KATHMANDU UNIVERSITY
End Semester Examination
May/June, 2022

Marks Scored:

Level : B.Pharm./B.Tech.
Year : II
Course : CHEM 212
Semester : II

Exam Roll No. :
Time: 30 mins.
F. M. : 20

Registration No.:
Date :

SECTION "A"
[20Q. × 1 = 20 marks]

Mark [X] in the appropriate box.

1. Suppose that 0.20 mg of precipitate is lost as a result of being washed with 200 ml of wash liquid. If the precipitate weighs 200 mg, the relative error due to solubility loss is
[ ] 1.0% [ ] -1.0% [ ] 0.1% [ ] -0.1%

2. Gravimetric factor of Fe in Fe_3O_4 is
[ ] 0.241 [ ] 0.723 [ ] 0.482 [ ] 4.14

3. A water sample is 0.00026 M in $CaCl_2$. What will be the concentration in parts per million (ppm)?
[ ] 28.86 [ ] 26.00 [ ] 0.2600 [ ] 0.2886

4. The mean activity coefficient (calculated using Debye-Huckel limiting law) for a solution of Na_2SO_4, having ionic strength 0.2 is
[ ] 0.107 [ ] 0.348 [ ] 0.485 [ ] 0.457

5. When 20.0 ml of 0.050 M HCl is titrated with 25.0 ml of 0.030 M NaOH, what will be the colour of solution, if phenolphthalein is used as an indicator?
[ ] Pink [ ] Orange [ ] Colourless [ ] Yellow

6. ..... is an example of adsorption indicator.
[ ] Erichrome Black T [ ] Ferroin
[ ] Fluorescein [ ] Potassium chromate

7. When 40.0 ml of 0.025 M NaCl is mixed with 40.0 ml of 0.020 M $AgNO_3$, the ion strongly adsorbed on primary layer of the precipitate is
[ ] Cl^- [ ] Ag^+ [ ] NO_3^- [ ] Na^+

8. Which one of the following statement is **NOT TRUE**?
[ ] Reference electrodes are used to calculate the potential of the indicator electrode.
[ ] Half-cell potential of reference electrode is known and is also constant.
[ ] Reference electrode should maintain constant potential while passing small currents.
[ ] Reference electrode responds to presence of analyte.

9. Which of the following statements are **TRUE**?
   A. Replacement titrations are useful when no suitable indicator is available for the metal ion being determined.
   B. α_4 increases as the pH increases.
   C. EDTA is a specific reagent.
   D. A Lewis acid is an electron donor.

   [ ] A, B [ ] B, D [ ] B, C [ ] A, D

10. Silver sulphide (Ag_2S) membrane electrode for S^{2-} and Ag^+ is an example of
   [ ] Polycrystalline membrane electrode
   [ ] Metallic electrode for second kind
   [ ] Single crystal membrane electrode
   [ ] Liquid membrane electrode

Fill in the banks by most appropriate VALUE or WORD

11. The data set for concentration of Fe (in ppm) is as follows: 19.4, 19.5, 19.6, 19.8, 20.1, and 20.3. The mean for this data set is _____ppm.

12. In thermogravimetric analysis, the graph of 'weight of the precipitate' versus temperature is called _____.

13. 0.5 mmol of Ca^{2+} ion solution is titrated with 10 ml of 0.010 M EDTA solution. The solution is buffered at pH 11. What will be the value of pCa at this stage? _____
   (Volume of Ca^{2+} ion solution is 50 ml. At pH 11.00, α_4 =0.85; Kabs for CaY^{2-} is $5*10^{10}$)

14. The potential ,at equivalence point for the following titration reaction is $A^{2+} + 2B^{4+} \leftrightarrows A^{4+} + 2B^{3+}$ (E^0_A= 0.20 V and E^0_B=1.06 V) _____. .

