



**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 SCIENCE**  
**FIRST SEMESTER EXAMINATION 2021**

**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 why there is a steady increase in boiling points going down the group of noble gases (5 marks)
- (1b) Predict the molecular geometries of the following compounds:  $\text{XeF}_4$ ,  $\text{XeOF}_4$ ,  $\text{XeO}_4$ ,  $\text{XeF}_6$ . (6 marks)
- (1c) Write the equation for the reaction of a named alkali metal with water. (3 marks)
- (1d) Write the equation for the reaction between iron(II) sulphide and hydrochloric acid. (3 marks)
- (1e) Explain how coordination compounds are Lewis adducts (5 marks)

**QUESTION TWO**

- (2a) Xenon reacts directly with fluorine on heating the gases in a nickel vessel. With the aid of balanced equations, give the possible products of the reactions; and the conditions under which each of the products is formed. (6 marks)
- (2b) What are noble gas clathrates? Discuss the essential condition necessary for their formation? (4 marks)
- (2c) What are rare earth elements? (2 marks)

### QUESTION THREE

(3ai) What is a transition metal? Give two examples (3 marks)

(3aii) Name any two elements that are usually excluded from transition behavior; and explain why. (5 marks)

(3b) Explain briefly why  $\text{CuSO}_4$  is blue while  $\text{ZnSO}_4$  is white (4 marks)

### QUESTION FOUR

(4a) Write short notes on the followings:

(i) Ligand (ii) Coordination number (iii) Chelate (6 marks)

(4b) Calculate in B.M., the magnetic moments expected for  $\text{Ni}^{2+}$  and  $\text{Ti}^{4+}$  (3 marks)

(4c) Discuss the significance of reduction of concentrated ores of metals. (3 marks)

### QUESTION FIVE

5a) Explain briefly the relationship between Valence Bond Theory and formation of coordination compounds. (6 marks)

(5b) Complete these reactions;

i.  $\text{Fe}_3\text{O}_4 + \text{CO} \rightarrow$  (3 marks)

ii.  $\text{FeO} + \text{CO} \rightarrow$  (3 marks)

### QUESTION SIX

6. Differentiate between electrolysis and zone refining as they apply to metal purification. (12 marks)