

CHEMISTRY

PAPER – 2

(PRACTICAL)

(Maximum Marks: 30)

(Time allowed: 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.

Credit will be given for precise observations recorded and for well-drawn deductions.

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 are provided.

Attempt all questions.

Question 1

[8]

You are provided with two solutions as follows:

- C-10 is a solution containing 1.60gms of potassium manganate (VII), KMnO_4 per litre.
 - C-11 is a solution prepared by dissolving 20.3gms of hydrated ammonium iron (II) sulphate crystals, $(\text{NH}_4)_2\text{SO}_4 \cdot \text{FeSO}_4 \cdot x\text{H}_2\text{O}$ per litre.
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This Paper consists of 4 printed pages and a graph paper.

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Turn over

PROCEDURE:

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

Titrate the solution in the conical flask with **C-10** (KMnO_4) slowly till one drop of this gives a light permanent pink colour to the solution **C-11** in the flask. The pink colour should not disappear on shaking the contents in the conical flask.

Repeat the above procedure to get at least **two** concordant readings.

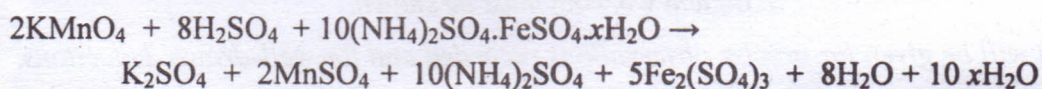
Tabulate your readings.

State:

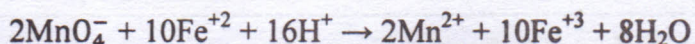
- The capacity of the pipette used.
- The titre value you intend to use in your calculations.

Show the titre value to the Visiting Examiner.

The equations for the above reactions are as follows:



The ionic equation for the reaction is:



Relative atomic masses:

$$\text{K} = 39 \quad \text{Fe} = 56 \quad \text{Mn} = 55 \quad \text{S} = 32 \quad \text{N} = 14 \quad \text{H} = 1 \quad \text{O} = 16$$

Calculate the following:

- The **molarity** of the solution of potassium manganate(VII) **C-10**.
- The **molarity** of hydrated ammonium iron(II) sulphate solution **C-11**.
- The **molecular mass** of hydrated ammonium iron(II) sulphate deduced from the experimental data.
- The numerical value of x , i.e. the number of molecules of water of crystallization in $(\text{NH}_4)_2\text{SO}_4 \cdot \text{FeSO}_4 \cdot x\text{H}_2\text{O}$.

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

Question 2**[5]**

This experiment is designed to find 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 of sodium thiosulphate crystals ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$) of strength 0.2 M.
- (b) C-14 is a solution of HCl of strength 0.1 M.

PROCEDURE:

Take 5 beakers labelled 1 to 5. With the help of a measuring cylinder, put sodium thiosulphate solution $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ (C-13) and distilled water according to the table given below:

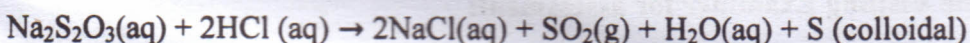
Beaker no.	Volume of the solution C-13	Volume of distilled water	Time in seconds
1	50ml	0ml	
2	40ml	10ml	
3	30ml	20ml	
4	20ml	30ml	
5	10ml	40ml	

Place beaker number 1 over a piece of paper with a cross mark on it.

Now add 10ml of the solution C-14 (HCl) to this solution and start the stop-watch at the same time. Swirl the contents of the beaker and return it over the cross mark.

Look down vertically on to the cross mark and stop the stop-watch as soon as the cross on the paper becomes invisible. Note the time in the stop-watch.

The disappearance of the cross mark is due to the formation of colloidal sulphur in the reaction. The reaction is given as:



Repeat the experiment by adding 10 ml of 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 the readings. From your results:

- (i) Plot a graph of the concentration of sodium thiosulphate solution (in terms of the volume of the sodium thiosulphate taken) against time taken for the cross mark to become 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.

- (iii) From the graph, find the time taken for the reaction when 25 ml of the solution C-13 is used.

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:
- How the solution/soda extract was prepared.
 - How the gases were identified.
 - The confirmatory test for each anion.

Show the results as required to the Visiting Examiner.

- (b) While testing for **cations** you must mention:
- How the original solution for group analysis was prepared.
 - The formal group analysis with pertinent group reagents.
 - 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:

- Project
- Chemistry Practical File.

- (iii) From the graph, find the time taken for the reaction when 25 ml of the solution C-13 is used.

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 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.

[7]

[3]

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

Name _____ UID _____ Index No. _____

