

M. Sc. (CHEMISTRY) EXAMINATION, 2022

(2nd Semester, CBCS)

INORGANIC CHEMISTRY**PAPER – VII**

Time : Two hours

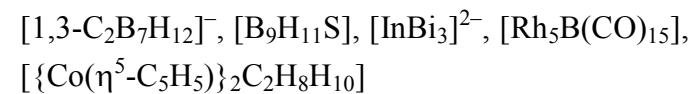
Full Marks : 40

Use a separate answer script for each Unit.**UNIT – 2071 a & b**

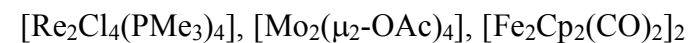
1. a) Calculate the *styx* number and draw the VB structure of the following (**any two**):



- b) Predict the structural type with the aid of Wade's rule (**any three**):



- c) Determine the number of metal–metal bond in the following clusters (**any two**):



- d) Determine the structure of *closo*-parent cluster and number of capping group(s) in $\text{Rh}_7(\text{CO})_{16}^{3-}$ and $\text{RuOs}_5(\text{CO})_{14}(\text{C}_6\text{H}_6)$ 3+3+2+2

2. Answer the following questions:

- a) Describe the binding modes of dinitrogen with metal ions. 2

[Turn over

[2]

- b) Comment on the oxidation state of Ir in dioxygen complex of Vaska's compound, $[\text{Ir}(\text{PPh}_3)_2(\text{CO})(\text{Cl})(\text{O}_2)]$. 2
- c) State the electronic structure of brown ring complex corresponding to the experimental magnetic moment of 3.9 B.M. 2
- d) Outline the mechanism of formation of cyclometalated complexes by C-H activation process. 2

OR

Comment on the linear vs. bent binding mode of NO in metal nitrosyl complexes. 2

- e) Remark on the oxidation state(s) of Ru centres in **Creutz-Taube** complex. 2

UNIT – 2072 a & b

3. a) Predict, with explanation, the expected number of lines in the esr spectra of *any two* of the following: 2×2
- methyl radical ($\dot{\text{C}}\text{H}_3$)
 - pyridine anion radical ($\dot{\text{C}}_5\text{H}_5\text{N}^-$)
 - manganate ion (MnO_4^{2-})
- b) What is zero field splitting? Explain, with an example, its influence on esr activity. 2+2

[3]

- c) What is electron diffraction? Find out the wavelength of electron-wave (in pm) for a 200 kV electron microscope. 1+1
4. a) Write a short note on size-exclusion chromatography (SEC). 3
- b) Define the term (*any two*): $1\frac{1}{2} \times 2$
- Retardation Factor (R_f) in case of paper chromatography
 - Distribution Coefficient in case of solvent extraction
 - Absolute stability constant and apparent stability constant
- c) Calculate the weight of Fe(III) left unextracted from 150 ml of a solution having 500 mg of Fe^{3+} ion in 5 M HCl after three extractions with 15 ml of diethyl ether in each step. [Given: $D=150$]. 2
- d) Mention two analytical reagents used in solvent extraction along with their specific application. 2