UNIVERSITY EXAMINATIONS

FACULTY OF SCIENCE

DEPARTMENT OF NATURAL SCIENCE

END OF SEMESTER FINAL ASSESMENT

SEMESTER 2, 2022/2023

COURSE:	**BACHELOR OF SCIENCE WITH EDUCATION**
YEAR:	TWO
EXAM:	**TRANSTION METAL CHEMISTRY**
SEMESTER:	**II**
DATE:	MAY 19, 2023
TIME:	9:30AM – 12:30PM
DURATION:	**3 HOURS**

INSTRUCTIONS

- This paper consists of ***SEVEN*** questions.
- Attempt any Five (5) Questions
- Begin each question on a fresh sheet of paper.
- All questions carry equal marks.

Question one

(a) Explain the difference between

(i) Transition elements and d-block elements (2 marks)

(ii) Electronic configuration and valence shell configuration (2 marks)

(b) Write the electronic configuration of the following elements and ions

(i) Mn^{2+} (25) (ii) Cu^{+} (29) (iii) Cr (24) (iv) Zn (30)(4 marks

(c) Explain why transition metals:

(i) Exhibit a paramagnetic behavior (2 marks)

(ii) form complex ions (3 marks)

(iii) have almost same ionic radius across the period (3 marks)

(d) Describe four other characteristics of transition metals (4 marks)

Question two

(a)Define the terms and give one example for each

(i) Chelate (2 marks)

(ii) Chelating ligand (2marks)

(b) Explain how the following affect the stability of the chalate

(i) Size of the chelate ring (2marks)

(ii) Steric hindrance (2marks)

(iii) Resonance (2 marks)

(c) (ii) Explain the applications of chelated complexes in analytical chemistry(8 marks)

(ii) State the two naturally occurring chelates and process (2 marks)

Question three

(a) Explain why lanthanides and actinides are called f-block elements (2marks)

(b) Write the actual valence shell electronic configuration of the following lanthanide elements

(i) Lanthanium (La_{57}) (1mark)

(ii) Gadolinium (Gd_{64}) (1 mark)

(iii) Europium (Eu_{63}) (1 mark)

(c) State 6 differences between lanthanides and actinides (6 marks)

(d) Explain the following;

(i) Lathanides and actinides experience lanthanide and actinide contraction(3marks)

(ii) $Lu(OH)_3$ is more basic than $La(OH)_3$ Lu = 71, (3 marks)

(e) State three uses of Lanthanides and their compounds (3 marks)

Question four

(a)Explain the term

(i) Ligand (2 mark)

(ii) π-acid ligands (2 mark)

(ii) Describe how carbon monoxide is used to stabilize Nickel in its zero oxidation states to form $Ni(CO)_4$ (8 marks)

(b) Write the formula of the following compounds (8 marks)

(i) Hexafluroferrate(iii) ion

(ii) Hexaaminenickel(ii) ion

(iii) Aquapentaammine cobalt (iii) nitrate

(iv) Sodium hexacyanoferrete (iii)

Question five

(a) With at least one example, explain the following terms

(i) Ligand (2 marks)

(ii) Chelating ligand (2 marks

(iii) Primary valency (2 marks)

(iv) Secondary valency (2 marks)

(b) Write the names of the following complexes

(i) $[Co(NH_3)_4Cl_2]Cl$ (2 marks)

(ii) $K_4[Fe(CN)_6]$ (2 marks)

(iii) $Ni(CO)_4$ (2 marks)

(c) Explain the application of coordination compounds (6 marks)

Question 6

(a) Define the following as applied to complexes

(i) Double salt (1 marks)

(ii) Central ion (1 marks)

(iii) coordination number (1 marks)

(b) Write the formulas of the following coordination compounds:

(i) Tetraammineaquabromocobalt(III) bromide (2 marks)

(ii) Potassium tetrahydroxyzincate(II) (2 marks)

(iii) Hexaammineplatinum(IV) chloride (2 marks)

(iv) Tetraamminecopper(II) chloride (2 marks)

(c) State the conditions that favor the formation of complex compounds (3 marks)

(d) Explain the different types of structural isomerism in coordination compounds (6 marks)

Question seven

(a) State the assumptions of;

(i) Valence bond theory (3 marks)

(ii) Crystal field theory (3 marks)

(b) The valence shell electronic configuration of iron atom is $3d^6 4s^2 4p^0$. Using valence bond explain the geometry and magnetic nature of ;

(i) $[Fe(CN)_6]^{3-}$ (4 marks)

(ii) $[Fe(CN)_6]^{4-}$ (consider (CN) as a stronger field ligand) (4 marks)

(c) State the limitations of crystal field theory (3 marks)

(d) State three factors that affect stability of the complex compounds (3 marks)

END