Candidate's Name:…….……..... Index No: …….

Signature……. School ……...……

P525/3
CHEMISTRY
Paper 3
July/August, 2024
3¼ hours

NATIONAL EDUCATION RESEARCH & EXAMINATIONS BUREAU

UACE NEREB NATIONAL MOCKS 2024

CHEMISTRY
PRACTICAL
Paper 3
3 hours 15minutes

INSTRUCTIONS TO CANDIDATES

- ✓ *Answer **ALL** questions. Use **blue** or **black** ball point pen. Any work done in pencil will **not** be marked except drawings.*
- ✓ *Record your answers on this question paper in the spaces provided.*
- ✓ *Mathematical tables and silent non-programmable calculators may be used.*
- ✓ *Reference books (i.e. text books, Books on qualitative analysis, etc) should **not** be used.*
- ✓ *Candidates are **not** allowed to start working with the apparatus for the first **15 minutes**. This time is to enable candidates to read the question paper and make sure they have all the apparatus and chemicals that they may need.*

For Examiners' Use Only			
Q.1	**Q.2**	**Q.3**	**Total**

Turn Over

1. You are provided with the following;
   FA1; which is a solution containing 5.6 gl^{-1} of iron(II) ions.
   FA2; which is a solution of potassium manganate(VII) of unknown concentration.
   Solid **R**, which is a salt containing persulphate ions.
   1 M sulphuric acid solution.

You are required to standardize **FA2** and use it to determine the reaction ratio between iron(II) ions in **FA1** and solid **R**.

In acidic medium, potassium manganate(VII) reacts with iron(II) ions in the ratio of $1:5$

PROCEDURE:

(a) Pipette 25.0 (or 20.0) cm^3 of **FA1** into a conical flask and add 20 cm^3 of 1 M sulphuric acid using a clean measuring cylinder.
Shake the mixture and titrate the mixture with **FA2**.
Repeat the titration until you obtain consistent results.
(i) Record your results in the **Table I** below.

RESULTS:

Volume of pipette used = …….. cm^3 (½ mark)

Table I

Experiment	**1**	**2**	**3**
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume **FA2** used (cm^3)			

(4½ marks)

(ii) Volumes of **FA2** used for calculating the average volume. (½ mark)
……

(iii) Average volume of **FA2** used …….....……cm^3
(2½ marks)

Questions:

(b) Calculate the molar concentration of potassium manganate(VII) in **FA2**.
($Fe = 56$) (4½ marks)
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PROCEDURE:

(c) Weigh accurately about 0.5 g of **R**. Add about 50 cm^3 of distilled water, carefully shake to dissolve and transfer the solution into a 250 cm^3 volumetric flask. Using a clean measuring cylinder, add exactly 150 cm^3 of **FA1** to the solution in the volumetric flask. Make the solution up to the mark with distilled water, shake well and label it **FA3**.
Pipette 25.0 (or 20.0) cm^3 of **FA3** into a conical flask add 10 cm^3 of 1 M sulphuric acid using a measuring cylinder.
Shake the mixture and titrate the mixture with **FA2**.
Repeat the titration until you obtain consistent results.

(iv) Record your results in the **Table II** below.

RESULTS:

Mass of weighing container + **R** = ... g (½ mark)

Mass of empty weighing bottle =..... g (½ mark)

Mass of **R** used = ...g (½ mark)

Volume of pipette used …… cm^3 (½ mark)

Table II

Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of **FA2** used (cm^3)			

(4½ marks)

(v) Volumes of **FA2** used for calculating the average volume

.....…… cm^3 (½ mark)

(vi) Average volume of **FA2** used…… cm^3

(2½ marks)

Questions

(d) Calculate the number of moles of

(v) iron(II) ions that reacted manganate(VII) ions in **FA2**. (2½ marks)

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(vi) iron(II) ions in 250 cm^3 of **FA3.** (1½ marks)

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(vii) iron(II) ions that reacted with solid **R**. (02 marks)

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(e) Determine the reaction ratio between iron(II) ions in **FA1** and solid **R**.
(*RFM of R= 270*) (02 marks)

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2. You are provided with substance **Z,** which contains **two** cations and **two** anions. You are required to carry out tests below on **Z** and identify the cations and anions in **Z**.
Identify any gas(es) evolved.
Record your observations and deductions in the table below.

(*32 marks*)

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Heat **two** spatula end- fuls of **Z** strongly in a dry test tube until there is no further change.		

(b) To about 6 cm^3 of water, add 2 spatula end-fuls of **Z** and shake well. Filter the mixture and keep both filtrate and residue.		
(c) Divide the filtrate into **five** parts. (i) To the **first** part of the filtrate, add dilute sodium hydroxide solution dropwise until in excess.		
(ii) To the **second** part of the filtrate, add dilute ammonia solution dropwise until in excess.		
(iii)Use the **third** part of the filtrate, to carry out a test of your own choice so as to confirm the **first** cation in **Z**.		
(iv) To the **fourth** part of the filtrate, add 2-3 drops of lead(II) nitrate solution and heat the mixture.		

(v) Use the **fifth** part of the filtrate, to carry out a test of your own choice so as to confirm the **first** anion in **Z**.		
(d) Wash the residue from (b) with distilled water and then add dilute hydrochloric acid until there is no further change. Divide the acidic solution into **three** parts.		
(i) To the **first** part of the acidic solution, add dilute sodium hydroxide solution drop wise until in excess.		
(ii) To the **second** part of the acidic solution, add dilute ammonia solution drop wise until in excess.		
(iii) Use the **third** part of the acidic solution, to carry out a test of your own choice so as to confirm the **second** cation in **Z**.		

Questions:

(e) Identify the

(i) cations in **Z** …….....……

(ii) anions in **Z** …….....

3. You are provided with an organic compound **W**.
   You are required to carry out tests below on **W** and describe the nature of **W**. Record your observations and deductions in the table below. (*18 marks*)

Tests	Observations	Deductions
(a) Burn a small amount of **W** on a spatula end or in a dry porcelain dish.		
(b) To about 1 cm^3 of **W**, add 2 cm^3 of water, shake and test with a litmus paper. Divide the mixture into **three** parts.		
(i) To the **first** part of the mixture, add 3-4 drops of sodium hydrogencarbonate solution.		
(ii) To the **second** part of the mixture, add 4-5 drops of neutral iron(III) chloride solution.		
(iii) To the **third** part of the mixture add 3-4 drops of 2,4-dinitrophenylhydrazine		

(c) To about 0.5 cm^3 of **W**, add about 1 cm^3 of acidified potassium dichromate(VI) solution. Then add 5 drops of 2,4-dinitrophenylhydrazine and shake. Leave it stand for about 1 minute.		
(d) To about 0.5 cm^3 of **W**, add about 1 cm^3 of ethanoic acid followed by 2-3 drops of concentrated sulphuric acid. Heat the mixture and the pour in a small beaker of cold water.		
(e) To about 0.5 cm^3 of **W**, add 4 drops of Lucas reagent.		
(f) To about 0.5 cm^3 of **W**, add 4 cm^3 of iodine solution followed by sodium hydroxide solution until the solution is pale yellow. Warm the mixture gently and allow it to cool under cold water.		

(f) Describe the nature of **W**.

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END