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 (III) (CHEM461)**

*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. Write about the oxidation states of lanthanides.
2. What is lanthanide contraction?
3. What is plaster of Paris? Write its utility.
4. Give the advantages of optical fibres.
5. Write the significances of Nepali (Lokta) papers.
6. Write in short about the processes of glazing of earthenware's.
7. Draw the structures of the following compounds:
   (a) $H_3PO_4$ (b) $Na_2S_2O_3$
   (c) $N_2H_4$ (d) $N_3H$
8. Write any two chemical properties of $KMnO_4$.
9. Why hydroxylamine sometimes may be regarded as derived from ammonia and sometimes may be regarded as derived from water?

### Group B:

**Long answer questions (Attempt All questions)**

10. How can we separate lanthanides by using ion-exchange method? [6]
11. Describe the manufacture processes of Portalnd cement. [6]
12. Write short notes on :
    (a) pπ-dπ back bonding in phosphorus pentoxide
    (b) Siemon´s ozoniser. [3.5+3.5]

**OR**

(a) Electrolytic preparation of Marshalls acid
(b) Structure of hydrogen peroxide. [3.5+3.5]

## Organic Chemistry

### Group –A

**Short answer questions (Attempt any SEVEN) [7x2=14]**

1. Differentiate between linear and convergent synthesis.
2. What is organic synthesis?
3. Name any two metal hydride reducing agents .What are their roles?
4. What synthons and synthetic equivalent exists for the following molecules?
   a) $CH_3CH_2OH$ b) $CH_3COOH$
5. Define catalytic hydrogenation Also give an example.
6. What is FGI? W
7. Show your acquaintance with stereospecific and stereo selective control elements.
8. Define retron with example.
9. How would you convert alkane into alcohol using Chromium (VI)?

### Group B:

**Long answer questions (Attempt All questions)**

10. Discuss the meaning of protection and deprotection along with their protecting and deprotecting of carboxylic acid and aldehyde functional group . [3+3=6]
11. Explain Wolf-Kishner reduction and Clemmenson reduction with their mechanisms. [3+3=6]
12. What are the principles of Green chemistry? Discuss any five. [2+5]

**OR**

Discuss the oxidation with Mn(VII) with different examples. [7]

## Physical Chemistry

### Group –A

**Short answer questions (Attempt any SEVEN)** **[7x2=14]**

1. What are the factors that affect the intensity of spectral line?
2. What type of molecules gives microwave spectra? Classify the molecules with principal moment of inertia.
3. What is centrifugal distortion constant? Calculate the relative population in the J =1 state for Rotational transition B = 2 $Cm^{-1}$ at 25°C.
4. Why a diatomic molecule can never have zero Vibrational energy?
5. For $N_2O$ molecules, following spectroscopic data are available. Predict the geometry of the molecule.

| Wave number $Cm^{-1}$ | Infra-red | Raman |
|---|---|---|
| 589 | Active(PQR) | Inactive |
| 1285 | Active(PR) | Active(Polarized) |
| 2224 | Active(PR) | Active(Depolarized) |

6. State Born-Oppenheimer approximation for electronic spectra of diatomic molecule.
7. In the photochemical combination of $H_2(g)$ and $Cl_2(g)$ a quantum efficiency of about $1x10^6$ is obtained with a wavelength of 4800$A^o$. How many moles of HCl(g) would be produced under these conditions per calorie of radiant energy absorbed?
8. What is the thermodynamic foundation for Transition state theory in terms of enthalpy, entropy and free energy?
9. Define chain reaction. Write the major steps of chain reaction with example.

### Group B:

**Long answer questions (Attempt All questions)**

10. What is anharmonic oscillator? Describe the anharmonic motion of molecule in terms of Morse curve and write the different energy level. For a molecule BH, $\bar{W}e = 2368\ Cm^{-1}$ and anharmonicity constant $XeWe = 49\ Cm^{-1}$. Calculate the Vibrational terms of the first four Vibrational levels and determine the spacing between them. [1+3+2]
11. Describe the collision theory of bimolecular reaction. Calculate the rate constant for bimolecular Hydrogen Iodide decomposition at 556K for which the observed value of rate constant is $3.5x10^{-7}$Sec $(mole/litre)^{-1}$, energy of activation is 44000 Cal. For Hydrogen Iodide collision diameter is $3.5x10^{-8}$ cm and molecular mass is 127.9 [3+3]

12. a) What is Raman Scattering?
    b) Describe the classical theory of Raman effect based on molecular polarizability.
    c) Explain Vibration-Rotation Raman spectra with well label diagram. [2+3+3]

    OR

    State and explain Franck-Condon Principle. How does this principle explain the intensity distribution of Vibrational structure of electronic bond? Write the applications of electronic spectra. [3+4+1]

**THE END**