

(93) SARDAR PATEL UNIVERSITY**M.Sc. (Analytical Chemistry) Examination (CBCS) IIIrd Semester****April-2016****Saturday, Date: 09.04.2016****Time: 2.30 p.m. to 5.30 p.m., Paper : PS03CANC03****Subject: Basic and thermal methods of analysis, Total marks: 70***N.B.: i) Figures to the right indicate marks.**ii) Assume the suitable data if necessary and indicate clearly.*

- Q.1.** Attempt by choosing the correct answer [08]
- i) A DTA peak of sample will be exothermic if the phenomena is

a) Melting	b) Adsorption
c) Vaporization	d) Sublimation
 - ii) The colloidal suspension is known to show

a) Scattering of light	b) Tandyll effect
c) Both a) and b)	d) None
 - iii) Example(s) of protic solvent include(s)

a) Benzene	b) Chloroform
c) Dichloromethane	d) Pure acetic acid
 - iv) Example(s) of the hard acid is/are

a) Fe^{1+}	b) Cu^{1+}
c) H^{1+}	d) Al^{2+}
 - v) An electrochemical cell consuming electric energy is called

a) Galvanic cell	b) Electrolytic cell
c) Both a) and b)	d) None
 - vi) Which of the following is/are the redox-indicator(s)

a) Ferroin	b) Starch
c) Diphenylamine	d) All
 - vii) Which of the following is/are metallochromic indicator(s)

a) EBT	b) Calmagite
c) PAN	d) All
 - viii) Which among the following is a complex?

a) $Ag(CN)_2^{1-}$	b) $Ni(CN)_4^{2-}$
c) $HgCl_4^{2-}$	d) All
- Q.2.** a) Attempt any **Seven** [14]
- i) State thermal methods of analysis in brief.
 - ii) Distinguish between 'emulsoids' and 'suspensoids', giving suitable examples.
 - iii) What do you mean by titrimetry? List the requirements of the reaction to be used in the titrimetry.
 - iv) Define 'iso-electric point'. Calculate the iso-electric point of glycine, which has dissociation constant values K_a and K_b to be 2×10^{-10} and 2×10^{-12} respectively in water [$K_w = 10^{-14}$].
 - v) Describe in brief the general principle of precipitation titration giving suitable examples.
 - vi) What is Nernst equation? State its significance in redox titrations.
 - vii) EDTA titrations are best performed at pH 10! Explain
 - viii) State the terms 'masking' and 'de-masking', with suitable examples, in complexometric titrations.
 - ix) Discuss the schematic diagram of the TG instrument.

- Q.3. a) Define 'relative super saturation'. State its relation with nucleation and particle growth rates, graphically. List the remedies to control the value of Q-S/S during precipitation. [06]
- b) What is gravimetric factor? Precipitates of AgCl (FW 143) and PbCrO₄ (FW 323) weighed 0.204 g and 0.304 g respectively. To what weights of Cl and Pb would these correspond, if 35.5 and 207 are their atomic weights respectively? [06]

OR

- b) Illustrate the term 'co-precipitation'. Occluded impurities are difficult to remove simply by washing the precipitates! Explain.
- Q.4 a) What do you mean by buffer solution? Suggest a pair of any two substances which can be used in the preparation of this solution. Derive an equation of pH for this solution. [06]
- b) State the term 'indicator error'. It was used to determine pH with methyl orange indicator. Ratio of concentration of acid form to that of base form of this indicator was found 1.64. Calculate the pH of solution [pK_a = 3.46], [06]

OR

- b) Derive an equation of pH for the solution of monosodium salt of a dibasic acid, NaHA, in water.
- Q.5. a) Distinguish between 'iodometry' and 'iodimetry' giving suitable examples. Iodimetry is generally performed in neutral to mildly alkaline condition! Explain. [06]
- b) State the 'adsorption indicator'. Write a note on FAJAN method. [06]

OR

- b) Reactions written below are proceeding to the right
 $2\text{H}^+ + \text{Cd} \leftrightarrow \text{H}_2(\text{g}) + \text{Cd}^{2+}$
 $2\text{Ag}^+ + \text{H}_2 \leftrightarrow 2\text{Ag}(\text{s}) + 2\text{H}^+$
 $\text{Cd}^{2+} + \text{Zn}(\text{s}) \leftrightarrow \text{Cd}(\text{s}) + \text{Zn}^{2+}$
 Deduce the reducing strength of Cd, Ag, H₂, and Zn.
- Q.6 a) Define stability and apparent stability constants. Stability constant of Ca-EDTA complex is 5.0×10^{10} . Value of EDTA fraction, α_4 , is 0.35 at pH 10. Calculate the apparent stability constant. [06]
- b) Discuss direct-, back- and displacement-titrations, which are employed in complexometry. [06]

OR

- b) A solution containing Mg²⁺, Zn²⁺ and Pb²⁺ was treated first with NaCN; to mask one of the metal ions, and then titrated with EDTA. It required 42.22 mL of 0.02064 M EDTA solution to titrate metal ions present. EDTA Y⁴⁻ ions were then released after addition of the reagent, BAL, (2,3-dimercapto-propnaol) to this titrating mixture, which consumed 19.35 mL of 0.007657M Mg²⁺ solution in another titration. Finally, formaldehyde was added to this, and ions of a metal thus released were titrated against same EDTA. It showed 28.63 mL the end-point reading. Calculate % age of each of these metals, if sample weighed 0.4085 g. [Mg = 24, Zn = 65, Pb = 207].

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