CHEMISTRY

Paper – 2

(PRACTICAL)

Three hours and a quarter

(The first 15 minutes of the examination are for reading the paper only. Candidates 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 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.

Read the questions carefully and follow the given instructions.

*Attempt **all** questions.*

All workings, including rough work, should be done on the same sheet as, and adjacent to, the rest of the answer in the answer booklet.

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

Question 1. **[7]**

You are provided with two solutions as follows:

(a) **C-10** is a solution containing 1.6 gms of potassium manganate (VII) $KMnO_4$ per liter of the solution.

(b) **C-11** is a solution containing 20.8 gms of hydrated ammonium iron (II) sulphate crystals $[(NH_4)_2SO_4.FeSO_4.\ xH_2O]$ per litre of the solution.

PROCEDURE

Rinse and fill the burette with the given solution **C-10**. Pipette out 20 cc or 25 cc of the solution **C-11** into a clean conical flask. Add about 20 cm^3 of sulphuric acid **C-12** to the conical flask specially provided for titration. Run the solution C-10 slowly till one drop of this solution gives a light pink colour to the solution in the flask. The pink colour should not disappear on shaking. This indicates the end point.

Repeat the titration to get at least two concordant readings.

Tabulate your readings.

State the:

(i) capacity of the pipette you used.

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

The equations for the reactions are as follows:

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

$10(NH_4)_2SO_4.FeSO_4.xH_2O + 5H_2SO_4 + 5[O] \rightarrow 10(NH_4)_2SO_4 + 5Fe_2(SO_4)_3 + 10xH_2O + 5H_2O$

The ionic equation for the reaction is as follows:

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

Relative atomic masses:

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

Calculate the following:

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

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

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

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

Question 2.

Substances **C-13** and **C-14** are organic compounds. Carry out the following experiments and note down all the changes taking place at each step of the experiment.

Note the smell of the substances formed, colour of the solution obtained and precipitate formed. Identify the compound on the basis of your observations and deduction.

(a) Substance **C-13**

(i) Take 1 cm^3 of Schiff's reagent and to it add 2-3 drops of C-13 solution.

(ii) Take about 2 cm^3 of Tollen's reagent in a test-tube. To it add 1 cm^3 of C-13. Warm the contents in a hot water bath for 5 minutes.

(iii) Take about 2 cm^3 of aqueous solution of C-13. To it add 1 cm^3 of Benedict's solution. Warm the contents in a hot water bath for 5 minutes.

(b) Substance **C-14**

(i) Take a drop of C-14 on a moist red litmus paper or a few drops of C-14 in a clean test-tube and add red litmus solution.

(ii) Mix 2-3 drops of C-14 with 1 cc of dilute H_2SO_4 in a test-tube. To this add few drops of potassium dichromate solution. Shake the contents well and heat the test-tube gently.

(iii) Take 1 cc of conc. HCl in a test-tube and add 2-3 drops of C-14 and shake well. To this add a few drops of $FeCl_3$ solution along with shaking and diluting with water.

(iv) Mix 1-2 drops of C-14 with 5 cc of water in a clean test-tube. Shake the mixture and add 2-3 drops of sodium hypochlorite solution.

Question 3.

Analyse qualitatively the substance **C-15** which contains two anions and two cations. Identify these ions. **[8]**

(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.

(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.

Note:

1. Use of qualitative analysis booklets/tables are not allowed.
2. Dry tests are not accepted as confirmatory tests.