

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

Bachelor level/ B.Sc /6th Semester

Full Marks: 100

Time: 3 hrs

Pass Marks : 50

Subject : Advanced 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

Short answer questions (Attempt any SEVEN)

[7x2=14]

1. What do you mean by kinetic and thermodynamic stability of complex?
2. Define EAN rule. Give an example which do not follow EAN rule.
3. Show your acquaintance with crystal field stabilization energy.
4. Differentiate between inner and outer orbital complex.
5. List the role of metal in biological system.
6. Write the structure of chlorophyll.
7. Define petrochemical series.
8. What are essential and trace element used in biological system?
9. How does the VBT account for the fact that $[\text{CoF}_2]^{3-}$ is paramagnetic.

Group B:

Long answer questions (Attempt all questions)

10. Write the postulates of crystal field theory. Write its limitation. [7]
11. Define metallo protein. Draw and explain the structure of Hemoglobin. [6]

OR

- Discuss the biological role of alkaline earth metal.
12. Write short notes on [6]

- i) Geometrical isomerism with example
- ii) Valence bond theory

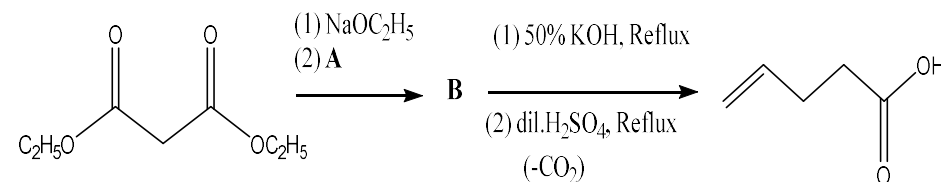
Organic Chemistry

Group –A

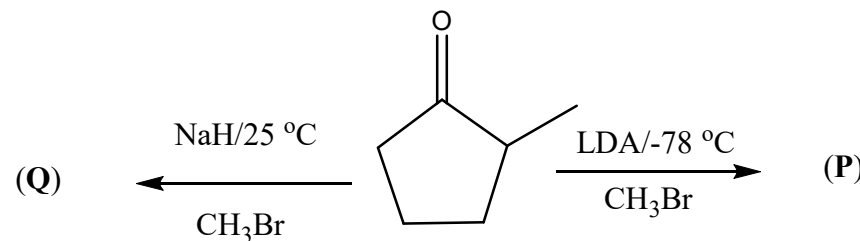
Short answer questions (Attempt any SEVEN)

[7x2=14]

1. What structural feature makes an organic compound an active methylene compound (AMC)? Write any one application of AMC.
2. Draw an enol and an enolate. Mention the condition of their formation.
3. Define halogenation, in broader sense. Write any chlorinating agent.
4. Provide structures for compounds **A** and **B** in the following synthesis.



5. How would you synthesize 3-Methyl-2-pentanone by acetoacetic ester synthesis?
6. Identify (**P**) and (**Q**) in the following reactions.



7. What is Perkin condensation?
8. Outline the steps of Wittig reaction?
9. Longifolene is a tricyclic sesquiterpene. Its synthesis involves Michael addition. Give an example of this reaction.

Group B:

Long answer questions (Attempt all questions)**Group-B**

- Write the mechanism of formation of Enolate ions. What are kinetic enolates and thermodynamic enolates? Mention the factors that favour to their formation. [2+2+2]
- Give your acquaintance with [3+3]
 - Friedel Craft acylation
 - Claisen Schmidt reaction
- Give a detail account of Aldol condensation (acid and base catalyzed both) [1+3+3]

OR

What is caryophyllene? Outline its synthesis.

Physical Chemistry**Group –A****Short answer questions.(Attempt any SEVEN)****[7x2=14]**

- State Third law of thermodynamics. Write the significance of this law.
- What is reaction Isotherm? How can you calculate reaction Isotherm in terms of free energy change?
- Define thermodynamic equilibrium constant. Find the equilibrium constant of the given reaction at 298.15K.

$$\frac{1}{2}\text{N}_2(\text{g}) + \frac{3}{2}\text{H}_2(\text{g}) \rightleftharpoons \text{NH}_3(\text{g}) \quad \Delta G^\circ = -3980 \text{ Cal.}$$
- How does entropy change in ideal gas? Explain
- Prove that decrease in free energy is the measure of net work done reversibly at constant temperature and pressure.
- For acetic acid the melting point at 1atm pressure is 16.61°C, molar heat of fusion is 2800 Cal/mol and molar volume change is 9.614 cc/mole. What will be the melting point at 11 atm pressure?
- Describe the thermodynamic principle of Refrigerator.

- Predict the criteria of spontaneity for a thermodynamic system in terms of entropy change, free energy change and work function change.
- What is the relation between K_p and K_c ? Explain on the basis of fugacity rule.

Group B:**Long answer questions (Attempt all questions)**

- Establish a thermodynamic relation for the entropy of mixing for two different ideal gases. Calculate the entropy of mixing of 1 mole of Oxygen gas and 2 moles of Hydrogen gas, assuming that no chemical reaction occurs and the gas mixture behaves ideally. [6]

- Prove that: $\Delta G = \Delta H + T \left[\frac{\partial(\Delta G)}{\partial T} \right]_p$. Where symbols have their usual meaning. Calculate the free energy change accompanying the compression of 1mole of CO_2 at 60°C from 25 to 300 atm. [4+2]

- Derive a thermodynamic relation for the dependence of entropy on volume and temperature. The molar heat capacity at constant pressure of ammonia gas is expressed by the equation: $C_p = 8.04 + 7.0 \times 10^{-4}T + 5.1 \times 10^{-6}T^2 \text{ Cal/deg/mol}$ Calculate the increase of entropy when 1 mole of ammonia is heated from 25°C to 125°C at constant pressure. [5+3]

OR

Derive Clausius-Clapeyron equation.

At 373.6K and 372.6K the vapor pressure of $\text{H}_2\text{O}(\text{l})$ are 1.018 and 0.982 atm pressure respectively. What is the heat of vaporization of water?

THE END