CHEMISTRY
PAPER – 2
(PRACTICAL)

(Three hours)

(*Candidates are allowed additional 15 minutes for* ***only*** *reading the paper.*
They must NOT start writing during this time.)

ALL ANSWERS MUST BE WRITTEN IN THE ANSWER BOOKLET PROVIDED SEPARATELY.

Question 1 *is an* ***oxidation-reduction titration*** *in which sufficient working details are given.*
All essential working must be shown.

Question 2 *is an experiment on the* ***rate of reaction****.*
Sufficient working must be shown.

Question 3 *is an exercise in* ***qualitative analysis****.*

Read the questions carefully and follow the given instructions.

Attempt ***all*** *questions.*

All working, including rough work, should be done on the same sheet as the rest of the answer.

The intended marks for questions or parts of questions are given in brackets [ ].

Mathematical Tables and graph paper are provided.

Attempt ***all*** *questions.*

Question 1 **[8]**

You are provided with two solutions as follows:

- **C-10** is a solution prepared by dissolving 1.04 gms of potassium manganate (VII) $KMnO_4$ per litre.
- **C-11** is a solution prepared by dissolving 13.4 gms of hydrated ammonium iron (II) sulphate crystals, $(NH_4)_2SO_4.FeSO_4.xH_2O$ per litre.

PROCEDURE:

Rinse and fill the burette with the solution **C-10** ($KMnO_4$). Pipette out 20 ml or 25 ml of **C-11** (hydrated ammonium iron (II) sulphate) into a clean conical flask. To this, add 20ml of dilute sulphuric acid **C-12**, specially provided for titration.

Titrate the solution with **C-10** ($KMnO_4$) till one drop of this gives a light permanent pink colour to the solution in the conical flask. Ensure that the pink colour does not disappear on shaking the contents of the conical flask.

Repeat the experiment to get at least ***two*** concordant readings.

Tabulate your readings.

State:

(a) The capacity of the pipette used.

(b) The titre value you intend to use in your calculations.

Show the titre value to the Visiting Examiner.

The equations for the above reactions are as follows:

$2KMnO_4 + 3H_2SO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5[O]$

$10(NH_4)_2SO_4.FeSO_4.xH_2O + 5H_2SO_4 + 5[O] \rightarrow 10(NH_4)_2SO_4 + 5Fe_3(SO_4)_3 + 10xH_2O + 5H_2O$

Relative atomic masses:

K = 39 Fe = 56 S = 32 N = 14 H = 1 Mn = 55 O = 16

Calculate the following:

(i) The **molarity*** of potassium manganate (VII) solution **C-10**.

(ii) The **molarity*** of hydrated ammonium iron (II) sulphate solution **C-11**.

(iii) The **molecular mass** of hydrated ammonium iron (II) sulphate deduced from the experimental data.

(iv) The **numerical value** of *x*.

***Note: Molarity must be calculated upto at least 4 decimal places.**

****Question 2** **[5]**

You are provided with two solutions as follows:

(a) **C-13** is a solution of sodium thiosulphate of strength 0.05 M

(b) **C-14** is a solution of hydrochloric acid of strength 0.05 M.

PROCEDURE:

Take the beakers labelled **1** to **5**. Put 0.05 M sodium thiosulphate solution and distilled water according to the following table:

Beaker Number	**1**	**2**	**3**	**4**	**5**
Volume of 0.05 M sodium thiosulphate (ml)	50	40	30	20	10
Volume of distilled water added (ml)	0	10	20	30	40

Now place the beaker labelled **1** on a white paper with a cross mark in black. View the cross-mark through the solution. Now pipette out 10 ml of 0.05 M hydrochloric acid **C-14** into it and immediately start a stop-watch. View the solution from the top and stop the stop-watch as soon as the cross on the paper becomes invisible. Note the time in the stop-watch.

Repeat the experiment by adding 10 ml of 0.05 M hydrochloric acid **C-14,** to the beakers labelled **2, 3, 4** and **5** and note the time taken in each case for the cross mark on the paper to become invisible.

Tabulate your results.

Sodium thiosulphate reacts with hydrochloric acid to produce colloidal sulphur which makes the cross-mark invisible.

The reaction is given by:

$Na_2S_2O_3$ (aq) + 2HCl(aq) $\rightarrow$ 2NaCl(aq) + SO_2(g) + H_2O(aq) + S (colloidal)

From your results:

(i) Plot a graph between the concentration of sodium thiosulphate and the time taken for the cross-mark on the paper to become just invisible.

(ii) Predict the effect of change in concentration of sodium thiosulphate on the rate of the above reaction from the nature of your graph.

****Note:** ***Question 2 will be set from any one OR a combination of any two of the following:***

- ***Rate of Reaction***
- ***Identification of Organic Compounds***
- ***pH determination***
- ***Test for carbohydrates and proteins.***

Question 3 **[7]**

Analyse qualitatively the substance **C-15** which contains *two* anions and *two* cations. Identify these ions.

(a) While testing for **anions** you must mention:

(i) How the solution/soda extract was prepared.

(ii) How the gases were identified.

(iii) The confirmatory test for anions.

Show the results as required to the Visiting Examiner.

(b) While testing for **cations** you must mention:

(i) How the original solution for group analysis was prepared.

(ii) The formal group analysis with pertinent group reagents.

(iii) The confirmatory test for each cation.

Show the results as required to the Visiting Examiner.

Note: *Use of qualitative analysis booklet/table is not allowed.*

Question 4

Show the following to the Visiting Examiner for assessment:

(a) Project **[7]**

(b) Chemistry Practical File. **[3]**