

KATHMANDU UNIVERSITY
End Semester Examination [C]
December, 2018

DEC 30 2018

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

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

SECTION "B"
[5 Q × 5 = 25 marks]

Attempt *ANY FIVE* questions.

1. a) Define the terms with an example of each:
 - i. determinate errors
 - ii. indeterminate errors

[2]
- b) What is a primary standard substance? Write the requirements of a compound to be the primary standard.

[3]
2. a) Distinguish between diffusion current and limiting current. What effect does complexation have on the voltametric reduction of a metal ion?

[1.5+1.5]
- b) A 50.0 mL sample containing La^{3+} was titrated with sodium oxalate to precipitate $\text{La}_2(\text{C}_2\text{O}_4)_3$, which was washed, dissolved in acid and titrated with 18.0 mL of 0.006363 M KMnO_4 . Calculate the molarity of La^{3+} in the unknown solution.

[2]
3. a) Does the end point in a permanganate titration coincide with the equivalence point? Explain and suggest how any discrepancies might be corrected.

[1+2]
- b) A solution is 0.001M in $\text{Cr}_2\text{O}_7^{2-}$ and 0.01 M in Cr^{3+} . If the pH is 2.0, What is the potential of the half reaction at 298K? (Given $E_{\text{Cr}_2\text{O}_7^{2-}, \text{Cr}^{3+}}^{\circ} = 1.33\text{V}$)

[2]

$$\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6\text{e}^- \rightleftharpoons 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$$
4. What is liquid junction potential? Discuss the mechanism of glass membrane electrode response for pH measurements.

[2+3]
5. a) What information concerning optimum conditions of precipitation does the von Weimarn ratio give us?

[3]
- b) A 523.1 mg sample of impure KBr is treated with excess AgNO_3 and 814.5 mg AgBr is obtained. What is the purity of the KBr?

[2]
6. Write short notes on:
 - i. Amperometric titration

[3]
 - ii. Conductometric titration of weak acid and weak base

[2]

SECTION "C"
[5Q × 6 = 30 marks]

Attempt *ANY FIVE* questions.

7. a) Discuss the theory of titration of strong acid with strong base. Give your comments on the nature of pH curve and the indicators to be used for such titrations.

[2+2]
- b) What is a carbonate error? What are the methods that reduce carbonate error?

[1+1]

8. a) 50.0 mL of a solution which is 0.02M in a metal M^{2+} and buffered at pH 9.0 is titrated with 0.02 M EDTA. The value of $\log K_f$ for MY^{2-} is 14.30. Calculate the value of pM when the following amounts of titrant (mL) are added. (i) 0.00, (ii) 25.0, (iii) 49.9 (iv) 50.0 (v) 50.1 and (vi) 55.0. Plot the titration curve. (Given: α_4 for EDTA at pH 9 = 5.2×10^{-2}) [4]
- b) Define the terms: [1+1]
- Back titration
 - Overpotential
9. a) Explain the principle of adsorption indicators. [3]
- b) Derive Nernst equation. [3]
10. Give reasons: [1.5+1.5+1.5+1.5]
- Alkaline error causes negative deviation from actual pH of a solution.
 - Conductometric titration is superior than manual titration.
 - Phenolphthalein is used as indicator for the titration of NaOH vs CH_3COOH .
 - Buffer solution of pH 10 has been used for the determination of hardness of water using EDTA.
11. Write notes on [2+2+2]
- Method of obtaining the best calibration curve.
 - Propagation of errors
 - Effect in change of concentration of the titrant and the analytic for the feasibility of acid base titration
12. a) Calculate the mean activity coefficient for $CaCl_2$ in a 0.30 M solution of the salt using (i) the Debye-Huckel limiting law, (ii) the extended Debye-Huckel equation, and (iii) The Davis equation. (Given: $\alpha = 4.5$; $B = 0.328$) [3]
- b) Define coulometric analysis. A sample of copper ore weighing 2.132 gram is dissolved in acid, and the copper is electrolyzed. If 8.04 min is required for the electrolysis using a constant current of 2.0A, calculate the percentage of copper in the ore. [1+2]
- $$Cu^{2+} + 2e^- \longrightarrow Cu$$
13. a) What are the advantage and disadvantage of dropping mercury electrode? Write the Ilkovic equation and define the terms. [3]
- b) Define equivalence conductance. What are the factors that affect equivalent conductance of electrolyte solution? [3]

