



NATIONAL OPEN UNIVERSITY OF NIGERIA
UNIVERSITY VILLAGE, PLOT 91 CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESS WAY,
JABI - ABUJA.

FACULTY OF SCIENCES
DEPARTMENT OF PURE AND APPLIED SCIENCE₄₅₆₇₈
SECOND SEMESTER EXAMINATION 2021_2

COURSE CODE: CHM303
COURSE TITLE: INORGANIC CHEMISTRY III
TIME: 2½ HOURS
INSTRUCTION: Answer question one and any other four questions.

QUESTION ONE

(1a) Explain briefly: (i) Why no compounds of He and Ne are known (3 marks) (ii) Why the tendency to form clathrates increase down the nobles gas group (2 marks).

(1bi) What are lanthanides and actinides? Why are they so called? (3 marks)

(1bii) Write the electronic configurations of the following species: Sc^{3+} , Co^{2+} , Y, Ni. (6 marks)

(1c) Discuss the relevance of beneficiation of ores in the processing of metals from their ores. (4 marks)

(1d) Complete the following chemical reactions:



QUESTION TWO

- (2a) The electronic configuration of chromium is $[\text{Ar}]3d^54s^1$; and not $[\text{Ar}]3d^44s^2$. Explain. (3 marks)
- (2b) List ANY TWO important methods of beneficiation; give an example each of ores beneficiated by each method. (4 marks)
- (2c) Discuss the chemical unreactivity of noble gases. (5 marks)

QUESTION THREE

- (3a) In $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ the observed magnetic moment is higher than the predicted value; Explain briefly the reason for this. (4 marks)
- (3b) Describe bronze in terms of composition, specific properties and uses. (5 marks)
- (3c) Complete this reaction:
 $\text{Si}_3\text{H}_{(l)} + 5\text{O}_2(g) \rightarrow 3\text{SiO}_{2(s)} + 4\text{H}_2\text{O}_{(l)}$ (3 marks)

QUESTION FOUR

- (4a) Lanthanides occur in only one oxidation state. What is the oxidation state? Explain the reason for this. (7 marks)
- (4b) Write down the chemical equations for the reactions of lanthanide elements with
(i) water. (ii) acids (5 marks)

QUESTION FIVE

- (5a) State TWO postulates of the Werner's theory. (4 marks)
- (5b) What is radioactivity? Give TWO characteristics of radioactivity. (5 marks)
- (5c) Describe briefly the properties of β -particles. (3 marks)

QUESTION SIX

(6a) (i) What is a ligand? (2 marks) (ii) Discuss briefly the classification of ligands in coordination chemistry (10 marks)