KATHMANDU UNIVERSITY
End Semester Examination
June/July, 2023

14 JUL 2023

Level : B.Tech.
Year : II
Time : 2 hrs. 30 mins.

Course : CHEM 212
Semester : II
F. M. : 55

SECTION "B"
[5Q. × 5 = 25 marks]

Attempt *ANY FIVE* questions.

1. a. Give reasonable answer. [3×1=3]
   i. Multidentate ligands are preferable to unidentate ligands for complexometric titration
   ii. Coprecipitation on gelatinous precipitate is pH dependent
   iii. Acidic pH is maintained in Volhard method

   b. A student obtained the following result for the concentration (ppm) of sodium in water samples: 242, 263, 228, 238 and 244. Can any result be rejected by the Q-test? (At n=5, Q=0.64) [2]

2. a. Calculate the number of milliliters of ammonia, density 0.98g/ml,2.4% by weight NH_3, which will be required to precipitate as $Fe(OH)_3$ the iron in a 0.80g sample that contains 20%Fe_2O_3. (MW Fe_2O_3=159.69) [3]

   b. Why Mohr method is limited to solution with pH values 6 to 10? [2]

3. a. Draw well labelled diagram of glass electrode, write cell representation and equation for it. [3]

   b. A 2.0 gram sample containing sodium oxalate (MW 126) is titrated with 80.0ml of 0.0200M $KMnO_4$ in acid solution:
   $5C_2O_4^{2-} + 2MnO_4^- + 16H^+ \rightarrow 10CO_2 + 2Mn^{2+} + 8H_2O$.
   Calculate the percentage of $Na_2C_2O_4$ in the sample. [2]

4. a. With a labeled diagram of typical polarogram, write expression for average diffusion current. [2]

   b. 10.0ml of 0.500M Fe^{2+} is titrated with 0.500M Ce^{4+} in sulfuric acid solution. Calculate the potential of solution after addition of 1ml, 10ml, 12ml of Ce^{4+} solution. (E^0Ce=1.44V , E^0Fe=0.68V) [3]

5. a. 50.0ml of 0.010M HA is titrated with 0.010M strong base. Calculate the minimum value of K so that when 49.95 ml of titrant has been added, the reaction is essentially complete and the pH changes by 2.00 units on the addition of two more drops (0.10ml) of titrant. [3]

   b. Show how stepwise and overall formation constants are related. [2]

6. a. 50.0 ml of a solution which is 0.0100 M in Ca^{2+} and buffered at pH 10 is titrated with 0.0100 M EDTA solution. Calculate values of pCa at various stages of titration: [2]
   (i) After addition of 30 ml titrant
   (ii) After addition of 50 ml titrant
   (Kabs for CaY^{2-} is 5.0×10^{10} and $\alpha4$ at pH 10 is 0.35)

   b. Calculate the pH of 0.10M solution of sodium acetate. The Ka of acetic acid is 1.8×10^{-5}. [3]

SECTION "C"

[5Q. × 6 = 30 marks]

Attempt *ANY FIVE* questions.

7. a. Explain clearly how to test two sets of results to determine if they are significantly different. [3]

   b. How precipitates can be dried? When it is required to ignite the precipitate? What are the errors during ignition? [3]

8. a. What is transition potential? In an oxidation reduction titration, differentiate between self-indicator and true redox indicator. [3]

   b. Why too much buffer is not added in EDTA titration? [3]

9. a. What are visual indicators? How they show the color change at the end point of acid base titration? Which indicator is selected for the titration of carbonic acid with sodium hydroxide? [3]

   a. Differentiate between formality and molarity of solution. What are the characteristics for the substance to be a primary standard? [3]

10. a. Show, how EDTA titration is pH dependent. [3]

    b. What is conductometric titration? Explain conductometric titration curve for titration of weak acid with strong base. [3]

11. a. What do you know about normal error curve? What information can be drawn from the area under the curve? [3]

    b. Write short note on amperometric titration. [3]

12. a. What is a galvanic cell? What are the major functions of salt bridge? Define thermodynamic cell potential. [3]

    b. What are the basic components of potentiometric method? Explain in brief. [3]

13. a. What is polarography? What are advantages of dropping mercury electrode? [3]

    b. What is poised solution? Why HCl cannot be used to acidify $KMnO_4$? [3]