This question paper contains **2** printed pages]

SB—18—2022

FACULTY OF SCIENCE

B.Sc. (Fifth Semester) EXAMINATION

JUNE/JULY, 2022

(CBCS/Old Pattern)

CHEMISTRY

Paper XIII (B1)

(Physical Chemistry and Inorganic Chemistry)

(Wednesday, 8-6-2022) **Time : 10.00 a.m. to 12.30 p.m.**

Time—2½ *Hours* *Maximum Marks*—40

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

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

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

(*a*) What are organometallic compounds ? Explain ionic and covalent organometallic compound with suitable example.

(*b*) How will you prepare organo-aluminium compounds from :

(*i*) Phenyl lithium

(*ii*) Grignard reagent

(*iii*) Organomercury compound

(*iv*) Ethene

(*v*) Alkyl halide.

(*c*) (*i*) Write any *three* methods of preparation of organotitanium compounds.

(*ii*) Explain bonding and structure of organotitanium compound.

(*d*) What are mononuclear metal carbonyls ? Give its characteristics and examples.

(*e*) (*i*) Explain the structure and bonding in $Ni(CO)_4$.

(*ii*) Draw the structure of $Fe_3 (CO)_{12}$.

P.T.O.

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

(*a*) Derive an expression for moment of inertia of diatomic molecule as rigid rotator.

(*b*) Explain Frank-Codon principle with the help of potential energy diagram.

(*c*) The fundamental vibrational frequency of a molecule is 2890 cm^{-1}. Calculate force constant of this molecule.

(Reduced mass is 1.626×10^{-27} kg)

(*d*) Define third order reaction and derive rate equation of third order reaction for equal concentrations.

(*e*) State and explain Nernst distribution law and give its limitation.

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

(*a*) Determine force constant and derive its qualitative relation with bond energy.

(*b*) Discuss electronic transition among the σ, π, and *n* molecular orbital.

(*c*) Discuss kinetics of opposing reactions.

(*d*) When phenol is distributed in water and chloroform gave the following result :

Concentration in Aqueous Solution (C_1)	0.094	0.103	0.254
Concentration in Cloroform (C_2)	0.254	0.761	0.1850

Comment on result ?