

KATHMANDU UNIVERSITY
End Semester Examination
March/April, 2017

Marks Scored:

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

Course : CHEM 212

Year : II

Semester : I

Exam Roll No. :

Time : 30 mins.

F. M. : 20

Registration No. :

Date

MAR 30 2017

SECTION "A"

[10 Q. × 1 = 10 marks]

Select the most appropriate answer.

- 5.0 liter of water sample is found to contain 0.0162 g of MgCO_3 . The concentration of MgCO_3 is
 3.24 ppm 4.24 ppm 1.62 ppm 5.24 ppm
- A measurement which on repetition gives same or nearly same result is called
 accurate measurement average measurement
 precise measurement estimated measurement
- For a gravimetric analysis to be successful
 the anion of the substance being investigated must be precipitated
 both the cation and the anion of the substance being investigated must be precipitated
 the ratio of anion to cation in the substance being investigated must be 1:1
 either the cation or the anion of the substance being investigated must be precipitated
- The endpoint of a titration involving the reaction of MnO_4^- to Mn^{2+} can be detected by the
 pink color of the MnO_4^- disappearing use of eosin indicator
 use of chromate ion use of fluorescein
- pH of solution prepared by mixing 300 mL of 0.1 M HF and 200 mL of 0.1 M KOH is
 2.82 3.14 3.98 3.44
- A precipitation titration in which AgSCN is precipitated with KSCN and Fe(III) indicator is used to detect excess thiocyanate falls into the category of
 volhard method mohr method fajans method adsorption indicator
- Ionic strength of 0.05 M Na_3PO_4 is
 0.30 0.50 0.10 0.20
- When a strong acid is titrated against a strong base the end point is the point of
 zero conductance maximum conductance
 minimum conductance none of these
- A titration where the end point is figured out by observing the effect of titrant addition upon a measured current is called
 potentiometry redox-titration polarography coulometry
- In titration of weak acid with weak base, the pH at the equivalent point is
 greater than 7 equal to 7
 less than 7 is impossible to predict

SECTION "B"
[10 Q. × 1 = 10 marks]

Fill in the blanks with most appropriate value or word.

11. A mathematical function giving the relative frequency of an error as a function of its magnitude is known as -----
12. A colloid which has only a slight affinity for water is called-----
13. α_4 is the fraction of EDTA in the Y^{4-} . As pH goes down α_4 -----and hence K_{eff} becomes -----
14. The potential of silver-silver chloride reference electrode at 25°C is -----
15. The magnitude of diffusion current is -----to the bulk concentration of reactive species.
16. The salt bridge in the electrochemical cells serve to -----
17. 50 mL of 0.10 M NaI is titrated with 0.10 M AgNO₃. The calculated pI after addition of 25 mL of titrant is -----
18. The surface of glass membrane must be hydrated before it functions for pH measurement. The amount of water involved is approximately -----per cubic centimeter of glass.
19. -----and -----agents can be used to analyze the mixture of three metals (Cu, Cd and Ca) using EDTA as a titrant.
20. -----is nearly ideal substance for the preparation of a crystalline membrane electrode for the determination of fluoride ion.

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SECTION "C"

[5 Q × 5 = 25 marks]

Attempt *ANY FIVE* questions of the following.

1. a. Suppose that 0.3562 gm of $\text{Na}_2\text{C}_2\text{O}_4$ is dissolved in a 250 mL volumetric flask. If 10 mL of the solution require 48.36 mL of KMnO_4 solution for titration, what is the molarity of the permanganate? [3]
b. How strong acid vs strong base titration curve differ from weak base vs strong acid. Why it is not practical to titrate an acid or base that is too weak or too dilute? [1.5+0.5]
2. a. A blood sample is sent to two different laboratories to be analyzed for cholesterol and results obtained for the concentration (mg/dL) were [3]

