National Open Unversity of Nigeria
Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi - Abuja
Faculty of Sciences
Department of Pure & Applied Science
October/November, 2019 Examination

CHM423: Coordination Chemistry
CREDIT UNIT: 3 Units
TIME: 2 ½ HOURS
INSTRUCTION: ANSWER QUESTION ONE & ANY OTHER FOUR QUESTIONS

Question 1

(a) State (i) Spin rule and (ii) Larporte rule. ***(3 marks; 1 ½ marks each)***

(b) Identify any four contributions of Werner to Coordination chemistry ***(4 marks)***

(c) State the Jahn Teller theory (***1 mark)***

(d) Highlight the main points of the Crystal Field Theory. ***(3 marks)***

(e) What are the factors that determine the shape of complexes? ***(3 Marks)***

(f) Differentiate between an electrolyte and a non-electrolyte complex [2 Marks]

(g) Discuss the advantages and disadvantages of the effective atomic number (EAN) ***(6 marks)***

Question 2

2. (a) (i) Define Lewis acid and base **[2 Marks]**

(ii) Give two examples of compounds that could act as Lewis acid **[1 Mark]**

(iii) What property makes transition metals to act as Lewis acids? **[1 Mark]**

(b) State three of the conclusions made by Werner in his contribution to coordination chemistry. **[3 Marks]**

(c) Explain the term Ligand. **[3 Marks]**

(d) Complete the following table

Complex	Primary Valency	Secondary Valency	Possible Shape
$K_4[Fe(CN)_6]$		6	Octahedral
$[Ag(NH_3)_2]Cl$	+1		Linear
$[Co(NH_3)_4Cl_2]Cl$	+3	6	
$[Cu(H_2O)_6]^{2+}$		6	Octahedral

(½ mark x 4) = (2 Marks)

Question 3

3. (a) (i) Define the term 'Isomerism' in relation to complexes **[2 Marks]**

(ii) State four types of structural isomerism. **[2 Marks]**

(b) Explain the Valence Bond Theory of complexes. **[4 Marks]**

(c) How are coordination compounds formed according to Valence Bond Theory? **[2 Marks]**

(d) What are the two limitations of Valence Bond Theory of complexes? **[2 Marks]**

Question 4

4. (a) (i) Explain the term chelate effect of complexes **[2 Marks]**

(ii) Describe the stability of complexes in term of the chelate effect **[2 Marks]**

(b) Explain with relevant equations three methods of preparing complexes **[6 Marks]**

(c) What is Crystal Field in relation to metal complex? **[2 marks]**

Question 5

5. (a) Explain briefly the Jahn Teller distortion [4 marks]

(b) State any three of the rules for Naming Complexes [3 Marks]

(c) State the industrial application of each of the following complexes:

(i) Rhodium complex

(ii) Cobalt complex

(iii) EDTA complex [3 Marks]

(d) Compare the infrared absorption in inorganic compounds with that of organic compounds. [2 Marks]

Question 6

6. (a) (i) What is physical method of structural investigation? [1 Mark]

(ii) What does physical method of structural investigation involved? [2 Marks]

(ii) State two physical method of structural investigation of complexes. [2 Marks]

(b) State the Spin Rule. [2 Marks]

(c) Explain the three major types of isomerism [3 Marks]

(d) Write the formula of each of the following complexes

(i) bis(oxalato)titanium(IV)

(ii) Potassium dicyanoaurate(I) **[2 x 1 mark = 2 Marks]**