KATHMANDU UNIVERSITY
End Semester Examination [C]
December, 2018

Marks scored:

Level : B.Sc./B. Pharm./B. Tech.
Year : II

Course : CHEM 212
Semester: II

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date DEC 30 2018

SECTION "A"

[20 Q × 1 = 20 marks]

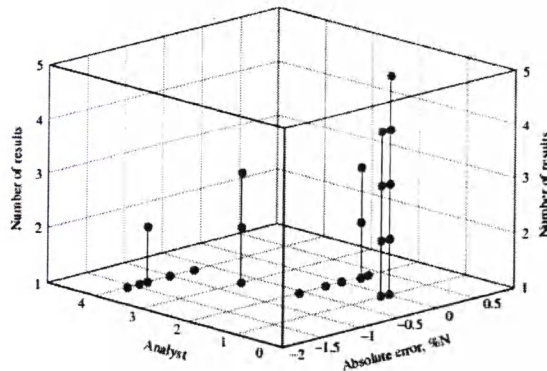
Select the most appropriate answer.

- In which of the following, a coagulated colloid returns to its original dispersed state because of a decrease in the electrolyte concentration of the solution containing the precipitate?
 Digestion Peptization Occlusion Supersaturation
- A 2.0 gram sample containing calcium is treated appropriately to precipitate 3.0 grams of $\text{Ca}_3(\text{PO}_4)_2$ (310 g/mol). The mass percent of calcium in the original sample is closest to
 19% 26% 39% 58%
- A weak acid, HA ($K_a = 1.0 \times 10^{-4}$) is titrated with NaOH. The concentration of NaA at the equivalence point is 0.01 M. The pH at the equivalence point is
 11.0 8.0 6.0 7.0
- Which of the following cannot be determined quantitatively by direct titration with a standard KMnO_4 solution under appropriate conditions?
 Ca^{2+} Sn^{2+} Fe^{2+} Sb^{3+}
- The ionic strength (μ) of an electrolyte solution depends on which of the following?
I. The charges on the ions
II. The concentrations of the ions
III. The sizes of the ions
 I only I and II only II only I, II and III
- Which of the following solids is **not** used as a primary standard in chemical analysis?
 Sodium hydroxide Sodium carbonate
 Sodium thiosulfate Potassium hydrogenphthalate
- The table below contains potential readings near the equivalence point of a potentiometric titration. The volume of titrant needed to reach the equivalence point is

Vol of titrant	Potential	$\Delta E / \Delta V$
24.70	210	
24.80	222	12
24.90	240	18
25.0	360	120
25.10	600	240
25.20	616	16
25.30	625	9

- 24.96 mL 25.00 mL 25.04 mL 25.50 mL

15. In an experiment of determination of N in two different organic compounds by Kjeldhal method, four analysts worked independently and the result were presented as the figure below. In this experiment, the less precise and more accurate analyst is



16. is the analytical technique of obtaining a stable solid compound of known stoichiometric composition so that the amount of an analyte in the sample may be found by weighing.
17. The is used to determine whether to reject or retain a suspected outlier.
18. Suppose that 0.50 mg of precipitate is lost as a result of being washed with 200 mL of wash liquid. If the precipitated weighs 500 mg, the relative error due to solubility loss is
19. The molarity of concentrated HNO_3 (63.0 g/mol) solution that has a specific gravity of 1.42 and is 70.5% pure (w/w) is.....
20. Henderson-Hasselbalch equation for an acid is given as

