Mid-West University

Examinations Management Office

End Semester Examinations-2080

Bachelor level/ B. Sc/ 6th Semester — Full Marks: 100

Time: 3 hours — Pass Marks: 50

Subject: Advance Chemistry IV (CHEM463)

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. Differentiate between inert and labile complex.
2. Define EAN rule.
3. Write the structure of following complex.
   a) $[Co(NH_3)_3Cl_2NO_2]Br_3$ b) $K_4[Fe(CN)_6]$
4. Write the isomer of the $Cr(en)_3$.
5. Define coordination compound with respect to double salt.
6. Write the limitation of valence bond theory.
7. $[Co(CN)_6]^{3-}$ ion is diamagnetic while $[CoF_6]^{3-}$ is a high spin complex. Give reason
8. Write the role of sodium in biological system.
9. Give short acquaintance towards thermodynamic stability of complex.

Group B

10. Explain the postulates of crystal field theory with suitable example. [7]
11. Explain the role of trace element in biological system. Draw the structure of hemoglobin and focus on the importance of iron atom? [6]
12. What are the main assumption of valence bond theory? Relate the valence bond theory with complex compound with suitable example. [6]

OR

Write short notes:

a) Inner orbital and Outer orbital octahedral complex

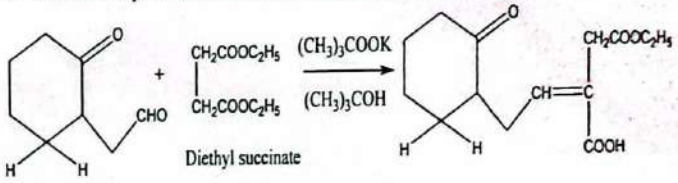
b) Crystal field splitting energy in complex

Organic Chemistry

Group A

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

1. In carbon-carbon bond forming reactions, active methylene compounds (AMC) play vital role. Define such compounds with at least two examples.
2. Sketch the plausible mechanism of the reaction given below.

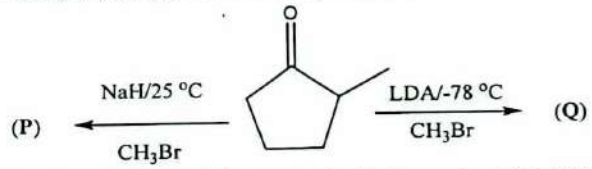


3. What is meant by C-alkylation and O-alkylation?
4. Predict the major products X and Y in the following halogenation reaction.

I. $C_6H_5CH{=}CHCHO \xrightarrow[CH_3COOH]{Br_2} X$

II. $H_2C{=}\underset{\displaystyle CH_3}{\overset{|}{C}}{-}CH{=}CH_2 \xrightarrow[CHCl_3,\ 25\ ^\circ C]{Br_2} Y$

5. Draw the synthetic route of 4-Methylpentan-2-one by acetoacetic ester synthesis.
6. Identify (P) and (Q) in the following reactions.



7. Give the substrate and the reagent for Perkin condensation. Write an example of this reaction.
8. Outline the synthesis of Pentanoic acid from Diethylmalonate (DEM).

9. Longifolene is a naturally occurring tricylic sesquiterpene. Its synthesis involves Michael addition. Give an example of Michael addition reaction.

Group B

10. What are enolates? Explain the thermodynamic and kinetic enolates along with the factors that favour to their formation. [2+3+2]
11. Give your acquaintance with [3.5+3.5]
    a) Friedel Craft acylation
    b) Diels-Alder reaction
12. Discuss aldol condensation (acid and base catalyzed both) [3+3]

OR

What is caryophyllene? Outline its synthesis. [1+5]

Physical Chemistry

Group A

Attempt any SEVEN questions [7x2=14]

1. State that third law of thermodynamics. What is its significance?
2. What do you mean by entropy of mixing?
3. Write down the properties of equilibrium constant.
4. Give the criteria of spontaneity in terms of Gibbs free energy change.
5. How does free energy vary with temperature and pressure?
6. What is the physical significance of work function?
7. Calculate the amount of heat supplied to Carnot cycle working between 150K and 300K, if the work obtained by the cycle is 450J.
8. What is reaction isotherm?
9. Prove that

$$(\partial (\Delta G/T)/\partial T)\, P = -\Delta H/T^2$$

Group B

10. Derive the Gibbs Helmholtz equation. [6]
11. Derive Clausius -Clapeyron equation. What are its applications? [6]
12. Derive an expression for entropy change of an ideal gas when the temperature changes from T_1 to T_2 and pressure changes from P_1 to P_2. Calculate the change in entropy when 2 mole of an ideal gas are heated from 63°C to 273°C at a constant pressure of 1 atm. The molar heat capacity of the gas is $23.7JK^{-1}\ mol^{-1}$ [6+2=8]

OR

State the second law of thermodynamics. Discuss thermodynamic principle of the working refrigerator. [2+6=8]

THE END