

Candidate Name \_\_\_\_\_

| Centre Number | Candidate Number |
|---------------|------------------|
|               |                  |

**International General Certificate of Secondary Education  
CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**PHYSICAL SCIENCE**  
PAPER 5 Practical Test

**0652/5**

**OCTOBER/NOVEMBER SESSION 2002**

1 hour 30 minutes

Candidates answer on the question paper.  
Additional materials:  
As listed in Instructions to Supervisors.

**TIME** 1 hour 30 minutes

**INSTRUCTIONS TO CANDIDATES**

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets [ ] at the end of each question or part question.

Chemistry practical notes for this paper are printed on page 8.

| FOR EXAMINER'S USE |  |
|--------------------|--|
| 1                  |  |
| 2                  |  |
| TOTAL              |  |

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**This question paper consists of 7 printed pages and 1 blank page.**

1 You are going to find the energy change when a certain mass of solid **Z** dissolves in water in a beaker. The first step is to find how much heat is stored by the 100 cm<sup>3</sup> glass beaker.

(a) (i) Weigh the 100 cm<sup>3</sup> glass beaker to the nearest gram. Record the mass in the space provided and convert this mass into kilograms.

mass of beaker in grams = .....g

mass of beaker in kilograms = .....kg [1]

(ii) Multiply the mass of the beaker in kg by 670. This gives the heat energy, **X** joules, for each degree Celsius change.

**X** = .....J/°C [1]

(b) (i) Weigh between 2.5 g and 3.5 g of solid **Z**. This must be accurately weighed to the nearest 0.1 g. Write down all weighings you make and record the accurate mass of **Z**.

mass of **Z** = .....g [2]

(ii) Using a measuring cylinder, measure out 25 cm<sup>3</sup> of cold water and pour into the 100 cm<sup>3</sup> beaker.

Measure and record the temperature  $T_1$  of this water, to the nearest 0.5 °C.

$T_1$  .....°C

Add the weighed solid **Z** to the water and stir until it completely dissolves.

Read and record  $T_2$ , the lowest temperature reached.

$T_2$  .....°C

Calculate the temperature change,  $\Delta T$ .

$\Delta T$  = .....°C [4]

- (iii) Use your results from (a)(ii) and (b)(ii) to calculate the total number of joules absorbed by the dissolving of **Z** in water, using the formula below.

$$\text{total heat energy absorbed} = \Delta T (\mathbf{X} + 105)$$

.....J [1]

- (c) Suggest **one** way in which you could improve the experiment.

.....  
 .....[1]

- (d) Is the dissolving of **Z** in water endothermic or exothermic? Explain your answer.

.....  
 .....[1]

- (e) (i) Empty and rinse the beaker. Measure out 20 cm<sup>3</sup> of the liquid **L** into the same beaker. Measure its temperature,  $T_3$ , as accurately as you can and record its value.

$$T_3 = \text{.....}^\circ\text{C}$$

You are now required to pour into this liquid 50 cm<sup>3</sup> of water at exactly 60 °C, and stir thoroughly. Record the final temperature,  $T_4$ , of the mixture. The way in which you make the temperature of the water exactly 60 °C is for you to decide.

$$T_4 = \text{.....}^\circ\text{C} \quad [2]$$

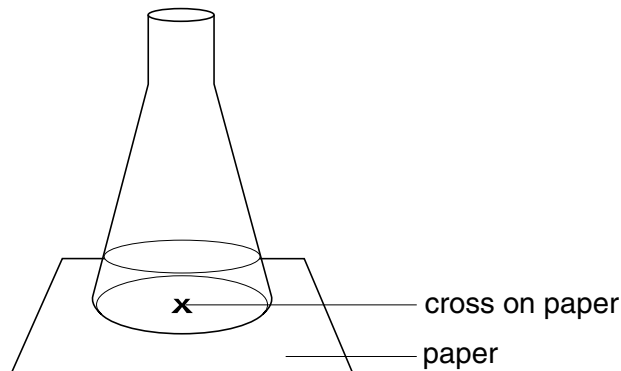
- (ii) Describe how you made the temperature of the 50 cm<sup>3</sup> of water exactly 60 °C.

.....  
 .....  
 .....  
 .....  
 .....  
 .....[2]

- 2 You are going to find out how the time taken for a reaction varies with temperature. The reaction produces a precipitate which will make the solution cloudy. See Fig. 2.1.

**Take care when handling hot liquids**

- (a) Mark a large cross in the centre of a piece of paper. The flask will be placed on this paper. You will look down at the cross through the solution. When the cross disappears, the reaction has finished.



**Fig. 2.1**

- (b)
- Using the larger measuring cylinder, measure  $50\text{ cm}^3$  of the solution labelled **H** and pour it into the flask.
  - Warm the contents of the flask to  $35\text{ }^\circ\text{C}$  (this will only take a few seconds). Place the flask over the cross on the paper.
  - Using the smaller measuring cylinder, measure  $5\text{ cm}^3$  of the solution labelled **J** and add it to the flask containing solution **H**. Start the clock and swirl the flask to mix the contents.
  - When you can no longer see the cross on the paper, stop the clock.
  - Record the starting temperature and time in seconds, in the table Fig. 2.2.

