01 s.

t = ...

- Calculate t^2, giving your answer to two decimal places.

t^2 = ...
[1]

- Record these values of L, t_1, t_2, t and t^2 in Table 1.1 on **Page 4**.

(b)
- Repeat the experiment until you have six different values of *L*.
- Each value of *L* must be between 25.0 cm and 50.0 cm.
- Record your measurements of *L*, t_1 and t_2 in your table of results.
- For each value of *L*, calculate values of *t* and t^2 in your table of results.

Table 1.1

L / cm	t_1 / s	t_2 / s	*t* / s	

[4]

(c) On the graph grid, plot a graph of t^2 (y-axis) against L (x-axis).

Draw the best-fit straight line.

[4]

(d) **(i)** Determine the gradient of your line.
Show your working clearly.

gradient = ... [2]

(ii) The acceleration of free fall g is related to the gradient by the equation:

$$\text{gradient} = \frac{\pi^2 K}{g}$$

where K is a constant and g has the value of $981\,\text{cm/s}^2$.

Use this equation to determine a value for K.
Give your answer to three significant figures.

K = ... [1]

(e) Suggest one improvement to increase the accuracy of the measurement of L.

....

....

.... [1]

(f) Describe how you could change this experiment to investigate how *t* depends on the mass *M* of the adhesive putty.

....

....

....

....

....

.... [2]

[Total: 15]

2 You will carry out experiments to investigate what happens when solid **W** dissolves in water and to determine the ions present in **W**. You are provided with a sample of **W**.

(a) **(i)** Read all the instructions before starting the experiment in **2(a)(i)**. Record all your results in Table 2.1.

Step 1. Weigh the container containing **W** with its cap and record the balance reading.

Step 2. Place a polystyrene cup inside the 250 cm^3 beaker.

Step 3. Use a measuring cylinder to measure 25.0 cm^3 of deionised water. Carefully add the water to the polystyrene cup.

Step 4. Place a thermometer into the water and record the initial temperature of the water.

Step 5. Add the entire sample of **W** to the cup and carefully stir the mixture with the thermometer.

Step 6. Record the final temperature of the solution formed when **all** of **W** has dissolved.

Step 7. Weigh the emptied container with its cap and record its mass.

Table 2.1

mass of container containing **W** with cap / g	
initial temperature of deionised water / °C	
final temperature of solution formed when **W** dissolved completely in water / °C	
mass of emptied container with cap / g	

[3]

(ii) Use your results from Table 2.1 to calculate the mass of **W** added to the cup and the change in temperature.

mass of **W** = ... g

change in temperature = ... °C
[1]

(iii) Explain, using your results, whether dissolving **W** in water is an exothermic change or an endothermic change.

....

.... [1]

(b) A student carried out a similar experiment to the one described in **(a)** but used a different solid compound. She dissolved different masses of the solid in 25.0 cm^3 of deionised water.

The results are given in Table 2.2.

Table 2.2

mass of solid used / g	1.5	3.0
change in temperature / °C	5.5	11.0

(i) The student concluded that the change in temperature is directly proportional to mass of solid dissolved.

Deduce the change in temperature when 4.5 g of solid is used if the change in temperature is directly proportional to mass of solid dissolved.

change in temperature = ... °C [1]

(ii) The student did not have enough data to be certain of her conclusion.

Outline what further measurements she should take to confirm her conclusion.

Briefly describe how she should process her results to determine the relationship between change in temperature and mass of solid.

....

....

.... [2]

(c) **Z** is a solution of solid **W**. **Z** contains one cation and two anions.

(i) You are provided with a sample of **Z**.

Carry out the tests in Table 2.3.

You should test any gases evolved. The volumes given below are approximate and should be estimated rather than measured.

Record your observations in Table 2.3. If there are no observable changes, write '**no observable change**'.

Table 2.3

test	observations
Add 1 cm depth of solution **Z** to a clean boiling tube. Add 1 cm depth of sodium hydroxide slowly with shaking to **Z** in the tube. Heat the mixture gently.	
Add 1 cm depth of solution **Z** to a clean test-tube. Add 1 cm depth of dilute nitric acid to **Z** in the tube. Then add 1 cm depth of aqueous silver nitrate to the mixture in the tube.	

[4]

(ii) Using your observations in Table 2.3, identify the ions present in **Z**. If you are unable to identify any of the ions, write 'unknown.'

The cation is ....

The anions are .... and ....

[3]
[Total: 15]

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

Test for aqueous cations

cation	***effect of aqueous sodium hydroxide***	***effect of aqueous ammonia***
aluminium (Al^{3+})	white ppt., soluble in excess giving a colourless solution	white ppt., insoluble in excess
ammonium (NH_4^+)	ammonia produced on warming	–
calcium (Ca^{2+})	white ppt., insoluble in excess	no ppt.
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 result***
ammonia (NH_3)	turns damp red litmus paper blue
carbon dioxide (CO_2)	gives white ppt. with limewater (ppt. dissolves with excess CO_2)
chlorine (Cl_2)	bleaches damp litmus paper
hydrogen (H_2)	'pops' with a lighted splint
oxygen (O_2)	relights a glowing splint
sulfur dioxide (SO_2)	turns aqueous acidified potassium manganate(VII) from purple to colourless