Name: **Enrolment No:**	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2025

Course: Inorganic Chemistry-IV **Semester : VIth**
Program: B.Sc. (H) Chemistry **Time : 03 hrs.**
Course Code: CHEM3016 **Max. Marks : 100**

Instructions: ***Read the questions carefully. Question nos. 9 & 11 have internal choice.***

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Determine the electron count for $Mn_2(CO)_{10}$ and explain how the metal-metal bond contributes to the overall count.	**4**	**CO2**
Q 2	Which form of mercury (Hg) is the most toxic? Name the compound responsible for the Minamata disease outbreak in Japan.	**4**	**CO3**
Q 3	Define the term hapticity in organometallic chemistry. Give at least two examples to justify your answer.	**4**	**CO2**
Q 4	Draw the molecular orbital diagram of carbon monoxide (CO). Identify the frontiers molecular orbitals (HOMO and LUMO) in its diagram. Explain the bond order, magnetic behavior, and the polarity of the molecule based on the MO theory.	**4**	**CO2**
Q 5	Illustrate the oxygen-binding curves of hemoglobin (Hb) and myoglobin (Mb).	**4**	**CO3**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Explain the structure and reactions involved in carboxypeptidase and carbonic anhydrase enzymes.	**10**	**CO3**
Q 7	With the help of a diagram, briefly discuss the important role of sodium-potassium pump in our biological system.	**10**	**CO3**
Q 8	Arrange the following carbonyl compounds in order of decreasing CO stretching frequency with proper reasoning:	**10**	**CO2**

	(i) $Mn(CO)_6^+$ (ii) $Cr(CO)_6$ (iii) $V(CO)_6^-$		
Q 9	Discuss the potential treatments for arsenic (As) poisoning in biological systems. Include a brief overview of chelation therapy used in such cases. OR What are the characteristic symptoms of lead (Pb) poisoning in humans? Name the medical tests that can be used to diagnose lead poisoning.	**10**	**CO3**
	SECTION-C **(2Qx20M=40 Marks)**		
Q 10	Define the possible modes in which a drug can interact with DNA? Explain the mechanism of cisplatin-DNA interaction.	**20**	**CO3**
Q 11	With the help of a detailed catalytic cycle, explain how Wilkinson's catalyst facilitates the hydrogenation of alkenes. Discuss the oxidation state changes in the metal center and the nature of intermediates formed during the reaction. OR Discuss π-back bonding in metal complexes. How does it affect CO stretching frequency in infrared spectroscopy? Briefly explain the synergic bonding in $[Ni(CO)_4]$.	**20**	**CO2** **CO3**