<u>Laboratory 1</u> Mean = 243 Standard deviation = 13 Number of experiment = 11	<u>Laboratory 2</u> Mean = 258 Standard deviation = 15 Number of experiment = 11
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Are the standard deviation and mean significantly different at 95% confidence level. [Use $t_{\text{tab}} = 2.086$ and $F_{\text{tab}} = 2.98$]

b. Calculate the gravimetric factor of KClO_4 , K_2O . The substance weighed is given first, then the substance sought. [2]
3. a. Calculate pCu^{2+} at each of the following point in the titration of 50.0 mL of 0.001 M Cu^{2+} with 0.001 M EDTA at pH 11. (a) 0 mL (b) 45 mL (c) 50 mL (d) 55 mL and (e) 60 mL. [3]
b. In which technique, iodimetry or iodometry, is starch indicator not added until just before the equivalent point? Why? [2]
4. a. The glass electrode is commonly used for the pH measurement. Illustrate its working principle and mechanism of electrical conductance across the glass membrane. [3]
b. In precipitation titration of chloride, bromide and iodide with Ag^+ ion, which among these halide ions have largest pX value at the equivalent point ($\text{X} = \text{Cl}, \text{Br}$ or I). Explain briefly. [2]
5. a. Why is high relative supersaturation undesirable in a gravimetric precipitation? Explain with suitable example the precipitation from homogeneous solution. [1+2]
b. How metal ion indicator function in EDTA titration. [2]
6. a. Differentiate between the formality and molarity of solution. Explain with suitable example the characteristics properties of the primary standard solution. [1.5+1.5]
b. What makes a liquid based ion selective electrode specific for one analyte? [2]

SECTION "D"
[5 Q × 6 = 30 marks]

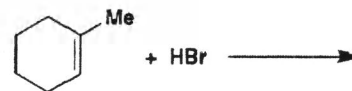
Attempt *ANY FIVE* questions of the following.

7. a. Differentiate between precision and accuracy. Derive an expression for error propagation in determinate error when results are obtained through the multiplication and division. [1+3]
- b. How does the properly chosen indicator change color near the equivalent point in acid-base titration? [2]
8. a. State the purpose of an auxiliary complexing agents in EDTA titration. Illustrate with proper example. [3]
- b. How is drying and ignition carried out in precipitation gravimetric analysis? What information can be achieved from the pyrolysis curve? [1+2]
9. a. Describe the basic principle of polarography. What is the relationship between the concentration of analyte and the diffusion current? [1.5 + 1.5]
- b. Define molar conductivity. Describe in detail the conductometric titration of mixture of strong acid weak acid with weak base. List out any two the advantages of conductometric titration. [1+1.5+0.5]
10. a. How Volhard and Mohr methods differ from each other? Explain with suitable example. [3]
- b. Define ionic strength. What is the fundamental difference between the Debye-Huckel limiting law and extended Debye-Huckel equation? [1+2]
11. a. Name the types of metallic electrodes used in potentiometric titration. Describe in details working principle of electrode of second kinds for Y^{4+} determination. [1+3]
- b. Differentiate between Walden Reductor and Jones Reductor. Give any two examples of each. [1+1]
12. Write short notes [2 × 3 = 6]
- (i) Amperometric titration
- (ii) Direct potentiometry
13. a. 50.0 mL of 0.040 M Sn^{2+} is titrated with 0.080 M Ce^{4+} . Calculate the potential at the equivalent point in the titration. [Use $E_{Sn^{4+}/Sn^{2+}}^0 = 0.15$ V and $E_{Ce^{4+}/Ce^{3+}}^0 = 1.44$ V]. [3]
- b. Explain levelling effect with suitable example. Explain why the 'carbonate error occur' and how it can be minimized in laboratories. [2+1]

11. Acid anhydride on reaction with ammonia produces
 amide carboxylic acid
 amide and carboxylic acid amide and ester
12. Which of the following is not the fibrous protein?
 keratin albumin myosin fibrin
13. Diazonium salt is produced when.....reacts with nitrous acid.
 primary aromatic amine secondary aromatic amine
 tertiary aromatic amine quaternary aromatic amine
14. Ziegler-Natta catalyst is used in
 Free radical polymerization Cationic polymerization
 Anionic polymerization Co-ordination polymerization
15. An aldehyde on reaction with excess of alcohol in presence of acid gives
 ester acetal ketone carboxylic acid

II. Fill in the blanks with appropriate words/symbols.

16. N,N -dimethylaniline has the structural formula as-----.
17. During the nitration of benzene the nitrating mixture (conc. $\text{HNO}_3 + \text{H}_2\text{SO}_4$) produce ----- as an electrophile.
18. -----react with Grignard reagent followed by hydrolysis to produce secondary alcohol.
19. Ethyne when oxidized by KMnO_4 yields ----- as product.
20. The product of the given reaction when carried out in presence of peroxide is-----.



