

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

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**CAMBRIDGE INTERNATIONAL EXAMINATIONS**  
**General Certificate of Education Advanced Level**

**CHEMISTRY****9701/5**

PAPER 5 Practical Test

**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.

You are advised to show all working in calculations.

Use of a Data Booklet is unnecessary.

**FOR EXAMINER'S USE****1****2****TOTAL****This question paper consists of 5 printed pages and 3 blank pages.**

- 1 You are to investigate the reaction between substance **X**, iodine and hydrogen ions.

**FA 1** is  $1.00 \text{ mol dm}^{-3}$  sulphuric acid.

**FA 2** is an aqueous solution of substance **X**.

**FA 3** is  $0.0038 \text{ mol dm}^{-3}$  iodine,  $\text{I}_2$ .

Fill a burette with solution **FA 3**.

- (a) Using the measuring cylinder provided, measure out  $20.0 \text{ cm}^3$  of **FA 1** and  $20.0 \text{ cm}^3$  of **FA 2**, as shown in column 1 of *Table 1.1*, into a  $250 \text{ cm}^3$  conical flask. It is not necessary to rinse the measuring cylinder between solutions.

Measure out  $4.0 \text{ cm}^3$  of **FA 3** from the burette into a test-tube.

Start the reaction by tipping the **FA 3** from the test-tube into the conical flask. Start the stop-clock with one hand and swirl the contents of the flask with the other. Place the flask on a white tile and stop the clock as soon as the colour disappears.

Record the time (in seconds, to the nearest second) in *Table 1.1*.

Repeat the experiment using the different volumes of **FA 1**, **FA 2** and **FA 3** as shown in *Table 1.1*. Where water is required, use the measuring cylinder to add the water to the other solutions in the conical flask.

Experiment 2 is the same as experiment 1 to give you the opportunity of practising the technique.

The 'rate of reaction' can be calculated by using the relationship:

$$\text{'rate'} = \frac{\text{volume of FA 3 in cm}^3}{\text{time in seconds for colour to disappear}}$$

**Table 1.1**

|                                       | 1    | 2    | 3    | 4    |
|---------------------------------------|------|------|------|------|
| volume of <b>FA 1</b> / $\text{cm}^3$ | 20.0 | 20.0 | 10.0 | 20.0 |
| volume of <b>FA 2</b> / $\text{cm}^3$ | 20.0 | 20.0 | 20.0 | 10.0 |
| volume of water / $\text{cm}^3$       | 0.0  | 0.0  | 10.0 | 10.0 |
| volume of <b>FA 3</b> / $\text{cm}^3$ | 4.0  | 4.0  | 4.0  | 4.0  |
| time for colour to disappear / s      |      |      |      |      |
| 'rate' of reaction                    |      |      |      |      |

Calculate each 'rate' and complete *Table 1.1*.

[10]

As the total volume of liquid is the same in each experiment, the volume of any reagent can be used as a measure of its concentration.

**(b) Compare experiments 2 and 3.**

- (i) Which reagents have the same concentration in both experiments?

[1]

- (ii) Which reagent has a different concentration?

[1]

- (iii) How is the rate of reaction affected by the change of concentration of the reagent named in (ii)?

[3]

**(c) Compare experiments 2 and 4.**

- (i) Which reagents have the same concentration in both experiments?

[1]

- (ii) Which reagent has a different concentration?

[1]

- (iii) How is the rate of reaction affected by the change of concentration of the reagent named in (ii)?

[3]

- (d) A text-book states that the reaction is zero order with respect to iodine. What volumes of reagents, compared with experiment 2, would you mix to investigate this statement?

FA 1 ..... cm<sup>3</sup>FA 2 ..... cm<sup>3</sup>water ..... cm<sup>3</sup>FA 3 ..... cm<sup>3</sup>

[1]

[Total : 21]



[4]

|     |  |
|-----|--|
| (a) |  |
| (b) |  |
| (c) |  |
| (d) |  |
| (e) |  |

|     |  |
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| (f) |  |
| (g) |  |
| (h) |  |
| (i) |  |

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