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**.*

Mathematical Tables and graph paper are provided.

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 [ ].

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*Attempt **all** questions.*

Question 1 **[8]**

You are provided with two solutions as follows:

- **C-10** is a solution prepared by dissolving 1·85 gms of potassium manganate (VII) $KMnO_4$ per litre.
- **C-11** is a solution prepared by dissolving 22 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 given solution **C-10** of potassium manganate (VII). Pipette out 20 ml or 25 ml of the solution **C-11** of ammonium iron(II) sulphate solution into a clean conical flask. To this, add 20 ml of **C-12** solution of dilute H_2SO_4 specially provided for titration.

Titrate the solution by running solution **C-10** from the burette till one drop of this solution gives a permanent light pink colour to the solution **C-11** in the conical flask. Ensure that the pink colour obtained does not disappear on shaking the contents of the conical flask.

Repeat the above procedure of the titration 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:

$$2KMnO_4 + 8H_2SO_4 + 10(NH_4)_2SO_4.FeSO_4.xH_2O \rightarrow K_2SO_4 + 2MnSO_4 + 10\,(NH_4)_2SO_4 + 5Fe_2(SO_4)_3 + 8H_2O + 10\,x\,H_2O$$

OR

$$2MnO_4^- + 10\,Fe^{2+} + 16H^+ \rightarrow 2Mn^{2+} + 10Fe^{3+} + 8H_2O$$

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 the 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, i.e. the number of molecule of water of crystallization in $(NH_4)_2SO_4.FeSO_4.x\,H_2O$

Question 2 [5]

This experiment is designed to find out the effect of concentration of the reactants on the rate of a chemical reaction.

You are provided with two solutions:

(a) **C-13** is a solution prepared by dissolving 60 gms of sodium thiosulphate crystals ($Na_2S_2O_3.5H_2O$) per litre.

(b) **C-14** is a solution of 1M hydrochloric acid.

PROCEDURE:

Measure out 50 ml of the solution **C-13** ($Na_2S_2O_3.5H_2O$) in a beaker. Place the beaker over a piece of paper with a cross mark on it. Now add 10 ml of the solution **C-14** (HCl) to this solution and start the stop watch at the same time. Look down vertically on to the cross and note the time when the cross becomes invisible. This is due to the formation of colloidal sulphur in the reaction. The reaction is given as:

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

Repeat the experiment using 40 ml, 30 ml, 20 ml and 10 ml of **C-13** solution made upto 50 ml with distilled water in each case and 10 ml of **C-14** according to the following table:

Expt.no	Volume of the solution **C-13**	Volume of distilled water	Time in seconds
1.	50 ml.	0 ml.	
2.	40 ml.	10 ml.	
3.	30 ml.	20 ml.	
4.	20 ml.	30 ml.	
5.	10 ml.	40 ml.	

Tabulate your results. From your results:

(i) Plot a graph of the concentration of sodium thiosulphate solution (in terms of the volume of sodium thiosulphate taken) against time.

(ii) From the graph find out the time taken for the reaction when 15 ml of the solution **C-13** is used.

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

Show the results as required to the Visiting Examiner.

Question 3

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 each anion.

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 [

(b) Chemistry Practical File. [

Chemistry Paper 2
Graph for Question 2
(To be attached with the answer booklet)

Name_____ Index No. B/_____