

KATHMANDU UNIVERSITY
End Semester Examination [C]
December, 2024

Marks Scored:

Level : B.Pharm.

Year : II

Course : CHEM 212

Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date **12 DEC 2024**

SECTION "A"

[20 Q. × 1 = 20 marks]

Choose and mark [X] in the most appropriate option.

- If an analyst finds a value of 20.44% iron in a sample which actually contain 20.54%, the relative error is
 0.10% -0.10% 0.10ppt -0.10ppt
- Which of the following statement is **NOT** true?
 Coefficient of variation is the standard deviation expressed as a percentage of the mean
 Precise values are always accurate.
 A determinate error which varies with the sample size in such a way that the relative error remains constant is proportional error
 Accuracy provides a measure of systematic error
- Gravimetric factor of Fe in Fe₂O₃ is
 55.85 0.699 5.718 159.69
- 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 NaCl which contains 58.44 g in 1 litre of solution?
 0.25 0.50 0.75 1
- What will be the pOH of the solution in which [H₃O⁺] = 9.5 × 10⁻⁴?
 4.54 3.02 10.98 7.01
- The potential at equivalence point, for the following titration reaction is
 $A^{2+} + 2B^{4+} \rightleftharpoons A^{4+} + 2B^{3+}$ ($E^0_A = 0.15V$ and $E^0_B = 1.44V$)
 1.06 V 0.58V 0.79V 0.87V
- Indicator phenolphthalein can be used for which of the following titration?
 0.1M acetic acid and 0.1 M sodium hydroxide
 0.1M hydrochloric acid and 0.1 M ammonia solution
 0.1M oxalic and 0.1 M ammonium hydroxide
 0.1M hydrochloric acid and 0.1 M sodium carbonate
- A titration where the end point is found by observing the effect of titrant addition upon a change of pH can also be termed as
 Potentiometric titration Coulometric titration
 Conductometric titration Amperometric titration

10. In a complexometric titration, 20ml of 0.01M Zn^{2+} ion solution is kept initially in conical flask, 0.01 M EDTA solution is used as titrant and Erichrome black T is used as indicator. What will be the color of the solution when the burette reading is 15.5 ml.
[] Wine red [] Pink [] Orange [] Blue

Fill in the banks by most appropriate VALUE or WORD

11. The cells which exhibit non-linear behavior between current and applied potential are said to be _____
12. In polarography, the expression for maximum diffusion current is _____
13. A pure metal which is in direct equilibrium with its own cation in the electrolyte solution forms _____
14. The mean activity coefficient (calculated using Debye Huckel limiting law) for a solution of $CaCl_2$, having ionic strength 0.9, is _____
[Given: $A=0.512$; $B=0.328$; $a=4.5A^a$]
15. In EDTA titration, the absolute stability constant is given as 5×10^{10} and the fraction of EDTA in the Y^{4-} form at pH 10 is given as 0.35. The effective stability constant will be _____
16. The half-cell representation for saturated silver/silver chloride electrode is _____
17. Composition for *corning 015* glass is _____
18. A salt M^+A^- of 0.15 normality, if has specific conductance of 0.030 S cm^{-1} , its equivalent conductance is _____
19. The suitable pH for Mohr method of formation of colored precipitate is _____
20. A student obtained the results for concentration (mg/ml) of citric acid samples as 10.30, 10.44, 10.38, 10.34, 10.68. Does the value 10.30 fall in same data set? (Q-tab for $n=5$ is 0.64) _____

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F. M. : 55

SECTION "B"

[5 Q. × 5 = 25 marks]

Attempt *ANY FIVE* questions.

- 1 a. A student analyzed a sample of Cl by precipitating and weighing AgCl. A 0.8625g sample gave a precipitate of AgCl weighing 0.7864g. By mistake the student used the atomic weight of Cl as 35.345 rather than the correct value of 35.453. Calculate the error in the percentage Cl the student would make. (Given, MW of AgCl as 143.321) [3]
- b. A sample of dichloroacetic acid (formula weight 128.94), weighing 6.447 gm is dissolved in 500ml 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. 50.0ml 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. [2]
- b. 40.0 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: (i) After addition of 10 ml titrant (ii) After addition of 40 ml titrant (iii) After addition of 50 ml titrant (K_{abs} for CaY^{2-} is 5.0×10^{10} and α_4 at pH 10 is 0.35) [3]
- 3 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 $\text{Fe}(\text{OH})_3$ the iron in a 0.80g sample that contains 20% Fe_2O_3 . (MW $\text{Fe}_2\text{O}_3=159.69$) [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. 10.0ml of 0.02M Fe^{2+} is titrated with 0.05M Ce^{4+} in sulfuric acid solution. Calculate the potential of an inert electrode in the solution (i) at the start of the titration and (ii) after addition 4 ml titrant. ($E^\circ\text{Ce}=1.44\text{V}$, $E^\circ\text{Fe}=0.68\text{V}$) [2]

P.T.O.

- 5 a. Why many compounds show increasing solubility in presence of electrolytes? [2]
 b. 50.0 ml of 0.10 M acetic acid is titrated with 0.10 M sodium hydroxide. Calculate the pH of solution (i) at the start of titration and (ii) at the equivalence point? [3]
- 6 a. A sample of pure CaCO_3 (MW 100.09) weighing 0.4148g is dissolved in 1:1HCl, and the solution is diluted to 500.0ml in a volumetric flask. A 50.00ml aliquot is withdrawn with a pipet. The solution is titrated with 40.34ml of an EDTA solution. Calculate the molarity of the EDTA solution. [3]
 b. Draw well labelled diagram of a glass electrode. Also write cell representation for it. [2]

SECTION "C"
 [5 Q. \times 6 = 30 marks]

Attempt *ANY FIVE* questions.

- 7 a. What is an error? Describe types of error in detail. [4]
 b. What is coprecipitation? How it can be minimized? [2]
- 8 a. What are the characteristics for the substance to be a primary standard? Give examples of primary standard for each type of chemical reaction used in titration. [3]
 b. What is the theory of acid base indicator? How the indicators are selected for titration? [3]
- 9 a. What is von Weimarn theory of relative super saturation? [3]
 b. Write short note on redox indicator. [3]
- 10 a. What is a reference electrode? Show the clear sketch and representation of the saturated calomel electrode. [3]
 b. What are metallochromic indicators? Explain the term masking. [3]
- 11 a. Define: (a) Boundary potential (b) Salt bridge (c) Residual current [3]
 b. Write short note on oxygen wave. [3]
- 12 a. What is amperometric titration? Draw different types of curves used in amperometric titration. [3]
 b. What are the different methods to determine end point in potentiometric titration? [3]
- 13 a. What do you mean by lyophilic and lyophobic precipitate? Write with example. [3]
 b. Write short note on Volhard method of formation of colored complex? [3]