Your Roll No .

5207 **J**

B.Sc. Prog /II

AC–202–Quantitative Methods of Analysis

(Admissions of 2005 and onwards)

Time · 3 Hours   *Maximum Marks* 75

(Write your Roll No on the top immediately
on receipt of this question paper)

*Attempt* **six** *questions in all*

Question No 1 *is compulsory*

1   Explain the following in brief

(a)   Hydrogen and hydroxyl ions have abnormally high conductivities

(b)   Illustrate giving suitable examples, the distinction between a reversible and an irreversible cell

(c)   What are the primary standards in volumetric titrations and how are they different from secondary standards?

(d)   What is the effect of complexation on the solubility of the precipitate?

(e)   Complete and balance the following ionic equations

(i) $Cr_2O_7^{2-} + Fe^{2+} + H^+ \rightarrow$

(ii) $AsO_4^{3-} + I^- + H^+ \rightarrow$ 3 × 5

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2 (a) The indicator Phenolphthalein is a weak acid, it is colourless in acidic solution and pink in alkaline solution Explain the change in colour with pH in the light of ionic theory of indicators   6

   (b) Calculate the pH of the solutions resulting by adding (i) 24 ml and also (ii) 25 1 ml of 0 2M NaOH respectively to 25 0 ml of 0 2M solution of acetic acid $(Ka = 1 \times 10^{-5})$ 6

3 (a) What is the principle of iodometric titrations? Describe the conditions which must be observed in iodometric determinations?   6

   (b) Give the chemical equation involved in the determination of available chlorine in bleaching powders   2

   (c) Calculate the weight per litre of chlorine if titration of the iodine liberated by 25 0 ml of it from KI by 20 0 ml of 0 10 N thiosulphate solution   4

4 (a) Explain the role of solubility product in the titration of mixture of halides (CI, Br & I) with aq Ag NO_3 Soln   4

   (b) Describe the thiocyanate method for the determination of silver What is the indicator used ?   3

   (c) Find the percentage of silver in an alloy, if the solution formed by dissolving 0 5000g of the alloy

in HNO_3 was neutralized by 25 0 ml of 0 1 M NH_4SCN solution 5

5 (a) Calculate the cell potential and the cell reaction for the following cell

Cu/Cu^{2+} (0.02M) || Fe^{2+} (0.2M), Fe^{3+}(0.01M)/Pt
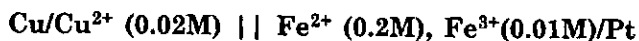
Given that E^0 (Fe^{3+}, Fe^{2+}) = + 0 771V and E^0 (Cu^{2+}/ Cu) = + 0 337V 4

(b) Draw and explain the potentiometric titration curve of ferrous ions *vs* ceric ions 4

(c) What is a reference electrode? Explain giving atleast one example and derive its Nernst equation 4

6 (a) What is a cell constant? How is it measured? 4

(b) For Hg at 0°C, k = 1 0630 × 10^6 S/m If the resistance of cell containing mercury is 0 2432 Ω

(i) What is the cell constant

(ii) The same cell filled with a solution of KCl at 0°C, the resistance of the cell is 3 966 × 10^4 Ω What is the conductivity of the KCl solution? 4

(c) What are the sources of error in performing precipitation titrations conductometrically? Draw and explain the conductometric titration curve for the titration of $AgNO_3$ against KCl 4

7 (a) Explain the conditions for the precipitation of Ba^{2+} ions Why is this precipitation performed in the presence of HCl? 4

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(b) Why are Ba^{2+} ion precipitated using dilute sulfuric acid and not using sodium sulphate?   4

(c) What is the weight of H_2SO_4 (98 078 g mol^{-1}) in 1 litre of sulfuric acid solution if 0 2126 g of $BaSO_4$ (233 43 g mol^{-1}) is formed from 50 0 ml of the solution by reaction with barium chloride solution?

4

8   Write short notes on any **three** :

(a) Precipitation from homogeneous solution

(b) Indicator electrodes

(c) Advantages of conductometric titrations

(d) Ignition   4 × 3