

NAME: INDEX NO.....

SCHOOL: DATE:

CLASSADM. NO.....SIGNATURE.....

CATHOLIC DIOCESE OF KAKAMEGA EVALUATION TEST JULY/AUGUST EXAM 2025

Kenya Certificate of Secondary Education (K.C.S.E.)

233/3

CHEMISTRY

PAPER 3

JULY/AUGUST - 2025

TIME: 2¹/₄ HRS

INSTRUCTIONS TO CANDIDATES:

- Answer **all** the questions in the spaces provided.
- Write your **name** and **index number** in the spaces provided above.
- You are **not allowed** to start working with the apparatus for the first 15 minutes of the 2 ¹/₄ 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 needed.
- Mathematical tables and electronic calculators may be used for calculations.
- All workings **must** be clearly shown where necessary

For Examiner's Use only:

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
1	19	
2	11	
3	10	
Total Score	40	

This paper consists of 6 printed pages

QUESTION 1

You are provided with:

- **Solution A**, 0.5M Copper (II) sulphate.
- **Solid B₁**, metal B powder.
- **Solid B₂**, Iron powder.
- **Solution C**, 0.02M acidified potassium Manganate (VII).

You are required to determine the;

- Enthalpy change for the displacement reaction between metal B and copper (II) sulphate.
- Mass of Iron that reacts with Copper (II) sulphate in the displacement reaction.

PROCEDURE I

- (a) (i) Using a pipette and pipette filler, place 25.0 cm³ of solution A into 100ml plastic beaker. Allow to stand for about 1 minute and then measure the temperature of the solution. Record the reading in **Table 1** as the initial temperature. Add all of solid **B₁** to the solution. Stir the mixture carefully with the thermometer and measure the highest temperature reached, this will take about 5 minutes. Record the reading in **Table 1** as maximum temperature reached.

Table 1

Maximum temperature reached (°C)	
Initial temperature (°C)	
Change In temperature, ΔT_1 (°C)	

(3 marks)

ii) Calculate the:

- I) Number of moles of copper (II) sulphate used.

(1 mark)

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- II) Enthalpy change for the reaction of metal B with one mole of copper (II) sulphate. (Assume that for the mixture, Specific heat capacity = 4.2Jg⁻¹K⁻¹ and density = 1.0gcm⁻³)

(1 mark)

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- b) Repeat the **procedure I**,(a) (i) with all metal **B₂** (iron powder) in place of metal **B₁**. The maximum is temperature reached after about 8 minutes. Record the temperature readings in **Table 2**. **Retain the mixture for use in procedure II.**

Table 2

Maximum temperature reached (°C)	
Initial temperature (°C)	
Change In temperature, ΔT_2 (°C)	

(3 marks)

(c) Compare the changes in temperature ΔT_1 and ΔT_2 and comment on the differences.

(2 marks)

PROCEDURE II

- (i) Fill a burette with **solution C**.
- (ii) Filter the mixture obtained in **procedure I (b)** into 250 ml volumetric flask. Wash the residue with distilled water and add into the flask. Add more distilled water to make up to the mark. Label this as **solution B₂**.
- (iii) Using a pipette and a pipette filler, place 25.0cm³ of **solution B₂** into a 250 ml conical flask. Titrate **solution B₂** with **solution C** until a permanent pink colour just appears. Record the readings in **Table 3**.

Repeat step (iii) and complete **Table 3**.

(d) **Table 3**

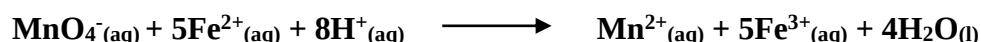
	I	II	III
Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of solution C used, cm ³ .			

(4 marks)

(e) Calculate the average volume of solution C used.

(1 mark)

(f) The equation for the reaction between manganate (VII) and iron (II) ions is:



Calculate the number of moles of:

- (i) Potassium manganate (VII) used.

(1 mark)

(ii) Iron (II) ions in 25.0cm³ **solution B**. (1 mark)

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(iii) Iron that reacted with Copper (II) sulphate. (1 mark)

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(g) Determine the mass of iron that reacted. (R.A.M = 55.8) (1 mark)

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QUESTION 2

You are provided with **solid R**, carry out the tests below and record your observations and inferences in the spaces provided.

(a) Describe the appearance of **solid R**. (1 mark)

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(b) Place about one-third of solid **R** in a dry test-tube. Heat the solid gently and the strongly. Test any gases produced with both blue and red litmus papers.

Observations	Inferences

(1 mark)

(1 mark)

(c) Place the remaining amount of **solid R** in a boiling tube. Add about 10 cm³ of distilled water and shake. Divide the mixture into **five** test tubes each containing about 2cm³.

(i) To the first portion, add aqueous sodium hydroxide dropwise until in excess.

Observations	Inferences

(1 mark)

(1 mark)

- (ii) To the second portion, add aqueous ammonia dropwise till in excess.

Observations	Inferences

(1 mark)

(1 mark)

- (iii) To the third portion, add three drops of acidified Barium Chloride.

Observations	Inferences

(1 mark)

(1 mark)

- (iv) To the fourth portion, add about 2cm³ of hydrogen peroxide, then about 1cm³ of sodium hydroxide solution.

Observations	Inferences

(1 mark)

(1 mark)

QUESTION 3

You are provided with **liquid Q**. Carry out the following tests and record your observations and inferences in the spaces provided.

- (a) Place 2 drops of **liquid Q** on a watch glass. Ignite the liquid with a Bunsen burner flame.

Observations	Inferences

(1 mark)

(1 mark)

(b) Place about 2cm³ of **liquid Q** in a test-tube. Add about 2cm³ of distilled water and shake the mixture.

Observations	Inferences

(1 mark)

(1 mark)

(c) To about 2cm³ of **liquid Q** in a test-tube, add all the solid sodium hydrogen carbonate provided.

Observations	Inferences

(1 mark)

(1 mark)

(d) To about 2cm³ of **liquid Q** in a test-tube, add 3 drops of bromine water.

Observations	Inferences

(1 mark)

(1 mark)

(e) To about 2cm³ of **liquid Q** in a test-tube, add 3 drops of acidified potassium dichromate (VI) and warm the mixture.

Observations	Inferences

(1 mark)

(1 mark)

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