This question paper contains 4 printed pages.

3858 *Your Roll No.* .....

B.Sc. Prog. / II **IS**

AC–202— QUANTITATIVE METHODS OF ANALYSIS

(N.C.— 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:

   (*i*) Draw and discuss the conductometric titration curve for strong acid *vs.* strong base.

   (*ii*) What is quinhydrone electrode? Write the Nernst equation for it.

   (*iii*) Discuss the methods to locate end point in potentiometric titrations.

   (*iv*) What is the effect of pH on the solubility of the precipitate?

   (*v*) What are the primary and secondary standard solutions? Give at least *one* example. 3×5

P. T. O.

2. (*a*) Write the structural formula of both the tautomeric forms of phenolphthalein. Explain the mechanism of their colour change on the basis of Modern Theory of Acid-Base Indicators. 6

(*b*) Name the suitable indicators for the following titrations:

(*i*) Strong acid – Strong base

(*ii*) Strong acid – Weak base

(*iii*) Weak acid – Strong base

(*iv*) Weak acid – Weak base. 4

(*c*) Calculate the pH at the equivalence point when 20 ml of 0·1 M acetic acid ($K_a = 1{\cdot}8 \times 10^{-5}$) is titrated with 0·1 M sodium hydroxide solution. 2

3. (*a*) Calculate the equivalent weight of $KMnO_4$ in neutral medium. The molar mass is given as 158 g mol^{-1}. 2

(*b*) Give reactions involved in the titration of Mohr's salt *versus* potassium permanganate. 4

(*c*) What is the % purity of sodium oxalate, if 0·5 g of a sample requires 40·0 ml of $KMnO_4$ solution? Given that 1·0 ml of $KMnO_4$ is equivalent to 0·0112 g of iron. Molar masses of $Na_2C_2O_4$ and Fe are 134 and 55·85 g mol^{-1} respectively. 6

4. (*a*) State and describe the conditions for the determination of silver by Mohr's method. 6

(*b*) What is the indicator used in the above method? 2

(*c*) A sample weighing 0·34 g containing a mixture of chlorides of sodium and potassium needed 48·2 ml of 0·10 M $AgNO_3$ in Mohr's titration. Calculate the % of NaCl (58·4 g mol^{-1}) and KCl (74·5 g mol^{-1}) in the mixture. 4

5. (*a*) Construct the appropriate cell for the potentiometric titration of Mohr's salt *vs.* $K_2Cr_2O_7$.

(*b*) Write the cell reaction and the Nernst equation for the above cell. Discuss the graph between EMF of the cell and volume of the base.

(*c*) Discuss the various methods of location of end point in potentiometric titrations. 4×3

6. (*a*) The molar conductivities of H^+ and OH^- are abnormally high. Explain.

(*b*) Describe the titration curve for the titration of mixture of weak and strong acid against strong base.

(*c*) Discuss the factors which cause errors while studying precipitation titrations conductometrically. 4×3

7. (*a*) What is meant by the precipitated form and the weighed form of precipitate in gravimetric analysis? Discuss with example. 3

(*b*) Outline the method for the gravimetric estimation of Nickel in the solution of nickel ammonium sulfate. 6

(*c*) Explain why large excess of dimethylglyoxime is avoided in the above estimation. 3

8. Write short notes on any *three*:

(*i*) Electro-gravimetry

(*ii*) Kohlrausch Law of independent migration of ions

(*iii*) Co-precipitation and Post-precipitation

(*iv*) External and Internal Indicators. 4×3

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