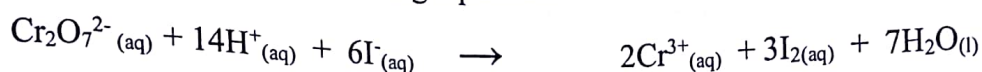
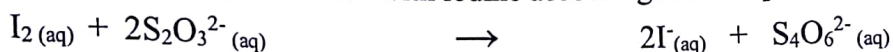


1. You are provided with the following:
FA₁, which is sodium thiosulphate solution.
FA₂, which is a solution containing 3.2 g l⁻¹ manganate of **Y** (YMnO₄).
Solid, **P** which is potassium dichromate (VI).
You are required to standardize **FA₁** and then use it to determine the percentage of manganese in the manganate of **Y**.

Under acidic condition, iodide ions react with manganate (VII) ions and dichromate (VI) ions according to the following equations:



Thiosulphate (VI) ions react with iodine according to the equation:



PROCEDURE:

- (a) Weigh out accurately 1.0 g of **P** and dissolve it in about 50 cm³ of 2 M sulphuric acid in a beaker. Transfer the solution into a 250 cm³ volumetric flask and make it up to the mark with distilled water. Label this solution **FA₃**.

Results:

Mass of weighing container + **P** = g
Mass of weighing container = g
Mass of **P** = g

- (b) Pipette 25.0 (or 20.0) cm³ of **FA₃** into a conical flask. Add 10 cm³ of potassium iodide solution followed by 10 cm³ of 2 M sulphuric acid. Titrate the mixture with **FA₁** until the solution is pale yellow. Add 5 drops of starch indicator and continue the titration until the dark blue solution turns green.
Repeat the titration to obtain consistent titre values.

Record your results in Table 1 below

Volume of pipette usedcm³

Table 1

Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of FA₁ used (cm ³)			

Average volume of FA₁ used.

Question

Calculate the molarity of FA₁ ($K = 39$, $Cr = 52$, $O = 16$)

- (c) Pipette 25.0 (or 20.0 cm³) of FA₂ into a conical flask. Add 10 cm³ of potassium iodide solution followed by 10 cm³ of 2 M sulphuric acid. Titrate the mixture with FA₁ until the solution is pale yellow. Add 5 drops of starch indicator and continue the titration until the end point. Repeat the titration to obtain consistent titre values. Record your results in **Table II** below.

Volume of pipette used cm³

Table II

Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of FA ₁ used (cm ³)			

Average volume of FA_1 used.

Question:

(a) Calculate the molarity of FA_2

(b) Calculate percentage of manganese in KMnO_4 ($Mn = 55$)

2. You are provided with substance X which contains two cations and two anions. You are required to carry out the following tests on X and identify the anions and cations in X. Record your observations in the table below.

TESTS	OBSERVATIONS	DEDUCTIONS
(a) Heat a spatula endful of X in a dry test tube.		
(b) Place 2 spatula endfuls of X in a test tube, add 3 drops of concentrated sulphuric acid and heat.		
(b) Shake two spatula endful of X with about 5 cm ³ of water and filter. Keep both the filtrate and the residue. Divide the filtrate into six parts.		
(i) To the first part of the filtrate add dilute sodium hydroxide solution drop-wise until in excess.		
(ii) To the second part of the filtrate add dilute ammonia solution drop-wise until in excess.		

<p>(iii) To the third part of the filtrate carry out a test of your choice to confirm the cation.</p> <p>Test</p>		
<p>(iv) To the fourth part of the filtrate add zinc granules and warm.</p>		
<p>(v) To the fifth part of the filtrate add 2-3 drops of lead (II) nitrate solution.</p>		
<p>(vi) Use the sixth part of the filtrate to carry out a test of your own choice to confirm one of the anions in X.</p> <p>Test</p>		
<p>(c) Wash the residue with water, add dilute hydrochloric acid drop wise to just dissolve the residue. Divide the solution into five parts.</p>		
<p>(i) To the first part of the solution add dilute sodiumhydroxide solution drop wise until in excess.</p>		

(ii) To the second part of the solution add dilute ammonia solution drop wise until in excess.		
(iv) Use the fourth part of the filtrate to carry out a test of your own choice to confirm one of the cations in X. Test		

The cations in X are.....and

The anions in X areand

3. You are provided with an organic compound T. You are required to identify the nature of compound T. Carry out the following tests on the compound and record your observations and deductions in the table below.

TEST	OBSERVATIONS	DEDUCTIONS
(a) Burn a little of T on spatula end.		
(b) Add sodium hydroxide solution to a little of T in a test tube and shake well.		
(c) To a little of T in a test tube add about 5cm ³ of water and shake well. Test the mixture with litmus paper. Divide the mixture into five parts.		

(i) To the first part, add sodium carbonate solution.		
(ii) To the second part, add neutral iron (III) chloride solutions.		
(iii) To the third part add Brady's reagent		
(iv) To the fourth part, add sodium hydroxide solution then three drops of concentrated sulphuric acid followed by ethanoic acid and warm. Pour the mixture in cold water.		
(v) To the fifth part add an equal volume of ethanol and then three drops of concentrated sulphuric acid and warm. Pour the mixture in cold water.		
(vi) To the sixth part add acidified potassium manganate (VII) solution and heat. Then, add Brady's reagent		
(vii) To the seventh part add Luca's reagent		

Comment on the nature of T.

.....

.....

END