Mid-West University
Examinations Management Office
Surkhet, Nepal
Final Examinations -2079

Bachelor level/ B.Sc /4th Semester — Full Marks: 100
Time: 3 hrs — Pass Marks : 50
Subject : Fundamentals of Chemistry IV (CHEM345)

Candidates are required to give their answer in their own words as far as practicable. The figures in the margin indicate full marks

Inorganic Chemistry

Group –A

Attempt any SEVEN questions **[7x2=14]**

1. Write the general valence shell electronic configurations of transition elements. Give an example of a transition element with electronic configuration.
2. What is atomic radius? How does atomic radius change in a period of the periodic table.
3. Write any two reasons of complex formation by transition elements.
4. Why do Cr, Mo, Cu, Ag, Au and Pd show abnormal electronic configurations?
5. Compare the chemistry of compounds of copper and zinc.
6. Redraw the molecular structure of the following compound and indicate central metal, ligand, co-ordination number and ionization sphere. Name this compound. $[Co(NH_3)_6]Cl_3$
7. Define cis-trans isomerism giving examples.
8. How can we prepare chromyl chloride?
9. Write any two uses of potassium dichromate.

Group-B

10. Describe about the reasons of the formation of coloured compounds of transition elements. [6]
11. Explain Werner`s theory of coordination compounds. Write the limitations of this theory. [4+2]
12. Describe about the preparations, properties and structure of ferrocene. [2+3+2]

OR

Write short notes on:

a. Ziegler-Natta catalyst
b. Bio-inorganic chemistry of iron.

Organic Chemistry

Group –A

Attempt any SEVEN questions **[7x2=14]**

1. Compare the boiling points of carboxylic acid and alcohol of comparable molecular weight.
2. How would you prepare ethanamide from ethanoic acid?
3. Illustrate the benzidine rearrangement with a suitable example.
4. Diethyl malonate is active methylene compound. Give reason.
5. Explain the spectroscopic analysis of amines.
6. What happens when phenol reacts with
   a) Conc.H_2SO_4 b)aq. Br_2
7. Discuss the basicity of 1^0, 2^0, 3^0 amines with one reason.
8. Introduce phenol as antioxidant.
9. What is Gatermann synthesis?

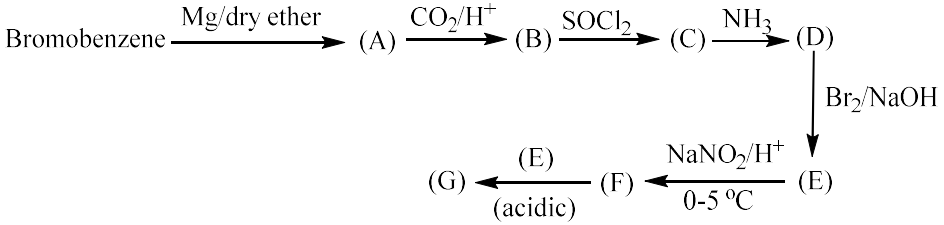
Group-B

10. Synthesize the following compounds [2x3=6]
    a. 2-methylbutanoic acid from malonic ester
    b. Butanone from acetoacetic ester
    c. 1, 4-pentanedioic acid from malonic ester
11. Elaborate the mechanism of methanol with ethanoic acid to form ester. Arrange the following compounds of their increasing boiling point CH_3COOH, $CH_3CH_2CH_2OH$,$CH_3CH_2CH_2CH_3$ [4+2=6]

12. Explain in detail the reaction of the primary, secondary and tertiary amines with nitrous acid. [7 marks]

OR

Identify the compound (A) to (G)



Physical Chemistry

Group –A

Attempt any SEVEN questions **[7x2=14]**

1. What is SHE? Write its limitations.
2. State the principle of Potentiometric titration. Write the advantages of Potentiometric titration over ordinary titration method.
3. Draw a self explanatory diagram for Hydrogen fuel cell and show cell reaction with cell notation.
4. Calculate the equilibrium constant for the given reaction at 25℃.

$$2Ag^{+} + Zn \rightarrow 2Ag^{++} Zn^{++} \quad E^{o}_{Cell} = +1.56V$$

5. Write the criteria thermodynamic spontaneity for a reaction in terms of entropy, free energy and work function.
6. A Carnot engine whose low temperature reservoir at 7℃ has an efficiency of 50%. It is desired to increase the efficiency by 70% by how many degrees show the temperature the high reservoir be increased?
7. How does entropy of a system for ideal gas related with the thermodynamic variables like temperature and volume?
8. What is Inversion temperature? Write mathematical interpretation for Joule-Thomson coefficient.
9. Calculate the work done for the expansion of 50 litres of an ideal gas at 5 atmosphere and 300K to a pressure of 1 atmosphere. ($R = 0.0821$ litre atm K^{-1} mol^{-1})

Group-B

10. Derive the Nernst equation. What concentration of Ag^{+} will the EMF of cell at 25℃ be zero if the concentration of Cu^{++} is 0.1M. (E^{o} for $Cu^{++}/Cu = +0.34V$ and E^{o} for $Ag^{+}/Ag = +0.80V$) [4+2]
11. Derive an expression for the formulation of entropy from Carnot cycle. Also write the significance of entropy. [5+1]
12. What is secondary reference electrode? Construct Calomel electrode with well label diagram. Compare the distinguish feature of Quinhydrous and Glass electrode. [1+3+4]

OR

Prove $T^{\gamma}P^{(1-\gamma)}$ = Constant.

What is the significance of work done in adiabatic reversible expansion?

8 gm of Oxygen at 27℃ and under a pressure of 10 atm are permitted to expand adiabatically and reversibly until the final pressure is 1atm. Find the final temperature and work done in the process. (For Oxygen $Cp = \frac{7}{2}R$)

THE END