



National Open University of Nigeria
Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi - Abuja
Faculty of Science
2023_2 EXAMINATIONS

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. 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**

Question 5

5a. Comment on the coordination number of lanthanides and provide evidence for the existent of the coordination number of 9. **5 marks**

(b) Illustrate with examples why some lanthanides ions are coloured and others are not coloured. **5 marks**

(c) Why are transition metal ions with zero, partially and completely filled orbital colourless. **5 marks**