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 exercise dealing with the* ***identification of organic compound*** *and* ***distinction between carbohydrates and proteins****.*
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 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:

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

$10(NH_4)_2SO_4.FeSO_4.xH_2O + 5H_2SO_4 + 5[O] \rightarrow 10(NH_4)_2SO_4 + 5Fe_3(SO_4)_{3+} \ 10\ xH_2O + 5H_2O$

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]**

Substance **C-13** is an organic compound. Carry out the following experiments and note all the changes taking place at each step.

Note the colour of the substance obtained, smell of the substance formed and changes on heating and cooling. State the identity of the compound on the basis of the experiments and observational changes.

(a) Substance **C-13:**

PROCEDURE:

1. Take 3 – 4 drops of **C-13** in a test tube, add about 0.5 grams of potassium hydrogen sulphate and heat strongly.
2. Take 0.2 grams of borax in a test tube and add 5 ml of water to it, and shake well to get a clear solution. To this, add 2 drops of phenolphthalein solution. Now add 2- 3 drops of **C-13** to this, shake well, warm and cool.
3. Take about 4 – 5 drops of **C-13** in a test tube. Add about 1 ml of copper sulphate solution followed by a few drops of Sodium Hydroxide solution.

(b) Substances **C-14** and **C-15** are unknown samples of carbohydrate and protein. Carry out the following experiments and record all your observations. State the identity of the compounds on the basis of the experiments and observational changes:

PROCEDURE:

Take a pinch of each of the samples in different test tubes labelled as **C-14** and **C-15**. Dissolve each in 10ml distilled water. Divide each solution into three parts.

(i) To the first part of **C-14** and **C-15** add 1ml of Tollen's reagent and place the test tubes in a beaker of boiling water for two minutes.

(ii) To the second part of **C-14** and **C-15** add two drops of alcoholic α-naphthol solution followed by 1ml concentrated H_2SO_4 carefully down the side of the test tube.

(iii) To the third part of **C-14** and **C-15** add two drops of concentrated HNO_3 and observe the change.

****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-16** 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]**