THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

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MAIN EXAMINATION

SEPTEMBER – DECEMBER 2019 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF CHEMISTRY

REGULAR PROGRAMME

CHEM 301: COORDINATION CHEMISTRY

Date: DECEMBER 2019	**Duration: 2 Hours**
INSTRUCTIONS: Answer Question ONE and any other Two Questions	

Q1. a) What is a complex ion? **(2 marks)**

b) Explain the special feature of the bond between a metal ion and a ligand **(2 marks)**

c) Differentiate the roles of the sulfate ion in the two coordination compounds below

$[Mn(OH_2)_6]SO_4$ and $[Mn(OH_2)_5SO_4]H_2O$ **(4 marks)**

d) Explain the origin of magnetic moment in substances **(3 marks)**

e) Using an ML_4 complex explain the differentiate between overall and stepwise formation constants. **(3 marks)**

f) What is a spectrochemical series? **(3 marks)**

g) The electronic configuration of copper indicated as $[Ar]4s^2 3d^9$ is not correct. Explain.

(3 marks)

h) Name the following ligands CN^- ,H^- and O^{2-}

(3 marks)

i) Using a suitable example, differentiate between d^2sp^3 and sp^3d^2 hybridizations **(3 marks)**

Q2. a) Using suitable examples illustrate your understanding of the following prefixes *cis*, *trans*, *mer*, and *fac*

(10marks)

b) State the two possible names for the complex $[Cr(H_2O)_5Cl]^{2+}$

(6 marks)

c) Explain the Jahn-Teller (J-T) effect.

(4 marks)

Q3. a) Explain the factors that affect crystal field splitting.

(8 marks)

b) Explain the superiority of Ligand Field Theory over Crystal Field Theory **(6 marks)**

c) Differentiate between low and high spin complexes.

(6 marks)

Q4. a) Discuss your understanding of Π-bonding in complexes

(12 marks)

b) Differentiate between the Laporte and the spin selection rules

(8 marks)

Q5. a) Draw the cis and trans isomers for the complex $[MX_4Y_2]$

(6 marks)

b) Explain the meaning of chirality in complexes.

(6 marks)

c) Explain any two main factors that affect the coordination number in coordination compounds.

(4 marks)

d) Discuss the cause of the variable oxidation states of transition metal ions.

(4 marks)

END