National Open Unversity of Nigeria
Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi - Abuja
Faculty of Science
Department of Pure & Applied Science
2021_1 Examination 1234

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

Question1

Q1. a) Define a coordination compound? (3 marks)

b) Coordination compound is also referred to as coordination complex. Why? (3 marks)

c) What are the two geometries with coordination number 5 and their hybridization? (4 marks)

d) Draw the structure of the compound: bis(tetraaqua-μ_2-hydroxo iron (II)) cation (4 marks)

e) Highlight two main limitations of Crystal Field Theory (CFT) (4 marks)

f) Reaction of $CoCl_3.6NH_3$ with $AgNO_3$ precipitated 3 mole of Cl-

(i) Assign the secondary valence to the metal (1 mark)

(ii) Using square bracket, write complex composition for $CoCl_3.6NH_3$ (3 marks)

Question 2

Q2. a) Highlight any three ways by which composition of reaction can be followed (6 marks)

b) Itemize three techniques used to study reaction kinetics noting their half-life (6 marks)

Question 3

Q3. a) Draw the structures of a pair of complexes that are enantiomers to each other (4 marks)

b) What is a racemic mixture? Hence, why is a racemic mixture not optically active (4 marks)

c) In concise term, describe ionization isomerism (4 marks)

Question 4

Q4. Briefly describe the following and give two examples of each

a) Monodentate ligand (4 marks)

b) Bidentate ligand (4 marks)

c) Ambidentate ligand (4 marks

Question 5

Q5a. Copy and complete the Table below regarding postulated geometry of complex (6 marks)

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

b)

Q5b. Provide the coordination number, hybrid type and shape of the following complexes

a) $[Cu(CN)_5]^{3-}$ (1 ½ marks)

b) $[ZnCl_4]^{2-}$ (1 ½ marks)

c) $[Ag(CN)_2]$ (1 ½ marks)

d) $[HgI_3]^-$ (1 ½ marks)

Question 6

Q6 Write short note on the following crucial phenomenon in metal complexes

a) Jahn-Teller Distortion (4 marks)

b) Far Infrared region (4 marks)

c) Diamagnetism (4 marks)