



**FEDERAL UNIVERSITY OF
TECHNOLOGY, MINNA
DEPARTMENT OF CHEMISTRY
FIRST SEMESTER EXAMINATION 2021/2022
SESSION**

COURSE TITLE: CHEMISTRY OF THE TRANSITION METALS

COURSE CODE: CHM 515

TIME ALLOWED: 2 HOURS 30 MINUTES

UNIT: 3

**INSTRUCTION: ANSWER QUESTION ONE (1) AND ANY
OTHER THREE (3)**

Q1. a) i. Predict the names, symbols and the condensed configurations for the transition elements with 44 and 76 atomic numbers respectively. (06marks)

ii. State the most stable oxidation state(s) for the elements stated in a (i) above. (02marks)

b) Considering only the HSAB characteristics:

i. Is F^- or CN^- more likely to form insoluble salts with $Au^+(aq)$ ion? (03marks)

ii. Will NCS^- or SCN^- reacts with Cu^{2+} ? (01 mark)

c) Using the Stock system predict the names of the following coordination compounds:

i. $Na_2[RhBr_4]$

ii. $[Cr(NH_3)_6][Co(CN)_6]$

iii. $[Fe(H_2O)_5Cl](OH)_2$ (02 marks each)

d) Give the chemical formula for each of the following;

i. hexaammineiron(II)nitrate

ii. μ - amidobis[pentaamminecobalt(5+)]ion

iii. pentaamminesulphatocobalt(III)bromide (02marks each)

Q2. With relevant examples, discuss linkage isomerism. (12marks each)

Q3. The nature of the ligands is one of the factors affecting the crystal field splitting. Explain. (12marks each)

Q4. a) In a tabular form, classify the elements of the third transition series into hard, soft and intermediate Lewis acids. (05marks)

b) i. State the limitations of Valence Bond approach in explaining the nature of bonding in complexes. (03marks)

ii. Using VBT, predict the hybridization scheme and the geometry of the complex tetracyanonickelate (ii) ion. (04marks)

Q5. Discuss the comparative chemistry of the transition series under the following headings: a) Magnetism b) Metal – Metal bonding (06 marks each)