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VA—10—2024

FACULTY OF SCIENCE

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

NOVEMBER/DECEMBER, 2024

(CBCS/New Pattern)

CHEMISTRY

Paper–XIII

(Physical and Inorganic Chemistry)

(Monday, 02-12-2024) **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. Answer any *three* of the following : 3×5=15

(*a*) What are organometallic compounds ? Give their classification with examples.

(*b*) (*i*) Write a short note on nomenclature of simple and mixed organometallic compounds with its examples.

(*ii*) Explain transition metal organometallic compound with its example.

(*c*) Give the methods of preparation and properties of organolithium compounds.

P.T.O.

(*d*) What are metal carbonyls ? Give their classification with examples.

(*c*) (*i*) Draw the structure of $Fe_3(CO)_{12}$ and $CO_2(CO)_8$.

(*ii*) Describe polynuclear metal carbonyls with examples.

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

(*a*) Derive the equation for moment of inertia of rigid diatomic rotor.

(*b*) Explain Nernst distribution law when one of solute gets associated.

(*c*) What is third order reaction ? Give characteristics of third order reaction.

(*d*) The fundamental frequency of CO is 2500 cm^{-1}. Calculate force constant of this molecule. The atomic masses are

$12_C = 19.0 \times 10^{-27}$ kg

$16_O = 26.0 \times 10^{-27}$ kg.

(*e*) Explain pure rotational Raman spectra of rigid diatomic molecule.

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

(*a*) Explain effect of isotopic substitution on rotational spectra.

(*b*) Explain $\sigma - \sigma^*$ and $\pi \rightarrow \pi^*$ transition.

(*c*) What are consecutive reactions and opposing reactions ? Explain.

(*d*) Succinic acid was shaken with mixture of water and ether. After the distribution, upon analysis the concentration of acid in two layers was found as follows :

conc. in aqueous layer 0.0252, 0.071, 0.121

(mole lit^{-1})

conc. in ether layer 0.0046, 0.013, 0.022.

(mole. lit^{-1})

Comment on the result. What is molecular state of acid in ether ?