

**MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**P.O. Box 972-60200 – Meru-Kenya.**

**Tel: 020-2069349, 061-2309217. 064-30320 Cell phone: +254 712524293, +254 789151411**

**Fax: 064-30321**

**Website:** [**www.must.ac.ke**](http://www.must.ac.ke) **Email:** [**info@must.ac.ke**](mailto:info@must.ac.ke)

**University Examinations 2015/2016**

FOURTH YEAR, FIRST SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE CHEMISTRY

**SCH 2413: F-BLOCK ELEMENTS AND BIOINORGANIC CHEMISTRY**

**DATE: NOVEMBER, 2015 TIME: HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions.*

**QUESTION ONE – (30 MARKS)**

1. Name the principal mineral source from which the following F-block elements can be extracted. (3 Marks)
2. Lanthanum
3. Thorium
4. Uranium
5. What property of lanthanoid complexes make them suitable for use as phosphors on TV screens? (2 Marks)
6. There are strong similarities between the chemical properties of the early d-block organometallic compound and those of the f-block. Discuss. (3 Marks)
7. Why are chemical properties of uranium more varied than those of thorium? (3 Marks)
8. Define each of the following terms; (10 Marks)
9. Bioinorganic chemistry
10. Compartmentalization
11. Metalloprotein
12. Apoprotein
13. Holoenzyme
14. Distinguish between a chelate and microcycle ligands. Give an example in each case.

(4 Marks)

1. Draw structure of:
2. ligand (2 Marks)
3. ligand (2 Marks)
4. Name a vitamin that contains. (1 Mark)

**QUESTION TWO (20 MARKS)**

1. Calcium-binding proteins can be studied using lanthanoids ions (). Compare and contrast the coordination preference of the two types of metal ion and suggest techniques in which Lanthanoid ions should be useful. (8 Marks)
2. Explain why lanthanoids does not form stable complexes with CO and phosphines ligands while their chemistry with halide and amides are extensively explored. (4 Marks)
3. Why is chemistry of thorium and uranium more established than chemistry of other actinoids. (4 Marks)
4. Give two reasons why all lanthanoids ions except () show luminescence, with ( ) and () showing particularly strong emissions. (4 Marks)

**QUESTION THREE (20 MARKS)**

1. Most Lanthanoids are weakly colored and spectra of their complexes generally show much narrower absorption band than those for d-metal complexes. Explain. (4 Marks)
2. Account for the similar electronic spectra of complexes with various ligands and the variations of the electronic spectra of complexes as the ligand is varied. (2 Marks)
3. The M(II) oxidation state is not common among the lanthanoids but a ‘normal’ M(11) chemistry does exist for, and . Write the electron configuration for these species. (6 Marks)
4. Name two lanthanoids that have greatest tendency to deviate from the unusual positive oxidation and correlate this deviation with electronic structure. (4 Marks)
5. Why cerium and Europium were the easiest lanthanoids to isolate before the development of ion-exchange chromatography? (4 Marks)

**QUESTION FOUR (20 MARKS)**

1. With consideration to the most stable oxidation state, give a general balanced equation for the reaction of lanthanoid metal with aqueous acid. (2 Marks)
2. How would you expect the first and second ionization energies of lanthanoids to vary across the series? (2 Marks)
3. Compare and contrast lanthanoids with actinoids. (8 Marks)
4. What are the reasons for the contrasting behaviour of lanthanoids and early actinoids?

(2 Marks)

1. Phosphate is the most abundant small anion in the cytoplasm. what implications does this abundance have for the biochemistry of (2 Marks)
2. Explain the role of transferring in biological system. (4 Marks)