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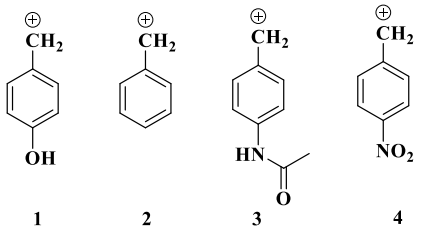
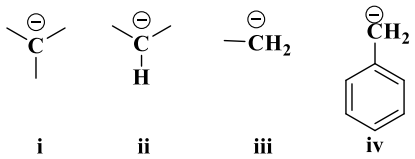
SCHOOL OF ADVANCED SCIENCES
Department of Chemistry
Fall Semester 2023-24
Continuous Assessment Test – I

Course Code: BCHY101L **Duration** : 90 Minutes **Slot : C2+TC2**
Course Name: Engineering Chemistry **Max. Marks :** 50
Class Numbers: VL2023240106245/6249/6253/6259/6273/6277/6281/6285/6289/6293/6535
Faculty Names: Dr. Mohana Roopan S/Dr. Nawaz Khan F/Dr. Manju S L/Dr. Anand Prabu A/ Dr. Sumathi S/Dr. Priyankar Paira/Dr. Rajasekhara Reddy/Dr. Vijayaraghavan R/Dr. Santhakumar K/ Dr. Asharani I.V/Dr. Amit Kumar Tiwari

QN	Answer ALL the questions (5 x 10 = 50 Marks)	Marks	CO	BL
1	Comment on the hybridisation, magnetic character, and spin of the following complexes with a suitable diagram. (a) $[Fe(CN_6)]^{3-}$ (b) $[Co(NH_3)_6]^{3+}$ (c) $[Ni(CN_4)]^{2-}$ (d) $[CoF_6]^{3-}$ **Key: (2.5 marks x 4= 10 marks)** $[Fe(CN_6)]^{3-}$ - d^2sp^3, paramagnetic, High spin $[Co(NH_3)_6]^{3+}$ - d^2sp^3, diamagnetic, Low spin $[Ni(CN_4)]^{2-}$ - dsp^2, Diamagnetic, Low spin $[CoF_6]^{3-}$ - sp^3d^2, paramagnetic, High spin	**10**	CO1	L3
2	Determine whether the complexes listed below follow the 18-electron rule. (a) $Fe(\eta^4\text{-}C_4H_4)(CO)_3$ (b) $[Co(CO)_4]^-$ (c) $HMn(CO)_5$ (d) $Fe(CO)_5$ **Key: (2.5 marks x 4= 10 marks)** (a) $Fe(\eta^4\text{-}C_4H_4)(CO)_3$ - stable and follow 18 electron rule (b) $[Co(CO)_4]^-$ - stable and follow 18 electron rule (c) $HMn(CO)_5$ - stable and follow 18 electron rule (d) $Fe(CO)_5$ - stable and follow 18 electron rule	**10**	CO1	L2
3	(a) A compound is fluorescent in the absence of a specific metal but turns phosphorescent in the presence of that metal. Identify the metal complex and describe its key role. Identification of chlorophyll: 2 marks. Role of Mg in chlorophyll : 3 marks (b) Make the suitable comparison between oxy-hemoglobin and deoxy-hemoglobin. 5 points for comparing blood colour, tensed/relaxed state, magnetic nature, spin, oxidation state of Fe	**(5 + 5)**	CO1	L1
4	(a) Provide the example for the use of coordination complexes in olefin hydrogenation as well as in analytical chemistry. Olefin hydrogenation: 2.5 marks Analytical chemistry: 2.5 marks	**(5 + 5)**	CO1	L4

	(b) Arrange the following carbocations in order of their increasing stability while providing suitable justification.  1 2 3 4 Increasing stability order: Identification: 1>3>2>4 (2 marks) Justification: 3 marks			
5	(a) Write down the stability order for following four different carbanions and justify your answer.  i ii iii iv Stability order: Iv > iii > ii > I (2marks) Justification: 3 marks (b) Give any two factors affecting the stability of free radicals with relevant examples. Any 2 factors which will affect free radicals with examples (each 2.5 marks)	**(5 + 5)**	CO1	L4