

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.

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

Question 1.

[8]

You are provided with two solutions as follows:

- (a) **C-10** is a solution of sodium thiosulphate ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$) containing 25 gms per liter of the solution.
- (b) **C-11** is a solution prepared by dissolving 7 gms of an impure sample of potassium dichromate ($\text{K}_2\text{Cr}_2\text{O}_7$) per liter of the solution.

PROCEDURE

Rinse and fill the burette with the given solution **C-10**. Pipette out 20 cm^3 (25 cm^3) of solution **C-11** into a clean conical flask. To this add about 20 cm^3 of

C-12 (dilute sulphuric acid) and about 20 cm³ of **C-13** (potassium iodide, 10%) solution in the titration flask. Now add about 20 cm³ of distilled water followed by a pinch of **C-14** (sodium hydrogen carbonate).

Shake the contents of the flask and cover it with a piece of paper. Allow the solution to stand for about 5 minutes till the solution becomes dark reddish brown.

Titrate the solution **C-10** from the burette till the solution turns yellowish green. Add about 2 to 3 cm³ of freshly prepared **C-15** (starch solution). The colour of the solution changes too dark blue. Continue adding **C-10** drop wise till the addition of one drop of **C-10** changes the colour from dark blue to light green.

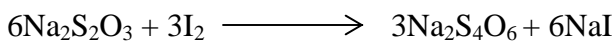
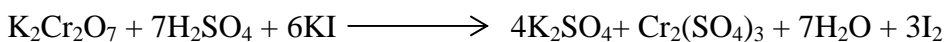
Repeat the above procedure of the titration to get at least three concordant readings.

Tabulate your readings.

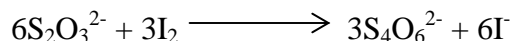
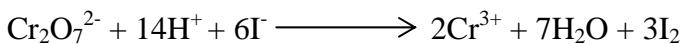
State the:

- (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:



The ionic equation for the reaction is as follows:



Relative atomic masses:

K = 39 Cr = 52 Na = 23 S = 32 O = 16 H = 1

Calculate the following:

- (i) The **molarity** of sodium thiosulphate ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$) solution C-10.
 - (ii) The **molarity** of potassium dichromate ($\text{K}_2\text{Cr}_2\text{O}_7$) solution C-11.
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- (iii) The **strength** of potassium dichromate solution in gm per liter.
- (iv) The **percentage purity** of the sample of potassium dichromate.

Question 2.

[5]

Substances **C-16** and **C-17** 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-16**

- (i) Take 1 cm^3 of the solution C-16 in a test tube and add about 1 cm^3 of the saturated solution of sodium bisulphite and shake the mixture.
 - (ii) To about 1 cm^3 of solution of C-16 in a test tube, add about 1 cm^3 of freshly prepared solution of sodium nitroprusside. Now add a solution of ammonium hydroxide and shake the mixture. Warm the contents of the test tube in a water bath and then cool the contents.
 - (iii) Take about 1 cm^3 of solution C-16 in test tube and add a few crystals of iodine (or solution of iodine in KI). To this add sodium hydroxide solution carefully till no further changes take place. Warm the mixture and allow to cool.
 - (iv) Take about 1 cm^3 of C-16 and to this add 1 cm^3 of mercuric chloride solution. Add sodium hydroxide solution drop by drop carefully till no further changes take place.
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- (b) Substance **C-17** (aqueous solution)
- (i) To 1 cm³ of C-17, add 3 – 4 drops of neutral ferric chloride solution.
 - (ii) To 1 cm³ of C-17 add about 5 cm³ of bromine water.
 - (iii) To 1 cm³ of C-17 add about 0.5 gm (small quantity) of phthalic anhydride and 3 to 4 drops of concentrated H₂SO₄ and heat till reddish brown in colour. Cool it and add a few cm³ of water. Add concentrated NaOH to it gradually while shaking until the solution becomes alkaline. To this add concentrated H₂SO₄ till the solution becomes acidic.

Question 3.

Analyse qualitatively the substance **C-18** which contains two anions and two cations. Identify these ions.

[7]

- (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 reagent 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.
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