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May 2026

B.SC. (CHEM.) VI SEMESTER

Inorganic Chemistry–IV (BCH-601)

Time : 3 Hours] [Maximum Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any **four** questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) Define solubility product and give its significance in qualitative analysis. (1.5)

   (b) What is the common ion effect? (1.5)

   (c) Define hapticity (η) of ligands with two example. (1.5)

   (d) State the 18-electron rule. (1.5)

   (e) Write one method of preparation of metal carbonyls. (1.5)

   (f) Write the formula of Zeise's salt. (1.5)

(g) What is meant by multicenter bonding? (1.5)

(h) What are essential elements? How do they affect function in biological system? (1.5)

(i) What is the role of carbonic anhydrase enzyme? (1.5)

(j) What is the function of Na^+/K^+ pump? (1.5)

PART–B

2. (a) Explain the principles involved in separation of cations into analytical groups. (10)

(b) What are interfering anions? Explain the need for their removal after Group II with examples. (5)

3. (a) Explain the concept of hapticity of organic ligands with suitable examples. (5)

(b) Discuss the preparation, structure and bonding in mononuclear metal carbonyls of 3d metals using VBT. (10)

4. Explain the following in detail: (15)

(a) Structure and bonding in ferrocene.

(b) Aromaticity of ferrocene and comparison with benzene.

(c) Important reactions of ferrocene (acetylation, alkylation, metaliation, Mannich reaction).

5. (a) Describe the structure of methyl lithium (tetramer) and trialkyl aluminum (dimer) highlighting multicenter bonding. (5)

(b) Explain the preparation, structure and bonding of Zeise's salt and discuss the synergic effect involved. (10)

6. (a) Discuss the role of metal ions in biological systems and classify elements based on their biological functions. (10)

(b) Write short notes on toxicity of heavy metals (Hg, Pb, Cd, As) and the use of chelating agents in medicine. (5)

7. Describe the catalytic activity of organometallic compounds with mechanisms of the following industrial processes: (15)

(a) Alkene hydrogenation using Wilkinson's catalyst.

(b) Fischer-Tropsch synthesis.

(c) Polymerization of ethene using Ziegler-Natta catalyst.