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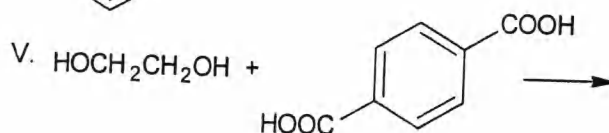
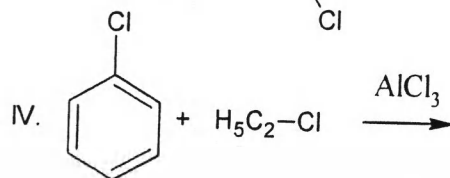
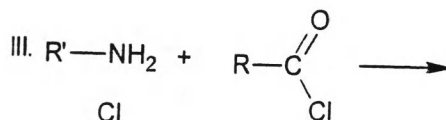
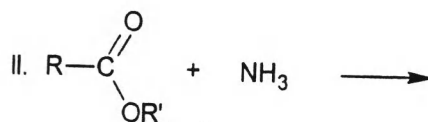
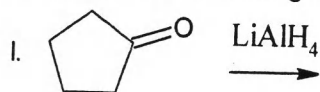
SECTION "B"

Attempt *ALL* questions.

1. a. Draw structural formulas of
- | | | |
|------------------------------|------------------------|-------------|
| i. Ortho-hydroxybenzaldehyde | ii. 2-bromo-3-hexanone | [4 × 1 = 4] |
| iii. Benzophenone | iv. cyclopentanone | |
- b. Write about:
- | | | |
|--------------------------------|----------------|-------------|
| i. Coordination polymerization | ii. Amino acid | [2 × 2 = 4] |
|--------------------------------|----------------|-------------|

2. a. Give product/s for the following reactions.

[5 × 1 = 5]



- b. Write the chemical reactions for followings.
- | | |
|---|---------------|
| i. Benzene is treated with conc. H_2SO_4 | [4 × 1.5 = 6] |
| ii. Methylmagnesiumbromide is reacted with propanal followed by hydrolysis. | |
| iii. Propanone is treated with sodium cyanide then subjected for hydrolysis. | |
| iv. Ethyne is reacted with ozone followed by $\text{Zn}/\text{H}_2\text{O}$ reaction. | |

3. Give appropriate reasons (*ANY FIVE*).
- | | |
|--|--------------|
| a. Secondary amines are more basic than tertiary amines. | [5 × 2 = 10] |
| b. Electrophilic substitution of phenol is favorable at <i>ortho</i> , <i>para</i> position. | |
| c. Amino acids can form dipolar ions. | |
| d. Aldehydes are more reactive than ketones. | |
| e. $\text{S}_\text{N}2$ reaction proceeds with inversion of configuration. | |
| f. Ionic polymerization produces living polymer. | |

4. Write short notes on [2.5 × 4 = 10]
- a. Mechanism of chymotrypsin enzyme action.
 - b. Free radical polymerization
 - c. Oxymercuration –demercuration reaction
 - d. Markovnikov's rule
5. Carry out the following conversion (write down the chemical reactions) [5 × 2 = 10]
- a. Styrene to polystyrene
 - b. Benzene to meta-bromonitrobenzene
 - c. Butanal to its semicarbazone
 - d. Benzene to hexachlorocyclohexane
 - e. Propene to 1,2-dibromopropane
6. Define the followings with appropriate examples (*ANY FOUR*) [4 × 1.5 = 6]
- a. Nucleophiles
 - b. Electrophoresis
 - c. Thermoplastic
 - d. Aromatic compound
 - e. Elastomers