# 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.*)

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*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 exercise dealing with* ***identification of organic compounds****.*

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

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

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***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****.*

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

**Question 1** **[7]**

You are provided with two solutions as follows:

- **C-10** is a solution containing 1·95 gms of potassium manganate (VII), $KMnO_4$ per litre.
- **C- 11** is a solution prepared by dissolving 23·2 gms of hydrated ammonium iron (II) sulphate crystals, $(NH_4)_2SO_4.FeSO_4.xH_2O$ per litre.

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**This Paper consists of 4 printed pages.**

PROCEDURE:

Rinse and fill the burette with the given solution **C-10** ($KMnO_4$). Pipette out 20 ml or 25 ml 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:

(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:

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

The ionic equation for the reaction is:

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

Relative atomic masses:

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

**Calculate the following**:

(i) The **molarity** of the solution of potassium manganate(VII) **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*, i.e. the number of molecules of water of crystallization in $(NH_4)_2SO_4.FeSO_4.xH_2O$.

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

**Question 2** **[4]**

You are provided with two organic compounds, **C-13** and **C-14**.

Perform the experiments given below on each of the two compounds. Record the changes taking place at every step of the experiment.

Note the smell of the substance formed, if significant, the colour of the solution obtained, the colour of the precipitate produced and any other observations you may have. State the identity of each compound on the basis of the experiments and observational changes.

PROCEDURE:

(a) **Substance C - 13**

(i) Take 2 ml of **C-13** in a test tube and add a few crystals of resorcinol. Shake the contents. Slowly add 1 ml of concentrated sulphuric acid along the side of the test tube.

(ii) Take 2 ml of **C-13** in a test tube and add 1ml of freshly prepared pyrogallol solution. Shake the contents. Add 2 ml of concentrated hydrochloric acid and warm the contents in a water bath.

(iii) Take 2 ml of **C-13** in a test tube. To this, add 1 ml of Tollen's reagent. Warm the contents in a water bath.

(b) **Substance C-14**

(i) To 3 ml of 1% borax solution in a clean test tube, add a few drops of phenolphthalein solution. To this solution, add a few drops of **C-14** and shake.

(ii) To 1 ml of **C-14** solution in a clean test tube, add 4 - 5 drops of phenol followed by 2 - 3 drops of concentrated sulphuric acid. Heat the mixture. Cool and dilute with water and add aqueous ammonium hydroxide.

(iii) To 1 ml of **C-14** solution, add 1 ml of copper sulphate solution and then 1 ml of sodium hydroxide solution.

**Question 3** **[4]**

Analyse qualitatively the substance **C-15** which contains one anion and one cation. Identify these ions.

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

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

(ii) How the gases were identified.

(iii) The confirmatory test for anion.

***Show the results as required, to the Visiting Examiner.***

(b) While testing for **cation** 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 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 **[10]**

(b) Chemistry Practical File. **[5]**