KATHMANDU UNIVERSITY
End Semester Examination
June/July, 2023

21 JUL 2023

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

Course : CHEM 215
Semester : I & 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. Titration involving EDTA are pH dependent
   iii. Coprecipitation on gelatinous precipitate is pH dependent

   b. What size sample containing 12.0% chlorine should be taken for analysis if the chemist wishes to obtain a precipitate of AgCl which weighs 0.500gram? (MW AgCl=143.32) [2]

2. 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: [3]
   i. After addition of 20 ml titrant
   ii. After addition of 50 ml titrant and
   iii. After addition of 70 ml titrant. (Kabs for CaY^{2-} is 5.0×10^{10} and $\alpha4$ at pH 10 is 0.35)

   b. What type of mobile phase and stationary phase are used in gas chromatography? [2]

3. a. Draw well labeled diagram of glass electrode, write its cell representation. [3]

   b. Write different techniques for the disposal of chemical waste generated from a laboratory. [2]

4. a. What are lyophobic precipitates? Write two examples of lyophilic precipitates. [2]

   b. 40.0 ml of 0.20 M HCl is titrated with 0.20 M NaOH. Calculate the pH of solution after addition of 20 ml, 40ml and 50 ml of titrant. [3]

5. a. Draw block diagram of Mass spectroscopy. [2]

   b. What are the different steps in flame atomization? [3]

6. a. What will you do if you spill hazardous material on your clothing or skin while working in the laboratory? [2]

   b. What are the ways to visualize colorless samples in TLC? [3]

SECTION "C"

[5Q. × 6 = 30 marks]

Attempt *ANY FIVE* questions.

7. a. List and give examples of four types of chemical reactions which can be used as the basis of titrimetric analysis. [3]

b. What is von Weimarn theory of relative super saturation? What are the optimal experimental conditions for obtaining crystalline precipitates? [3]

8. What are different types of ion sources used in mass spectroscopy? What are the advantages and disadvantages of each? [3+3]

9. a. State Beer's law. What is real limitation to Beer's law? [4]

b. Write about sample containers used in UV Visible spectroscopy. [2]

10. a. Write short note on sampling handling in IR spectroscopy. [4]

b. What are metallochromic indicators? [2]

11. a. What is charge transfer absorption? Why it is important for quantitative purpose? [4]

b. Write short notes on redox indicator. [2]

12. What are different types of radiation sources used in AAS? Write in detail about electrode less discharge lamp.

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

b. Differentiate between planar chromatography and column chromatography. [3]

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Registration No.:

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SECTION "A"
[20Q. × 1 = 20 marks]

Mark [X] in the most appropriate option.

1. The information sorter for Mass Spectrometer is_____.
   [ ] Filter [ ] Mass analyzer
   [ ] Monochromator [ ] Electrodes

2. Electromagnetic radiation having energy 3.75×10^{-19} J lies in which part of the electromagnetic spectrum?
   [ ] Infra-red [ ] Ultraviolet [ ] Visible [ ] X-ray

3. What will be the molarity (mol/ltr.) of a solution which contains 5.00gm of NaCl in 250ml of solution?
   [ ] 0.341 [ ] 0.513 [ ] 12.06 [ ] 0.126

4. The pOH of 0.05M solution of HCl is_____.
   [ ] 1.30 [ ] 12.70 [ ] 0.05 [ ] 13.75

5. For the titration of 10.0ml of 0.100M HCl with 25.0 ml of 0.050M Na_2CO_3, what indicator will be suitable?
   [ ] Phenolphthalein [ ] Methyl Orange
   [ ] Erichrome black T [ ] Starch

6. The wavelength of the radiation source used in Atomic Absorption Spectroscopy is usually in the range_____.
   [ ] Infra-red [ ] Radiofrequency
   [ ] Microwave [ ] Ultraviolet visible

7. Which of the following is **NOT** a gas phase source?
   [ ] Electron impact source [ ] Electrospray ionization
   [ ] Chemical ionization [ ] Field ionization

8. A titration where the end point is found by observing the effect of titrant addition upon a measured pH is termed as_____.
   [ ] Potentiometric titration [ ] Coulometric titration
   [ ] Conductometric titration [ ] Amperometric titration

9. The potential ,at equivalence point, for the following titration reaction is_____.
   $A^{2+} + 2B^{4+} \leftrightarrows A^{4+} + 2B^{3+}$ (E^0_A= 0.15V and E^0_B=1.44V)
   [ ] 1.18V [ ] 0.58V [ ] 1.06V [ ] 0.76V

10. Which of the following statement is **TRUE**?
    [ ] Atomic absorption lines are not narrow
    [ ] Hollow cathode lamp is used in IR spectroscopy
    [ ] Hydride generation technique can be used for the analysis of Arsenic
    [ ] Electrothermal atomizers cannot be used for the direct analysis of solid sample

Fill in the blank by most appropriate VALUE or WORD.

11. In IR spectroscopy, the number of normal modes for SO_2 molecule is _____.

12. The gravimetric factor for Fe in Fe_3O_4 is commonly written as_____.

13. _____% amount of light is transmitted through the sample when it has absorbance value 0.278.

14. The resolution required separating the ions $C_2H_4^+$ and CH_2N^+, with masses of 28.0313 and 28.0187, respectively is _____.

15. Atomic Absorption Spectroscopy (AAS) is mainly used for the determination of _____.

16. The tallest peak in the mass spectrum is called_____.

17. 50.00 ml of 0.100 M solution of the weak acid, HB, $Ka = 1.0\times10^{-5}$, is titrated with 0.100M NaOH. The pH at the start of titration is_____.

18. 0.78μm wavelength is equal to_____cm^{-1} wave number.

19. The two main phases in chromatography are _____.

20. Which instrument is used to study flame emission spectroscopy? _____.