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NA—10—2023

FACULTY OF SCIENCE

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

NOVEMBER/DECEMBER, 2023

(New/CBCS Pattern)

CHEMISTRY

Paper-XIII (B_1)

(Physical and Inorganic Chemistry)

(Tuesday, 5-12-2023) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

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

(*iii*) Use of logarithmic table and non-functional calculator is allowed.

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

(*a*) Write short notes on :

(*i*) Electron deficient organometallic compounds.

(*ii*) Transition metal organometallic compounds.

(*b*) Write down any *two* methods for the preparation of organolithium and explain the structure of organolithium compound in brief.

P.T.O.

(*c*) Write down any *two* methods for the preparation of ferrocene. Explain the effect of the following on ferrocene :

(*i*) HCHO in liq. HF.

(*ii*) H_2SO_4 in acetic anhydride.

(*iii*) $CH_2{=}CH_2$ in the presence of $AlCl_3$.

(*d*) Write down any *two* methods for the preparation of $Ni(O)_4$. Explain in brief the structure of $Ni(CO)_4$.

(*e*) Define mononuclear and polynuclear metal carbonyls with suitable example.

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

(*a*) Explain isotopic substitution effect on rotational spectra of diatomic rigid rotator with diagram.

(*b*) Calculate force constant of HCl molecule if fundamental frequency is 3.1 cm^{-1} and reduced mass is 1.626×10^{-27} kg.

(*c*) Give the modification of distribution law for association and dissociation of solute in one of the solvent.

(*d*) Explain classical theory of Raman scattering.

(*e*) Define third order reaction and give its characteristics.

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

(*a*) Give the applications of distribution law.

(*b*) Derive third order rate equation for equal concentration.

(*c*) Explain types of electronic transitions.

(*d*) For the distribution of I_2 between CS_2 and H_2O at 25°C, the following data were obtained :

Conc of I_2 in CS_2 (C_1)	41	66	129
Conc of I_2 in H_2O (C_2)	0.100	0.161	0.314

Give comment on molecular state of I_2.