



National Open University of Nigeria  
Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi - Abuja  
Faculty of Science  
2023 2 EXAMINATIONS

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**COURSE CODE: CHM426**

**COURSE TITLE: Chemistry of lanthanides and actinides**

**CREDIT: 2 Units**

**TIME ALLOWED: 2 Hours**

**INSTRUCTION: Answer Question ONE (1) and any other Three (3) Questions**

**Question 1**

1a. The organometallic compounds of the lanthanoids are dominated by good donor ligands, with complexes of acceptor ligands being rare. Give three reasons for this observation. **5.5 marks**

1b. Write the electronic configuration of the following ions. **4 marks**

- i. cerium(III)
- ii.  $\text{Am}^{3+}$

Hence determine to which series they belong.

1c a. State five general properties of actinides. **7.5 marks**

1d. Briefly explain the term actinide contraction. **5 marks**

1e. How would you account for the increasing difficulty in enriching Uranium? **3 marks**

**Question 2**

2a. Write short note on the catalytic role of lanthanides and the application of actinide in nuclear power stations. **10 marks**

b. State five physical properties of the lanthanide elements. **5 marks**

**Question 3**

3a. Comment on the stability of the various oxidation states of lanthanides. **6 marks**

b. With the aid of electronic configurations, provide at least examples (at least one for each group) of lanthanides that are zero, half and fully filled 4f orbital. **9 marks**

**Question 4**

4a. Highlight three principal ores of lanthanides? **6 marks**

b. Highlight three effects of the lanthanide contraction and state three consequences. **9 marks**