****

**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2019/2020 ACADEMIC YEAR FOUR**

**SECOND SEMESTER EXAMINATION**

**SCHOOL OF PURE AND APPLIED SCIENCES**

**FOR THE DEGREE OF BACHELOR OF EDUCATION**

**COURSE CODE: CHE 410/410E**

**COURSE TITLE: TRANSITION METAL CHEMISTRY**

**EXAMINATION DURATION: 2 HOURS**

**DATE: 0/02/2020 TIME: 0.00-.00 PM**

**INSTRUCTION TO CANDIDATES**

* **The examination has FIVE (5) questions**
* **Question ONE (1) is COMPULSORY**
* **Choose any other TWO (2) questions from the remaining FOUR (4) questions**
* **Use sketch diagrams to illustrate your answer whenever necessary**
* **Do not carry mobile phones or any other written materials in examination room**
* **Do not write on this paper**

**This paper consists of TWO (2) printed pages *please turn over***

**QUESTION ONE (COMPULSORY)**

1. Give reasons for the following
	1. Most of the compounds formed by transition elements are coloured.
	2. Zn and Cd are normally not considered as transition elements
	3. K2[PtCl6)] is a well-known compound whereas the corresponding nickel compound is not known.
	4. The atomic radii of the 2nd and 3rd transition series elements are almost equal **(12 marks)**
2. How do the following properties vary in the transition elements?
	1. Ionic character
	2. Basic properties
	3. Stability of various oxidation states
	4. Ability to form complexes? **(12 marks)**
3. Write the ionic configuration for the following elements:
4. La
5. Lu **(6 Marks)**

**QUESTION TWO**

1. The chemistry of the first transition series elements shows some significant differences from that of the heavier second and third transition series elements.
	* 1. Briefly describe three of the major differences. **(3 marks)**
		2. Explain why the second and third transition series elements show many similarities in their chemistry **(5 marks)**
2. What are the oxidation states of the transition metal in each of the following?

KMnO4 b) CrO3 c) MnO2 d) Na2Fe2O4 e) Mn2(CO)10 f) Na2CrO4  **(12 marks)**

**QUESTION THREE**

Discuss the d-block elements in the following respects:

1. Electronic configuration
2. Magnetic properties
3. Complex compound formation
4. Catalytic properties **(20 marks)**

**QUESTION FOUR**

1. Suggest three uses of each of the following group 4 metals
2. Titanium
3. Zirconium **(12 marks)**
4. Using a well labeled diagram show the chloride process of TiO2 manufacture  **(6 marks)**
5. Why can’t sulphate process of preparing pigment grade TiO2 use rutile **(2 marks)**

**QUESTION FIVE**

1. State the three main differences with Zr & Hf from Ti.  **(6 marks)**
2. Using a well labeled diagram show the sulphate process of preparing pigment grade TiO2 **(7 marks)**
3. Briefly describe the mechanism involved in the polymerization of an alkene over the Ziegler-Natta catalyst TiCl4/AlEt3. **(7 marks)**