



13MY 44 – IV (29)

B.Sc. IV Semester Degree Examination, May 2013  
CHEMISTRY (Paper – IV)

Time : 3 Hours

Max. Marks : 80

- Instructions :** 1) Question paper has **four** Sections. **All** Sections are **compulsory**.  
2) Answer for **all** Sections should be written in the **same** answer book.

SECTION – A  
(Inorganic, Organic and Physical)

1. Answer **any ten** of the following : (10×2=20)
- Define radioactivity.
  - Can lanthanum ion exist in +4 oxidation state ? Justify your answer.
  - $\text{Cu}^{+2}$  ions are coloured and paramagnetic while  $\text{Zn}^{+2}$  ions are colourless and diamagnetic. Explain.
  - What are d-block elements ? Why they are called transition elements ?
  - Name the lanthanides in correct order.
  - Why is  $\alpha$ -hydrogen atom in aldehydes and ketones acidic in nature ?
  - What is Clemmensen reaction ?
  - Give one method of preparation of ester.
  - What are enantiomers ?
  - Why n-propene do not exhibit geometrical isomerism ?
  - What is difference between Helmholtz function and Gibbs function ? Under what condition,  $\Delta G$  becomes equal to  $\Delta A$  ?
  - What is difficulty in determining absolute entropy of a substance ?
  - What are basic components of a spectrometer ?
  - Define degree of freedom.
  - What do you mean by selection rule ?

P.T.O.



SECTION – B  
(Inorganic)

2. Answer **any two** of the following : (2×4=8)
- Explain n/p ratio of nuclear stability.
  - Discuss general properties of 3d-elements with respect to electronic configuration and variable oxidation states.
  - What is lanthanide contraction ? How it causes ? What are its consequences ?
3. Answer **any two** of the following : (2×6=12)
- Explain :
    - Radio active equilibrium
    - Induced radioactivity.
  - Explain the following characters of 3d-elements :
    - Atomic size
    - Ionisation potential
    - Colour and spectra.
  - Explain ion exchange method for the separation of lanthanides.

SECTION – C  
(Organic)

4. Answer **any two** of the following : (2×4=8)
- Give the reactions of
    - Perkins reaction
    - Knoevenagel condensation reaction.
  - Explain the mechanism of base catalysed hydrolysis of ethylacetate.
  - Discuss the geometrical isomerism of maleic and fumaric acid.
5. Answer **any two** of the following : (2×6=12)
- Explain the mechanism of
    - Cannizaro's reaction
    - Mannich reaction.



- b) Give a synthesis of
- i) Monocarboxylic acids
  - ii) Acid chlorides
  - iii) Amides.
- c) Explain :
- i) Asymmetric synthesis
  - ii) Sequence and priority rules.

SECTION – D  
(Physical)

6. Answer **any two** of the following : (2×4=8)
- a) Explain rotational spectra of a diatomic molecule.
  - b) Three moles of an ideal gas undergoes isothermal reversible expansion from 20 to 40 litres at 300 K.  
Calculate work done and entropy change ( $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ ).
  - c) Write a note on Raman spectroscopy.
7. Answer **any two** of the following : (2×6=12)
- a) Derive an expression for vibrational energy levels of harmonic oscillator.
  - b) Derive an expression for the net work done in a reversible cyclic process operating between temperatures  $T_1$  and  $T_2$ .
  - c) Explain :
    - i) Frank-Condon principle
    - ii) Born-Oppenheimer approximation.