

Name Index Number

233/3
CHEMISTRY
Paper 3
(PRACTICAL)
Nov. 2016
2¼ hours

Candidate's Signature

Date



THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education
CHEMISTRY
Paper 3
2¼ hours

Instructions to candidates

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) Answer **all** the questions in the spaces provided in the question paper.
- (d) You are not allowed to start working with the apparatus for the first 15 minutes of the 2¼ hours allowed for this paper. This time is to enable you to read the question paper and make sure you have all the chemicals and apparatus that you may need.
- (e) All working **must** be clearly shown where necessary
- (f) KNEC mathematical tables and silent electronic calculators may be used.
- (g) **This paper consists of 7 printed pages.**
- (h) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- (i) **Candidates should answer the questions in English**

For Examiner's Use Only

| Question | Maximum Score | Candidate's Score |
|-------------|---------------|-------------------|
| 1 | 16 | |
| 2 | 14 | |
| 3 | 10 | |
| Total Score | | |

1. You are provided with the following:

- Aqueous potassium iodide, solution A₁
- Aqueous sodium thiosulphate, solution A₂
- Acidic solution, solution A₃
- Starch solution, solution A₄
- Dilute hydrogen peroxide, solution B
- Distilled water

You are required to determine the rate of reaction between acidified potassium iodide and hydrogen peroxide.

Procedure

Step 1

Using a 10 ml measuring cylinder, place 2 cm³ of solution A₁ into a 100 ml beaker. Add 2 cm³ of solution A₂ followed by 2 cm³ of solution A₃. Add 5 drops of solution A₄. Finally, add 12 cm³ of distilled water and shake the mixture.

Step 2

Using a burette, place 6 cm³ of solution B into a test tube. Pour the measured 6 cm³ of solution B into the beaker in Step 1 above and immediately start a stopwatch/clock. Swirl the mixture and place on a white paper. Observe the mixture and immediately stop the stopwatch/clock when a blue colour appears.

Record the time taken in table 2. Measure the temperature of the mixture and record in table 2. These are the results of experiment 1.

Step 3

Repeat steps 1 and 2 using the volumes of solutions given in table 1 for experiments 2, 3, 4, 5 and 6 and record in table 2.

Table 1

| Experiment number | Volume of solutions (cm ³) | | | | Distilled Water (cm ³) |
|-------------------|--|----------------|----------------|----------------|------------------------------------|
| | A ₁ | A ₂ | A ₃ | A ₄ | |
| 1 | 2 | 2 | 2 | 5 drops | 12 |
| 2 | 4 | 2 | 2 | 5 drops | 10 |
| 3 | 6 | 2 | 2 | 5 drops | 8 |
| 4 | 8 | 2 | 2 | 5 drops | 6 |
| 5 | 10 | 2 | 2 | 5 drops | 4 |
| 6 | 12 | 2 | 2 | 5 drops | 2 |

- (a) Calculate the rate of reaction $\frac{1}{\text{time}} \text{ s}^{-1}$ for each experiment and fill in table 2.

