B.Sc. 6th Semester (Honours) Examination, 2025 (CBCS)

Subject : Chemistry

Course: CC-XIII

Time: 2 Hours **Full Marks: 40**

The figures in the right hand margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

1. Answer *any five* questions: 2×5=10

(a) What do you mean by essential and beneficial elements? Give one example of each.

(b) What do you mean by hydrolytic enzyme? Give an example.

(c) In chlorophyll, the 'chlorin' ring with Mg(II) is fluorescent, but after incorporation of Mg(II) it becomes phosphorescent.— Explain.

(d) Identify the products in the following reaction:
$Fe(CO)_2(NO)_2 + PR_3 \longrightarrow A + B$

(e) Compare the structures of cisplatin and carboplatin, stating the advancement done in the carboplatin.

(f) Give example of one homogeneous catalyst and one heterogeneous catalyst.

(g) Show the reaction profile of associative mechanism.

(h) Write the significance of the terms ΔG° and $\Delta G^{\neq}$ of a chemical reaction.

2. Answer *any two* questions: 5×2=10

(a) (i) Write briefly the significance of $Na^+ - K^+$ ion pump in biological system. 3

(ii) Count the number of electrons in the following organometallic compounds: 1+1

(A) $\left(\eta^5 - C_5H_5\right)Fe(CO)_2Cl$

(B) $\left[PtCl_3\left(\eta^2 - C_2H_4\right)\right]^-$

(b) (i) C–O stretching frequencies in $Mo(CO)_3(PF_3)_3$ is 2090 cm^{-1} and in $Mo(CO)_3(PMe_3)_3$ is 1945 cm^{-1}. — Justify these observations. 3

(ii) What is the difference between Hydroformylation reaction and Wacker process? 2

(c) (i) Mention the role of carbonic anhydrase in human body. 3

(ii) What do you mean by synergic effect in metal carbonyl compounds? 2

(d) (i) Write the most abundant metallic and non-metallic elements in the human body and mention their major place of existence. 2

(ii) Mention the toxic effects of aluminium and lead. 3

3. Answer *any two* questions: 10×2=20

(a) (i) What is Ziegler-Natta catalyst? Show the schematic representation of polymerisation of ethylene using this catalyst. Mention the special importance of this catalyst. 1+3+1

(ii) Give example of one ionic organometallic compound and one covalent organometallic compound. 2

(iii) Mention the key feature of 16-electron organometallic compound. 1

(iv) Mention the role of magnesium(II) in biological system. 2

(b) (i) How is ferrocene obtained? Depict the acylation and Mannich condensation reaction of ferrocene. 2+3

(ii) During photosynthesis oxygen is formed from which component—water or carbon dioxide? Justify your answer. 2

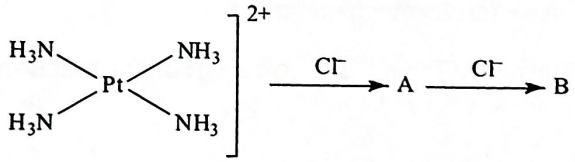
(iii) Explain the term *cis*-effect with suitable example(s). 1.5

(iv) What is Wilson's disease and how it is treated? 1.5

(c) (i) What is Wacker process? Write the overall reaction in the Wacker process. Mention the role of $CuCl_2$ in this process. 1+3+1

(ii) Give a short account on Linear Free-Energy relationship. 3

(iii) Considering *trans*-effect identify the products: 2



(d) (i) What is Fischer-Tropsch process? Name the catalyst(s) used in this reaction. Write the importance of this reaction. 4

(ii) A mechanistic switch over is observed as we move from left to right and top to bottom in a periodic table (associative to dissociative and dissociative to associative). —Discuss. 3

(iii) What is spectator ligand? 1

(iv) Give an example of gold(Au) containing drug and mention its uses. 2

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