This question paper contains **3** printed pages]

SA—01—2025

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

APRIL/MAY, 2025

(CBCS/New Pattern)

CHEMISTRY

Paper–XIV

(Organic & Inorganic Chemistry)

(Monday, 7-4-2025) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. *:—* (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

1. Answer any *three* of the following : 3×5=15

(*a*) Write the postulates of crystal field theory.

(*b*) Define CFSE and calculate CFSE in octahedral complexes having d^4 and d^5 configurations in week ligand field.

P.T.O.

X114Y416BBDX114Y416BBDX114Y416BBDX114Y416BBD

(*c*) Explain the following factors affecting the magnitude of crystal field splitting :

(*i*) Nature of the ligands

(*ii*) Oxidation state of the metal ion.

(*d*) Calculate the spectroscopic ground state term symbol of d^1 and d^4 configuration.

(*e*) Discuss the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion.

2. Answer any *three* of the following : 3×5=15

(*a*) Define and explain the terms.

(*i*) Bathochromic and Hypsochromic shift.

(*b*) Explain equivalent proton with example and predict number of NMR signal of :

(*i*) Acetone

(*ii*) Methanol

(*iii*) Ethyl benzene.

(*c*) Give the synthesis and uses of :

(*i*) Nylon 6, 10

(*ii*) Neoprene.

X114Y416BBDX114Y416BBDX114Y416BBDX114Y416BBD

(*d*) Explain Favorskii rearrangement reaction with mechanism

(*e*) The organic compound with molecular formula $C_4H_{10}O$ shows the following spectral data :

UV : Transparent above λ_{max} = 210 nm

IR : 3315 cm^{-1}, 2975, 2870 cm^{-1} 1150 cm^{-1}.

PMR : δ 1.5 s 9H

δ 4.5 s 1H (exchangeable with D_2O)

Deduce the structure of compound.

3. Answer any *two* of the following : 2×5=10

(*a*) How will you distinguish between Ethane, Ethene, Ethyne by using I.R. spectroscopy ?

(*b*) Explain shielding effect with suitable example.

(*c*) Describe anionic polymerization reaction with mechanism

(*d*) Deduct the structure of compound based on the following PMR spectral data :

Molecular formula : $C_7H_6O_2$

PMR : δ 7.1 – 7.5 M 5H

δ 10.8 S 1H

X114Y416BBDX114Y416BBDX114Y416BBDX114Y416BBD