

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – CHEMISTRY

FIRST SEMESTER – NOVEMBER 2007

CH 1809 - ANALYTICAL CHEMISTRY

AD 17

Date : 02/11/2007

Dept. No.

Max. : 100 Marks

Time : 1:00 - 4:00

PART – A

Answer ALL the questions:

(10 x 2 = 20)

1. An analyst reports the percentage of carbonate in 80% pure CaCO_3 as 50%. Calculate the absolute error and relative error in ppt.
2. Mention the two important conditions to apply the method of least squares for drawing the calibration graph.
3. Explain back titration in complexometry with an example.
4. Mention the equivalence point potential for B^{+2} vs. A^{+3} ; given
$$\text{A}^{3+} + e^- \rightleftharpoons \text{A}^{2+} \quad E^\circ = + 1.42 \text{ V}$$
$$\text{B}^{4+} + 2e^- \rightleftharpoons \text{B}^{2+} \quad E^\circ = + 0.40 \text{ V}$$
5. Mention the advantages of HPLC over GLC.
6. What is a hollow cathode lamp?
7. State the principle in the spectrophotometric analysis of iron(III).
8. Mention any two applications of DTA.
9. Mention any two advantages of DME.
10. Sketch a cyclic Voltammogram for a reversible system. Explain the parameters.

PART – B

Answer any EIGHT questions:

(8 x 5 = 40)

11. K_a for HA is 10^{-9} . Check whether HA can be estimated by titration against OH^- . Explain.
12. pH at the equivalence point for HCl vs OH^- is 7, while it is around 8 for CH_3COOH vs OH^- . Explain.
13. K_{a_1} , K_{a_2} , K_{a_3} , and K_{a_4} for EDTA are 10^{-2} , 10^{-3} , 10^{-8} and 10^{-12} respectively. Determine the concentration of completely ionized form of EDTA in 10^{-2} M aq. EDTA at pH = 12.
14. 0.2535g sample of sodium oxalate consumed 40.20mL of 0.0730N KMnO_4 . Determine the percentage of sod. oxalate in the sample and express it scientifically.
15. Discuss the principle involved in GLC. Name two liquids, which can be used, as immobile phase.
16. Show that the equivalence point potential for the titration of Fe^{+2} vs. KMnO_4 is pH dependent.
17. How is Copper determined by electrogravimetry method?
18. Discuss the deviations from Lambert-Beer's Law.
19. How is sulphate determined by turbidimetric method?
20. Discuss any two applications of spectrophotometric method of analysis.
21. Discuss the thermo gravimetry (TG) of $\text{Ca}(\text{OOC}-\text{CH}_3)_2 \cdot \text{H}_2\text{O}$.
22. How is Faraday's Law useful in Coulometric analysis?

PART – C

Answer any FOUR questions:

(4 x 10 = 40)

23. One common way to determine phosphorus in urine is to treat the sample, after removing the protein, with molybdenum(VI) and then reduce the resulting 12-Molybdophosphate complex with ascorbic acid to give an intense blue coloured species called molybdenum blue. The absorbance of molybdenum blue can be measured at 650nm. A patient produced 1122 mL of urine in 24 hours. A 1mL aliquot of the sample was treated with Mo(VI) and ascorbic acid and was diluted to a volume of 50.00mL. A calibration curve was prepared by treating 1.00 mL aliquots of phosphate standard solutions in the same manner as the urine sample. The absorbance of the standard and the urine sample were obtained at 650 nm and the following results were obtained.

Solutions/ppm P	Absorbance
1.0	0.230
2.0	0.436
3.0	0.638
4.0	0.848
Urine sample	0.518

- a) Determine the slope and intercept.
b) Calculate the ppm of P in the urine sample.
c) What is S_r if the absorbance of the urine sample is the average of 3 determinations.
24. Draw the flow sheet diagram of HPLC and explain the principle and its working.
25. a) Explain the factors, which influence ΔpM at the equivalence point. (4)
b) Calculate the concentrations of all the species in a mixture containing 75.00mL of 0.025M Fe^{+3} and 50.00mL of 0.00375M EDTA at pH_2 .
- $$Fe^{3+} + Y^{4-} \rightleftharpoons FeY^- \quad K_{abs} = 10^{25}$$
- The value of α at pH_2 is 10^{-14} . (6)
26. Describe the instrumentation and method of analysis by atomic absorption analysis.
27. Write the Ilkovic equation. Explain the terms. How are Cu^{2+} and Cd^{2+} analysed simultaneously by polarographic method.
28. Discuss the factors that influence TG-DTA curves.

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