Name.. Index Number...

School …………………………………………………Candidate's signature …………………..

Date ………………………………………….

233/3
CHEMISTRY
PAPER 3
(Practical)
August 2022
2¹/₄ hours

SUKELLEMO JOINT MOCK EXAMINATION

Instructions to Candidates

1. *Write your name and index number in the spaces provided in the question paper.*
2. *Sign and write the date of the examination in the spaces provided above.*
3. *Answer **ALL QUESTIONS** in the spaces provided on the question paper.*
4. *You are NOT allowed to start working with the apparatus for the first 15 minutes of the 2 ¼ 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.*
5. *All working **MUST** be clearly shown where necessary.*
6. *Mathematical tables and electronic calculators may be used*

For Examiner's Use Only

Question	Maximum Score	Students Score
1	22	
2	10	
3	8	
Total score	40	

This paper consists of …..**8**….. printed pages

Candidates should check the question paper and ascertain that all pages are printed as indicated and that no questions are missing.

You are provided with:

i)   Solution A, which is 2M hydrochloric acid

ii)   Solution B, which is 0.1M sodium thiosulphate $(Na_2S_2O_3)$

iii)   Solution C which is an alkali of 0.1M concentration.

You are required to:

i)   find the effects of change of temperature on the rate of reaction between sodium thiosulphate, solution B and hydrochloric acid, solution A

ii)   prepare a dilute solution of hydrochloric acid, solution A

iii)   write an ionic equation for the reaction between hydrochloric acid solution A and the alkali solution C
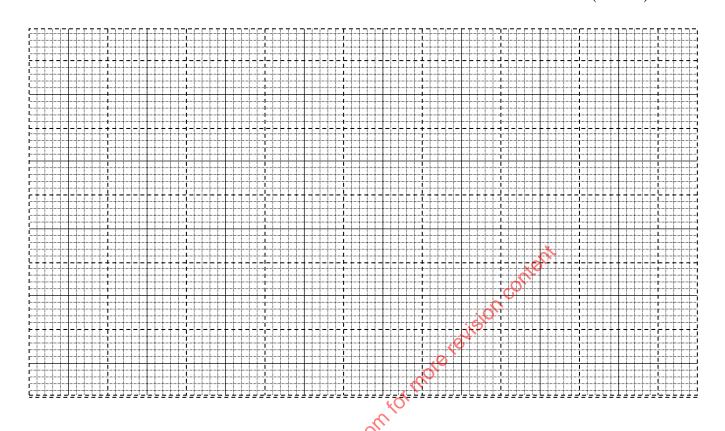
Procedure I

a) Using a 10 ml measuring cylinder, measure $10cm^3$ of solution B into a clean $100cm^3$ glass beaker. Place it together with its contents on a white piece of paper with a **cross (X)** written on it. Measure the temperature of solution A and record it in as room temperature in **table I**.

b) Using a clean measuring cylinder, measure $5cm^3$ of solution A. Add this to the contents of the beaker in (a) above and immediately start the stopwatch. Record the time it will take for the cross (X) to become invisible when viewed from above the reaction mixture in the $100cm^3$ beaker in **table I**.

c) Pour out the contents of the beaker and wash it thoroughly. Measure $10 cm^3$ of solution B into the beaker and warm it to 30^oC, place the beaker and its contents on the white paper with a cross (X) written on it. Immediately add $5cm^3$ of solution A to the beaker and start the stopwatch. Record the time taken for the cross (X) to become invisible in **table I**.

d) Repeat procedure (c) at the temperatures indicated and complete **table I.**

Table I

Test No.	1	2	3	4	5
Volume of hydrochloric acid, Solution A, (cm^3)	5	5	5	5	5
Volume of Sodium thiosulphate, Solution B, (cm^3)	10	10	10	10	10
Temperature (^oC) of sodium thiosulphate solution B	**Room temperature**	30	40	50	60
Time in seconds					
Reciprocal of time$^1/_t$ (s^{-1})					

(5marks)

a) On the grid provided; plot a graph of reciprocal of time ($^1/_t$) (vertical axis) against temperature.

(3marks)

b) Comment on the effect of change of temperature on the reaction between sodium thiosulphate, solution B and hydrochloric acid, solution A. (1 mark)

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c) Use your graph to determine:

i) The time taken by the reaction when the temperature is 45°C. (1 mark)

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ii) The temperature at which the time taken for the cross (X) to become invisible is 22 seconds. (2 marks)

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Procedure II

Using a burette, place 12.5cm^3 of solution A into a 250ml volumetric flask. Add about 200cm^3 of distilled water and shake. Top up to the mark. Label this solution D.

Rinse the burette and fill it with solution D. Using a pipette and pipette filler, place 25.0cm^3 of solution C into a 250ml conical flask. Add two drops of phenolphthalein indicator and titrate with solution D. record your results in **table II**. Repeat the titration two more times and complete the table.

Table II	I	II	II
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution D (cm^3) added			

(4 marks)

Calculate the:

i) Average volume of solution D used.   (1 mark)

ii) Number of moles of hydrochloric acid, solution D used.   (2marks)

iii) Number of moles of alkali, solution C used.   (1mark)

iv) Ionic equation for the reaction between hydrochloric acid, solution A and alkali, solution C. (2marks)

Q2.   You are provided with **solid E**. Carry out the tests below and record your observations and inferences in the spaces provided.

i)   Place all solid E into a dry boiling tube and add 10cm^3 of distilled water and shake well. Divide the mixture into 4 equal portions.

Observation	**Inferences**
(1 mark)	(1 mark)

ii)   To a first portion, add aqueous sodium hydroxide dropwise until in excess.

Observation	**Inferences**
(1 mark)	(1 mark)

iii)   To the second portion, dip a clean glass rod and place it in a non-luminous flame.

Observation	**Inferences**
(1 mark)	(1 mark)

iv)   To the third portion, Add 3 drops of 2M nitric (V) acid. Retain the mixture for use in step (v).

Observation	Inferences
(½ mark)	(1 mark)

v)   To the mixture in step (iv), add 3 drops of barium nitrate solution.

Observation	Inferences
(½ mark)	(½ mark)

vi)   To the fourth portion, add 3 drops of lead (II) nitrate solution.

Observation	Inferences
(½ mark)	(1 mark)

Q3. You are provided with an organic liquid F. Use 2cm^3 portions of liquid F to carry out the tests below and write your observation and inferences in the spaces provided.

i)   To the first portion, add 2 cm^3 of distilled water and shake.

Observation	Inferences
(1 mark)	(1 mark)

ii) To the second portion, add 2 drops of acidified potassium manganate (VII).

Observation	Inferences
(1mark)	(1mark)

iii) To the third portion, add 2 drops of 2M sulphuric (VI) acid followed by 2cm^3 of ethanol and warm the mixture. Pour the mixture in a beaker containing about 10 cm^3 cold water.

Observation	Inferences
(1mark)	(1mark)

iv) To the fourth portion, add 2 drops universal indicator.

Observation	**Inferences**
(1mark)	(1mark)

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