

KATHMANDU UNIVERSITY
End Semester Examination
January/February 2024

Marks Scored:

Level : B.Pharm./B.Tech.

Year : II

Exam Roll No. :

Registration No.:

05 FEB 2024

Time: 30 mins.

Course : CHEM 212

Semester : II

F. M. : 20

Date :

SECTION "A"

[20Q. × 1 = 20 marks]

Mark [X] in the most appropriate answer.

- Which of the following statement is **NOT TRUE**?
 The difference between the experimental value and the true value is called absolute error
 Precision is the measure of how closely a measured quantity agrees with the true value
 Coefficient of variation is the standard deviation expressed as a percentage of the mean
 Accuracy provides a measure of systematic error
- Student A obtains a mean value of 12.96% and a standard deviation of 0.05 for the purity of a sample. Student B obtains corresponding values of 13.12% and 0.08. The true percentage purity is 13.08. Compared to student B, student A is
 Less accurate but more precise
 Less accurate and less precise
 More accurate and more precise
 More accurate but less precise
- The process of dispersing an insoluble material into a liquid as a colloid is called
 Occlusion
 Peptization
 Nucleation
 Coagulation
- What will be the molarity (in mol/L) of glacial acetic acid having density 1.05 g/mL and percentage purity 99.8%?
 6.3
 3.65
 17.45
 12.6
- What will be the pOH of the solution in which $[H_3O^+] = 10^{-10}$?
 1
 13
 -1
 14
- When 25 mL of 0.2 M NaCl is titrated with 15 mL of 0.1 M AgNO₃, AgCl is precipitated. The ion most strongly adsorbed to the surface of the colloidal particle at this condition is
 Cl⁻
 Ag⁺
 NO₃⁻
 Na⁺
- In the titration of Iron (II) with Cerium (IV) sulfate in 1 M H₂SO₄, what indicator should be used? ($E^\circ_{Ce} = 1.44$ V and $E^\circ_{Fe} = 0.68$ V)
 Phenosafranine (transition potential 0.28 V)
 Ferroin (transition potential 1.11 V)
 Nitroferroin (transition potential 1.25 V)
 Methylene blue (transition potential 0.53 V)
- Which titration will give the largest change in pH at the equivalence point?
 0.1 M acetic acid and 0.1 M sodium hydroxide
 0.1 M hydrochloric acid and 0.1 M sodium hydroxide
 0.1 M oxalic and 0.1 M sodium hydroxide
 0.1 M hydrochloric acid and 0.1 M sodium carbonate

KATHMANDU UNIVERSITY
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January 2024

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

05 FEB 2024

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) Occluded impurities are not removed by washing.
 - (ii) In basic solution (pH above 10), glass electrode gives error in measurement of hydrogen ion concentration.
 - (iii) AgCl is never filtered on filter paper.

- b. A sample of dichloroacetic acid (formula weight 128.94), weighing 6.447 gm is dissolved in 500 mL of solution. At this concentration, the acid is about 45% dissociated:
$$\text{Cl}_2\text{CHCOOH} \rightleftharpoons \text{H}^+ + \text{Cl}_2\text{CHCOO}^-$$

Calculate the formality of the dichloroacetic acid and the molarities of the two species Cl_2CHCOOH and $\text{Cl}_2\text{CHCOO}^-$. [2]

2. a. 50.0 mL of 0.10 M acetic acid is titrated with 0.10 M sodium hydroxide. Calculate the pH of solution after addition of 10 mL, 50 mL and 60 ml of titrant. [Given: $K_a=1.8 \times 10^{-5}$] [3]

- b. 50.0 mL of 0.010 M M^{2+} is titrated with 0.010 M EDTA. Calculate the value of K_{eff} so that when 49.95 mL of titrant has been added, the reaction is essentially complete and the pM changes by 2.00 units on the addition of two more drops (0.10 mL) of titrant. [2]

3. a. A 0.7203 gm sample containing chloride is dissolved and chloride precipitates as AgCl. The precipitate is washed, dried, and found to weigh 0.4026 gm. Calculate the percentage of chloride in the sample. (MW AgCl=143.32) [3]

- b. While using adsorption indicator, illustrate the function of dextrin. Why must the pH be controlled in such case? [2]

4. a. What is the optimum pH for EDTA titration? What happens if the pH is low or very high? At what condition K_{eff} approaches K_{abs} ? [3]

- b. 50.0 mL of 0.0400 M Fe^{2+} is titrated with 0.0800 M Ce^{4+} in sulfuric acid solution. Calculate the potential of solution after addition of 10 mL, 25 mL of Ce^{4+} solution. ($E^\circ\text{Ce}=1.44 \text{ V}$, $E^\circ\text{Fe}=0.68 \text{ V}$) [2]

5. a. Define equivalent conductance. Draw and explain conductometric titration curve for weak acid and strong base. [3]
- b. If a water sample contains 2.5 ppm of NaF, how many liters of water can be fluoridated with 500 gm of NaF? [2]
6. a. In spectrophotometric determination, the concentrations are given as: 0.0050, 0.010, 0.020, 0.030 and 0.040. The corresponding absorbances were 0.750, 0.642, 0.498, 0.290 and 0.132. Using the method of least squares calculate (i) The equation of the best straight line (ii) The standard deviation of the absorbance values (iii) The standard deviation of the slope. [3]
- b. With a labeled diagram of typical polarogram, write expression for average diffusion current. [2]

SECTION "C"
[5Q. × 6 = 30 marks]

Attempt *ANY FIVE* questions.

7. a. What kinds of systematic errors are detected by varying the sample size? Describe at least three ways in which a systematic error might occur while using a pipet to transfer a known volume of liquid. [1+1.5]
- b. What are the requirements for successful gravimetric analysis? What is coprecipitation? How it can be minimized? [1+2.5]
8. 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 transition potential? What are different types of indicators used in redox titration? [3]
9. a. What is the theory of acid base indicator? How the indicators are selected for titration? [3]
- b. In rejecting results, what is meant by making an "error of first kind"? What kinds of error are most likely to be made when applying the Q-test? [3]
10. a. What is a reference electrode? Show the clear sketch and representation of the saturated calomel electrode. [3]
- b. What is meant by absolute stability constant of a complex ion? How it is affected by the pH of a solution? [3]
11. a. What are metallochromic indicators? Explain the term masking. [3]
- b. What are advantages and disadvantages of dropping mercury electrode? [3]

03 FEB 2024

- 12 a. What are the different methods used to determine end point in potentiometric titration? [3]
- b. Describe metallic electrode of third kind. [3]
- 13 a. Define: (i) Boundary potential (ii) Salt bridge (iii) Residual current [3]
- b. Write short note on Mohr method of formation of colored precipitate? [3]

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