

**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 2016/2017**

FOURTH YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN CHEMISTRY

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

**DATE: December, 2016 TIME: HOURS**



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

**QUESTION ONE - (30 MARKS)**

1. Define the term lanthanoids,Ln. (2 Marks)
2. (i) Identify the principal uses of lanthanoids. (2 Marks)

(ii) Promethium (Pm); z = 61 is justifiably known as a rare element in the lithosphere. Explain. (2 Marks)

1. (i) What is the composition of mischmetal? (2 Marks)

(ii) Explain why mischmetal is used in steel making. (2 Marks)

1. Give the electronic configuration of the following chemical species;
2. La (z = 57) (2 Marks)
3. (Yb, z = 70) (2 Marks)
4. (Eu; z = 63) (2 Marks)
5. Using appropriate balanced chemical equation, demonstrate how the following lanthanoids are obtained from their appropriate halides;
6. Praseodymium (2 Marks)
7. Holmium (2 Marks)
8. The organometallic compounds of the lanthanoids are dominated by donor ligands with acceptor ligands being rarely encountered. Discuss this observation. (4 Marks)
9. Account for the following properties of lanthanoid complexes.
10. Lanthanoid ions are weakly coloured (2 Marks)
11. All lanthanoid ions show luminescence, except for and (4 Marks)

**QUESTION TWO ( 20 MARKS)**

1. Metals are known to play an important function enzyme activity in the biochemical structures;
2. What are enzymes and what role do they play in biochemical reactions?(4 Marks)
3. Define the term metalloenzyme. (2 Marks)
4. The chemical structures responsible for the absorption of electromagnetic radiation during the process of photosynthesis are the chlorophylls. The chlorophylls contain porphyrin-type ligands derived from the basic unit known as porphin.
5. Draw the structure of the porphin unit. (2 Marks)
6. Chlorophylls a,c & d are derivatives of chlorin. Show the molecular structure of chlorin. (2 Marks)
7. In animal life, the transport of oxygen in the body of almost all animals is by a protein molecule known as heme (haem).Illustrate structurally;
8. The coordination of the cation to simplified heme group showing only the nitrogen atoms. (2 Marks)
9. The coordination of cation in the presence of the oxygen molecule being transported. (2 Marks)
10. (i) What are cobalamins? (2 Marks)

(ii) How does the coordination of the cation in Vitamin differ from the coordination of the cation in heme (haem) group? (4 Marks)

**QUESTION THREE (20 MARKS)**

1. Explain the functions of each of the following proteins;
2. Hemoproteins (haemoproteins) (4 Marks)
3. Iron – sulphur proteins (2 Marks)
4. Non-heme (haem) proteins (4 Marks)
5. Metal complexes have been used in the treatment of certain types of cancer. Cis-diamminedichloroplatinum (II), Cis – [Pt (NH3)2 Cl2] is one such metallodrug.
6. Show the molecular structure of the compound named above. (2 Marks)
7. Briefly discuss the interaction of Cis-[ Pt (NH3)2 Cl2 ] with DNA in treatment of cancer. (2 Marks)
8. What challenges have been observed with the use of Cis-[ Pt (NH3)2 Cl2 in the treatment of cancer? (2 Marks)
9. Identify the derivatives of Cis-[ Pt (NH3)2 Cl2 which can be used in the treatment of cancer. (4 Marks)

**QUESTION FOUR (20 MARKS)**

1. Given that the generic representation of lanthanoids is Ln and of actinoids is Ac, show the products of the following chemical reactions;
2. Ln(s) + H2O(l) (2 Marks)
3.  (2 Marks)
4.  (2 Marks)
5.  (2 Marks)
6. Uranium is one of the very few actinoids whose chemical properties can be studied in the laboratory. What are the products of the following reactions of uranium compounds?

 (2 Marks)

 (2 Marks)

1. Briefly explain how a named lanthanoid/ lanthanoid compounds are used in;-
2. Glass industry ( 2 Marks)
3. Metallurgical industry (2 Marks)
4. Television industry (2 Marks)
5. In nuclear reactors (2 Marks)