2021
B.A./B.Sc. Semester III Honours Examination
University of Calcutta
CHEMISTRY
Paper CC5
(PRACTICAL)
F.M. 30

FAKIR CHAND COLLEGE CENTRE (551)

[Use A4 pages and black ink only for writing answers. Write Roll number and Registration number at the top and page number at the bottom of each page. Images of answer script and admit card must be in a single pdf file.]

Determine the concentration of the supplied Mohr salt solution when titrated against a standard solution of potassium dichromate by using a potentiometer.
Find the E^0 (reduction potential) of the Fe^{3+}/Fe^{2+} system using the supplied data.

1a) Write down the theory using the following points:

(i) Representation of the electrochemical cell, overall cell reaction, EMF of cell by Nernst equation; composition of salt bridge and its role.

(ii) Determination of E^0 at equivalence and concentration of Mohr salt solution by drawing a model potentiometric titration curve. (2+2+2+2+2) + (2+2) = 14

2. (i) Calculate and show the amount of solid $K_2Cr_2O_7$ required to prepare 100 ml of standard **1.074 (N/2) $K_2Cr_2O_7$** solution by accurate weighing using a digital balance.

The measured EMF data of the experimental cell consisting of 10 ml supplied Mohr salt solution when titrated with the above **1.074 (N/2) $K_2Cr_2O_7$** solution at **27^0C** are as follows:

Total no. of drops of $K_2Cr_2O_7$ soln.	2	4	6	8	10	12	13	14	15	16	17	18	19	20	21
EMF (V)	0.358	0.371	0.390	0.408	0.427	0.445	0.455	0.466	0.479	0.491	0.507	0.532	0.673	0.688	0.697

(ii) Show the titration data in proper tabulated form with necessary units.

(iii) Calculate $\left|\frac{\Delta E}{\Delta n}\right|$ versus mean number of drops of for each pair of reading in a tabular form.

(iv) Find out the concentration of the supplied Mohr salt solution from this data.

(v) Assuming the region near the half equivalence point of the titration curve follows a simple straight-line equation with **slope = 0.0101** and **intercept = 0.3273**, calculate the E^0 value of Fe^{3+}/Fe^{2+} system.

Given: At room temperature (t^0C) **E_{SCE}= 0.2415 – 7.6 × 10^{-4} (t – 25) volts**
Volume of 1 drop of $K_2Cr_2O_7$ solution = **0.052 ml**

(2+3+5+2+4) = 16