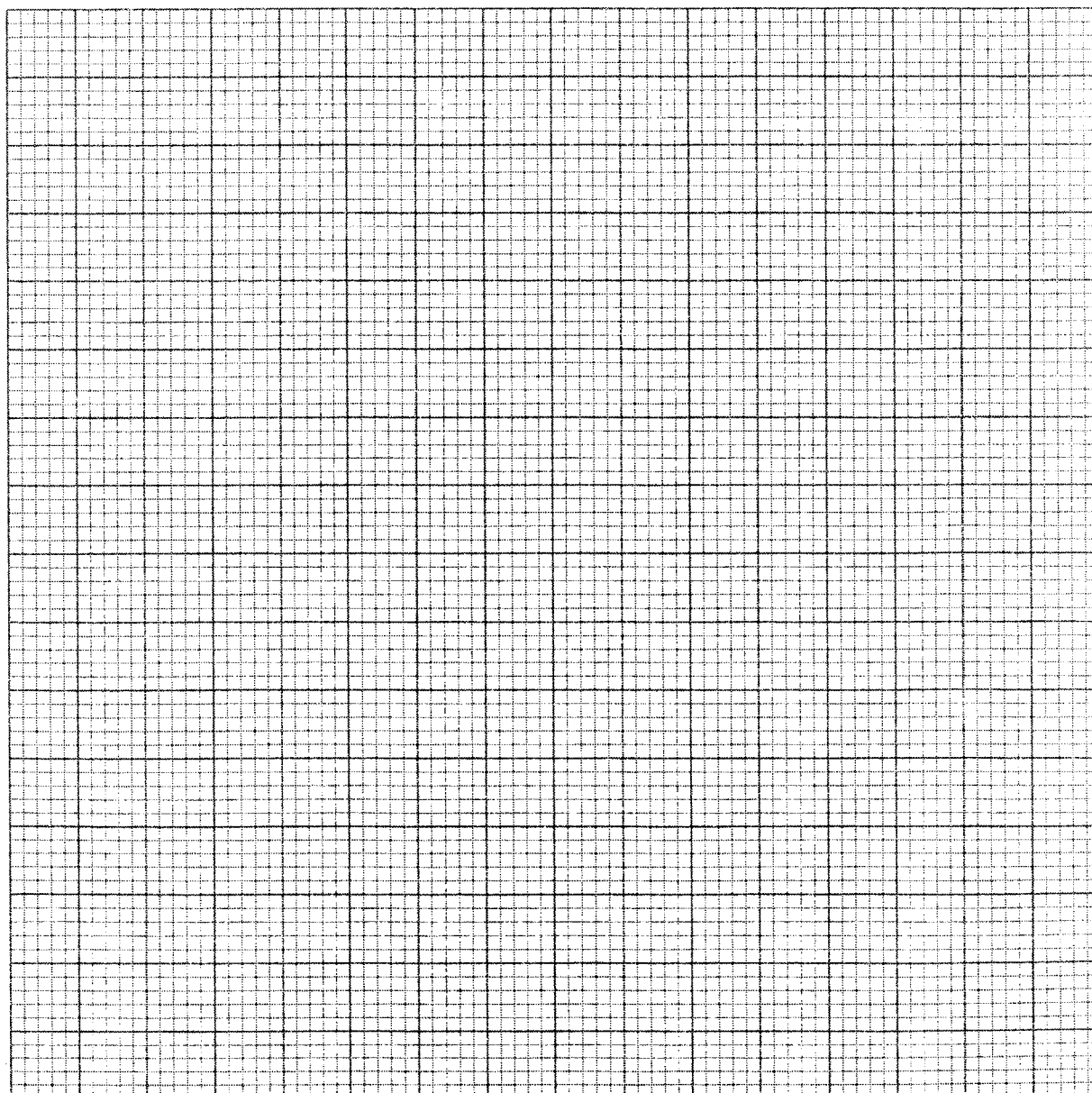
Table 2

| Experiment number | Volume of solution A ₁ Acidified Potassium iodide (cm ₃) | Temperature (°C) | Time (sec) t | Rate $\frac{1}{t}$ s ⁻¹ |
|-------------------|---|------------------|--------------|------------------------------------|
| 1 | 2 | | | |
| 2 | 4 | | | |
| 3 | 6 | | | |
| 4 | 8 | | | |
| 5 | 10 | | | |
| 6 | 12 | | | |

(8 marks)

(b) Plot a graph of rate of reaction $\frac{1}{\text{time}}$ vertical axis against volume of potassium iodide.

(3 marks)



- (c) Explain why it is necessary to record the temperature for each experiment. (1 mark)

.....

- (d) If the experiment was repeated using 7 cm^3 of acidified potassium iodide, solution A₁, determine:

- (i) the volume of distilled water that would be used. (1 mark)

.....

- (ii) the time taken for the blue colour to appear. (2 marks)

.....

- (e) Explain how the rate of the reaction is affected by the volume of acidified potassium iodide. (1 mark)

.....

2. You are provided with Solution G. Carry out the following tests and record your observations and inferences in the spaces provided.

- (a) Measure the pH of the solution using 2 cm^3 of Solution G and universal indicator paper.

| observations | inferences |
|--------------|------------|
| | |
| | |

(1 mark)

(1 mark)

- (b) To about 2 cm³ of **G** in a test tube, add dropwise dilute nitric (V) acid until no further change. Retain the mixture for use in tests (c)(i) and (c)(ii)

| observations | inferences |
|--------------|------------|
| | |
| | |

(1 mark)

(1 mark)

- (c) Divide the mixture obtained in (b) above into two portions.

- (i) To the first portion, add 3 drops of aqueous lead (II) nitrate.

| observations | inferences |
|--------------|------------|
| | |
| | |

(1 mark)

(2 marks)

- (ii) To the second portion, add 3 drops of aqueous barium nitrate.

| observations | inferences |
|--------------|------------|
| | |
| | |

(1 mark)

(1 marks)

- (d) Describe a test that you would carry out to find out if Zn²⁺ ions are present in Solution **G**.

| test | observations |
|------|--------------|
| | |
| | |

(2 marks)

(1 mark)

- (e) Carry out the test described in (d) above.

| observations | inferences |
|--------------|------------|
| | |
| | |

(1 mark)

(1 mark)

3. You are provided with Solid H. Carry out the following tests and record your observations and inferences in the spaces provided.

- (a) Place all of Solid H in a boiling tube. Add about 10 cm³ of distilled water and shake the mixture thoroughly.

| observations | inferences |
|--------------|------------|
| | |
| | |

(1 mark)

(1 mark)

- (b) To about 2 cm³ of the mixture in a test tube, add about half of the solid sodium hydrogen carbonate.

| observations | inferences |
|--------------|------------|
| | |
| | |

(1 mark)

(1 mark)

- (c) To the remaining amount of the mixture of H in the boiling tube add about 10 cm³ of dilute hydrochloric acid. Shake thoroughly then filter the mixture. Wash the residue with distilled water. Dry the residue using filter papers. Use the residue for tests (i), (ii) and (iii) below.

- (i) Place about one third of the residue in a test tube. Add about 10 cm³ of distilled water and warm the mixture. To the warm mixture, add the remaining amount of solid sodium hydrogen carbonate.

| observations | inferences |
|--------------|------------|
| | |
| | |

(1 mark)

(1 marks)

- (ii) To about one third of the residue in a test tube, add about 5 cm³ of distilled water, shake the mixture and then add 3 drops of bromine water.

| observations | inferences |
|--------------|------------|
| | |
| | |

(1 mark)

(1 marks)

- (iii) To the remaining amount of the residue in the boiling tube, add about 10 cm³ of distilled water, about 5 cm³ of dilute sulphuric (VI) acid and then about 5 cm³ of ethanol. Warm the mixture.

| observations | inferences |
|--------------|------------|
| | |
| | |

(1 mark)

(1 marks)

THIS IS THE LAST PRINTED PAGE.