Name:

Enrolment No:

UPES

End Semester Examination, December 2024

Course: Organometallic and Bioinorganic Molecules **Semester: 1**

Program: MSc. Chemistry **Time: 03 hrs.**

Course Code: CHEM7063 **Max. Marks: 100**

Instructions:

- Do not wrote anything on the QP except your name and roll number.
- Use of scientific calculator is allowed
- Attempt all the parts of QP in one place only
- Internal choice is available in Q9 and Q11

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	What are ionophores? Give examples of channel forming ionophores along with their mechanism of action.	**4**	**CO1**
Q2	Draw the Tollman's catalytic loop for Wacker process. What are the final products obtained in this reaction?	**4**	**CO3**
Q3	Comment why cis platin is more effective as an anticancer drug as compared to its trans isomer?	**2+2**	**CO2**
Q4	Comment on the following statement "Carboxypeptidase is an important enzyme for the metabolism of proteins".	**4**	**CO1**
Q5	Identify x and y for the metal complex $[Co(NH_3)_x]Cl_y$ so that it obeys the 18-electron rule.	**4**	**CO2**
SECTION B **(4Qx10M= 40 Marks)**			
Q6	Explain how is the oxygen carrying capacity of hemoglobin determined by? a. Cooperativity effect and b. Bohr's effect.	**5+5**	**CO4**
Q7	Nickel forms mononuclear complexes with carbonyl ligand whereas cobalt forms binuclear complexes. Explain with reasons.	**10**	**CO2**
Q8	Discuss the role of oxy-hemoglobin and deoxy-hemoglobin in the exchange of O_2 and CO_2 to the lungs.	**10**	**CO2**
Q9	Illustrate the following: a. Manganese does not form a stable mononuclear carbonyl complex.	**10**	**CO1**

	b. Iron forms pentacarbonyl whereas nickel forms tetracarbonyl complex. **OR** What role does Cytochrome P-450 play in biological systems? Explain.		
SECTION-C (2Qx20M=40 Marks)			
Q 10	a. Arrange the following metal complexes in an increasing order of their νCO bands. Justify your response with appropriate reasons. $[Hf(CO)_6]^{2-}$ $[Re(CO)_6]^{+}$ $[Os(CO)_6]^{2+}$ $[Ta(CO)_6]^{-}$ $[W(CO)_6]$ $[Ir(CO)_6]^{3+}$ b. Which metal complexes are widely used as contrast enhancement agent in MRI? Explain with examples.	**10+10**	**CO4**
Q11	a. Differentiate between the dissociate substitution and associate substitution reactions of metal carbonyls. Write suitable examples. b. Calculate the hapticity of ligands in the following complexes: (i) CH_3MgBr (ii) $(C_2H_5)_4Zn$ (iii) $Ti(OEt)_4$ (iv) $Ti(CH_3)(OEt)_3$ (v) $B(OMe)_3$ (vi) $(\eta^5\text{-}C_5H_5)_2Fe$ (vii) $K[PtCl_3(C_2H_4)]$ (viii) $(\eta^6\text{-}C_6H_6)_2Cr$ **OR**	**12+8**	**CO3**
	The 16 electron dirhodium complex, $Rh_2(CO)_4Cl_2$ can in principle have five structural isomers possible, all having 16 electrons per rhodium center. Draw these isomeric structures. Given that the IR spectra of this compound give bands for νCO in the range of 2012-2086 cm-1 only, and that μ2 bridging is favored over metal-metal bond formation in this complex, predict the most probable structure among the five structural isomers possible.	**20**	**CO4**