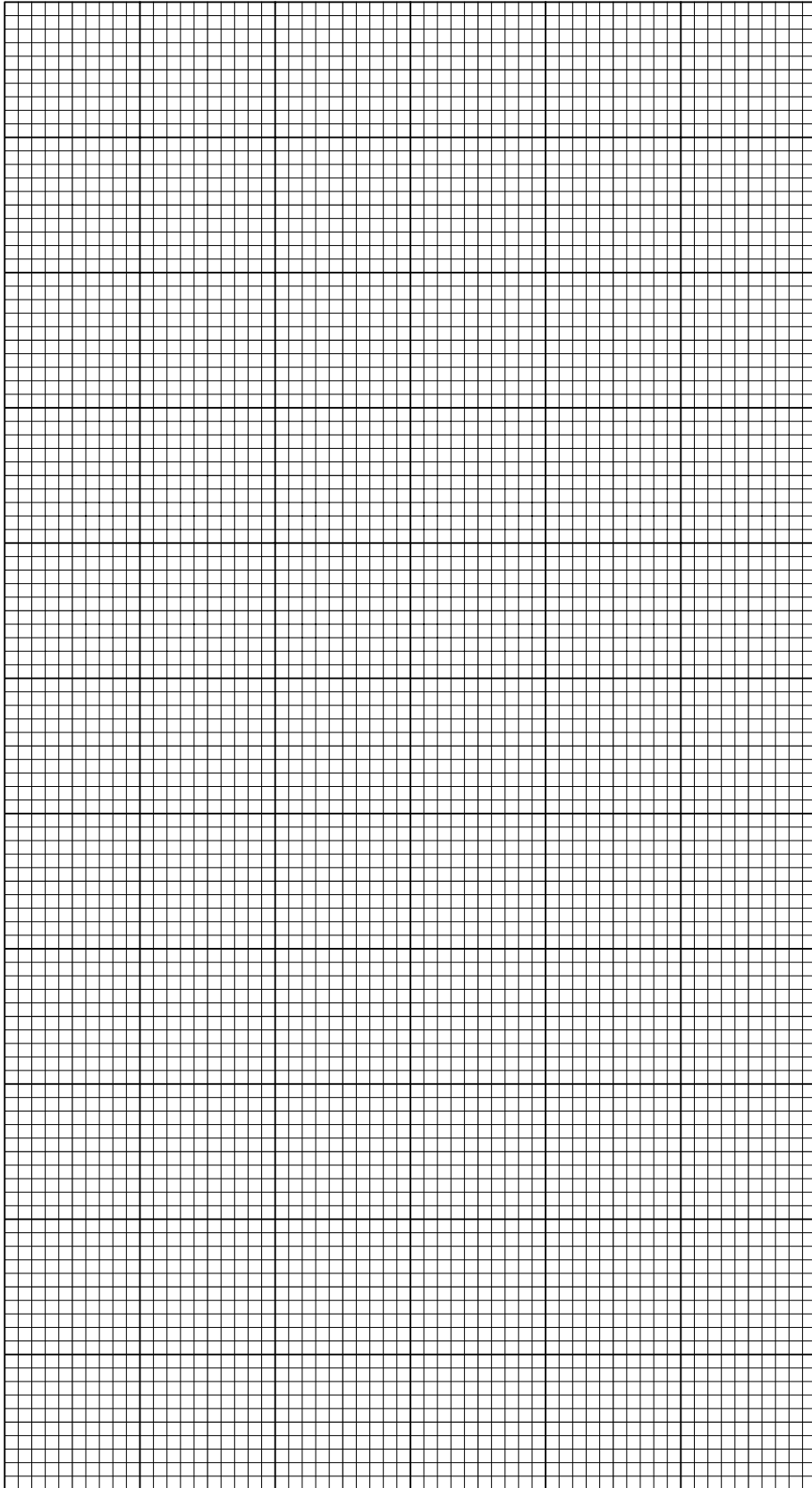
| starting temperature/ $^\circ\text{C}$ | time for cross to disappear/s |
|--|-------------------------------|
|  |                               |
|  |                               |
|  |                               |
|  |                               |
|  |                               |

**Fig. 2.2**

[5]

- (c)
- Wash out the flask with water.
  - Repeat the above procedure but heat solution **H** to  $40\text{ }^\circ\text{C}$ .
  - Record the starting temperature and time in the table.
  - Repeat three more times using an increased starting temperature each time. Do **not** exceed a starting temperature of  $70\text{ }^\circ\text{C}$

- (d) Plot a graph on the grid provided of time (vertical axis) against temperature. Label the temperature axis from 0 °C to 100 °C. Draw a smooth curve through your points.



[4]

(e) Use your graph to answer the following questions:

(i) Find the time for the reaction at 10 °C.

time = .....s

(ii) Find the temperature required to produce a reaction time of 50 seconds.

temperature = ..... °C [2]

(f) Describe the relationship between the temperature and the time taken for the reaction to occur.

.....  
.....  
.....[1]

(g) The graph you have plotted does not show the relationship between **rate of reaction** and temperature. Briefly explain what you would do with your results to show such a relationship.

.....  
.....  
.....[1]

(h) Briefly describe how you would carry out an experiment at 0 °C to find the reaction time.

.....  
.....  
.....  
.....[2]



## CHEMISTRY PRACTICAL NOTES

## 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 ( $\text{Cl}^-$ )<br>[in solution]      | acidify with dilute nitric acid, then add aqueous silver nitrate           | white ppt.                             |
| nitrate ( $\text{NO}_3^-$ )<br>[in solution]     | add aqueous sodium hydroxide, then aluminium foil; warm carefully          | ammonia produced                       |
| sulphate ( $\text{SO}_4^{2-}$ )<br>[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 result</i>  |
|----------------------------------|------------------------------|
| ammonia ( $\text{NH}_3$ )        | turns damp litmus paper blue |
| carbon dioxide ( $\text{CO}_2$ ) | turns lime water 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    |