IARE

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INSTITUTE OF
AERONAUTICAL ENGINEERING
(An Autonomous Institute affiliated to JNTUH, Hyderabad)
Dundigal, Hyderabad - 500 043

LABORATORY WORK SHEET

Name of the Student : Mohammad Mateen

Class : CSE - C Semester : 01

Course Code : A11SD03 Course Name : Chemistry lab

Roll Number									
2	3	9	5	1	A	0	5	5	B

Name of the Course Faculty : Dr VNSR Venkateshwara Rao Faculty ID : IARE 10682

Exercise Number : 06 Week Number : 06 Date : 14/12/23

DAY TO DAY EVALUATION:

Marks	Aim / Preparation	Algorithm / Procedure / Performance in the Lab	Source Code / Calculations and Graphs	Program Execution / Results and Error Analysis	Viva - Voce	Total
Max. Marks	4	4	4	4	4	20
Obtained	4	4	4	4	4	20

Signature of Faculty

START WRITING FROM HERE :

Estimation of Fe^{+2} by potentiometry Using $K_2Cr_2O_7$.

Aim: To estimate the amount of ferrous iron present in the whole of the given solution by potentiometry.

Principle: * This is an example of redox titration and is based on the oxidation - reduction reaction between the titrand and the titrant. Here the end pint is decteced using a potentiometer.

* Potassium dichromate is an oxidising agent and in acid medium : it follows the half reaction to give Cr(III) as the reduction product.

The total reaction is

$$Cr_2O_7^{-2} + 14H^+ + 6e \rightleftharpoons 2Cr^{3+} + 7H_2O$$

while Fe^{2+} which is used to titrate $K_2Cr_2O_7$ gets oxidised to Fe^{3+} as per the reaction. $Fe^{2+} \rightleftharpoons Fe^{3+} + e$

The Overall ionic equation of this titration can be obtained by adding the above two :

$$Cr_2O_7^{-2} + 6Fe^{2+} + 14H^+ \rightleftharpoons 6Fe^{3+} + 2Cr^{3+} + 7H_2O$$

($Cr_2O_7^{-2}$: (+6))

Preparation of Solutions :

1) Preparation of standard $K_2Cr_2O_7$ and ammonium iron(II) Sulphate

Using 100cm³ volumetric flasks prepare of 0.02M potassium dichromate solution and 0.10M ammonium iron(II) sulphate solution. You may have to add sufficient amount of dilute acid to prepare ammonium iron (II) sulphate solution.

2) Preparation of 2N H_2SO_4 solution :

56ml of conc. H_2SO_4 is added Drop by Drop to 1000ml of water in a beaker by keeping it in a trough of water, this reaction is highly exotheric.

Note : H_2SO_4 must not be added to Water.

Procedure :

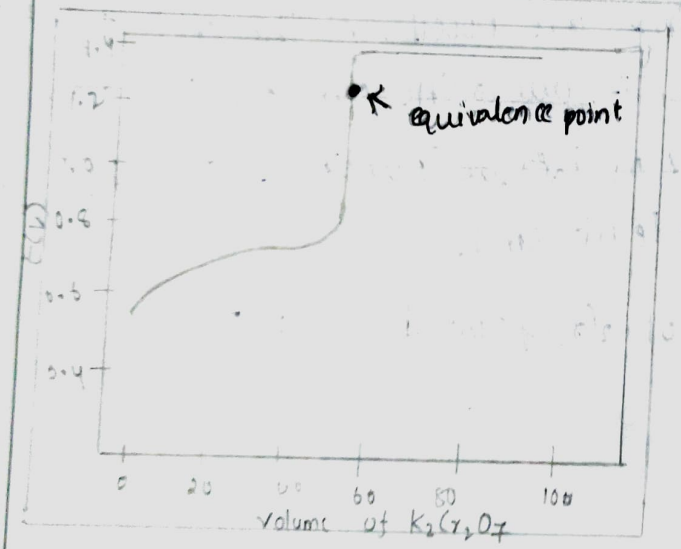
potentiometric Titration : * The given Fe^{+2} Solutions is made up to the mark of the given 100ml standard flask and shake the flask well for uniform Concentration.

ROLL NUMBER :

* pipette out 20ml of the Fe^{+2} solution into a clean 250ml beaker and add equal volume (20ml) of dil H_2SO_4 along with 100ml of distilled water to enable the electrodes to immerse well in the solution.
* A platinum electrode (indicater electrode) and a standard calomel electrode (refrence electrode) from the potentiometer are dipped in to the beaker. The solution in the beaker is stirred using a magnetic stirrer. The intial EMF is noted 0.5ml of $K_2Cr_2O_7$ solution is added from the burette at regular intervals of time, while stirring the solution and the EMF is measured. The volume of $K_2Cr_2O_7$ added and the corresponding EMF readings are noted. At the end point there is a sharp increase in EMF due to the complete oxidation of the Fe^{+2} to Fe^{+3}. The addition of $K_2Cr_2O_7$ is continued till the equivalent point is crossed by at least 5ml.

S.NO.	Volume of $K_2Cr_2O_7$ added	EMF
1	0	0.301
2	1	0.360
3	2	0.377
4	3	0.392
5	4	0.403
6	5	0.413
7	6	0.423
8	7	0.433
9	8	0.446
10	9	0.463
11	10	0.496

12	11	0.641 → M
13	12	0.697
14	13	0.698
15	14	0.711
16	15	0.721
17	16	0.729
18	17	0.787
19	18	0.740
20	19	0.743
21	20	0.745



Modal graph

calculations:

$V_1N_1 = V_2N_2$

V_1 = Volume of $K_2Cr_2O_7$ = 10.5ml

N_1 = Normality of $K_2Cr_2O_7$ = 0.1N

V_2 = Volume of Fe^{+2} = 10ml

N_2 = Normality of Fe^{+2} = ?

$N_2 = y \times (20 \times \text{Normality of } K_2Cr_2O_7)/20$

$N_1V_1 = N_2V_2$

$0.1 \times 10.5 = N_2 \times 10$

$N_2 = \frac{10.5 \times 0.1}{10} = \frac{1.05}{10} = 0.105N$

Result: Amount of Fe^{+2} present in the given solution $= \frac{N_2 \times \text{equivalent wt}}{10}$

$= N_2 \times 55.85 \text{ gms}/100\text{ml}$

⑥ Estimation of Fe^{+2} By Potentiometry Using $K_2Cr_2O_7$