15. Outliers can be rejected after performing _____test.

16. The process by which an impurity is deposited along with precipitation of the desired substance is termed as _____.

17. A titration where the end point is found by observing the effect of titrant addition upon a measured current is termed as_____.

18. The potential for the cell: Ag $|Ag^+(0.0200\ M) \| Cu^{2+}(0.0200\ M)|Cu$ is _____.
   (Given: $E_{Ag+/Ag}$ = 0.6984 V and $E_{Cu2+/Cu}$ = 0.2867 V)

19. A salt M^+A^- of 0.12 normality, if has specific conductance of 0.002765 $Ohm^{-1}\ cm^{-1}$, (at 298K) and resistance of the cell containing this solution is 80 Ohm. The cell potential will be _____.

20. _____is the measure of how closely a measured quantity agrees with the true value.

KATHMANDU UNIVERSITY
End Semester Examination
May/June, 2022

Level : B.Pharm./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. We should not add too much buffer in EDTA titration
   ii. Coprecipitation on gelatinous precipitate is pH dependent
   iii. In basic solution (pH above 10), glass electrode gives error in measurement of hydrogen ion concentration

   b. A student obtained the following result for the percentage purity of a sample: 10.30, 10.44, 10.38 and 10.34. What is the highest value a fifth result could be without being discarded by the Q-test? (At n=5, Q=0.64) [2]

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

   b. Draw and compare the titration curve of halides (Cl^-, Br^- and I^-) with silver nitrate. [2]

3. a. Draw a well labelled diagram of glass electrode. Write its working principle and cell representation for it. [3]

   b. A 2.165 gm sample of a copper ore is dissolved and excess KI added to liberate I_2. The I_2 required 31.43 ml of 0.0978 M $Na_2S_2O_3$ for titration. Calculate the percentage of copper in the ore. (AW of Cu =63.54) [2]

4. a. With a labeled diagram of typical polarogram, define residual current and half wave potential. [2]

   b. 50.0 ml of 0.100 M Fe^{2+} is titrated with 0.100 M Ce^{4+} in sulfuric acid solution. Calculate the potential of solution after addition of 20 ml, 50 ml, 80 ml of Ce^{4+} solution. (E^0Ce=1.44V , E^0Fe=0.68V) [3]

5 a. 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]

   b. 50.0 ml of 0.10 M solution of weak acid HA, Ka=$1.0*10^{-5}$, is titrated with 0.10 M NaOH. Calculate the pH of solution after addition of 5 ml, 50 ml and 70 ml of titrant. [3]

6. a. Calculate the volume of 0.0500 M EDTA needed to titrate 27.16 ml of 0.0741 M $Mg(NO_3)_2$. [2]

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: [3]

$Cl_2CHCOOH \rightleftharpoons H^+ + Cl_2CHCOO^-$

Calculate the formality of the dichloroacetic acid and the molarities of the two species $Cl_2CHCOOH$ and Cl_2CHCOO^-.

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. What is von Weimarn theory of relative super saturation? [3]

8. a. What do you know about Gaussian distribution curve? Draw and explain it. [3]
b. What are advantages of dropping mercury electrode? Write about oxygen wave. [3]

9. a. What is the theory of acid base indicator? How are the indicators selected for titration? [3]
b. List and give examples of four types of chemical reactions which can be used as the basis of titrimetric analysis. [3]

10. 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. Write a short note on amperometric titration. [3]

11. a. How Volhard method differs from Mohr method? Explain with suitable example.
b. What are metallochromic indicators? What would happen if the metal-indicator complex is stable than the metal EDTA complex? [3]

12. a. What is a reference electrode? How does it differ from indicator electrode? What are different types of indicator electrodes? [4]
b. Derive a general equation for direct potentiometric determination of ions. [2]

13. a. What is conductometric titration? Explain conductometric titration curve for titration of weak acid with weak base. [3]
b. Differentiate between iodimetry and iodometry titration. How redox titration can be used for the determination of iron in iron ore? [3]