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**GARISSA UNIVERSITY**

**UNIVERSITY EXAMINATION 2020/2021 ACADEMIC YEAR FOUR**

**SECOND SEMESTER EXAMINATION**

**SCHOOL OF 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: 07/10/2021 TIME: 09.00-11.00 AM**

**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 THREE (3) printed pages *please turn over***

**QUESTION ONE (COMPULSORY)**

1. How do the following properties vary in the transition elements? **(12 marks)**
   1. Ionic character
   2. Basic properties
   3. Stability of various oxidation states
   4. Ability to form complexes?
2. Give reasons for the following **(12 marks)**
   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.
3. Suggest three uses of each of the following group 4 metals (**6 marks**)
4. Titanium

**QUESTION TWO (20 Marks)**

1. The chemistry of the first transition series elements shows some significant differences from that of the heavier second and third transition series elements.
2. Briefly describe three of the major differences. **(3 marks)**
3. Explain why the second and third transition series elements show many similarities in their chemistry. **(5 marks)**
4. (ii) What are the oxidation states of the transition metal in each of the following?
5. KMnO4
6. CrO3
7. MnO2
8. Na2Fe2O4
9. Mn2(CO)10
10. Na2CrO4 **(12 Marks)**

**QUESTION THREE (20 Marks)**

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 (20 Marks)**

1. State the three main differences with Zr & Hf from Ti.  **(6 marks)**
2. Using a labelled 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)**

**QUESTION FIVE (20 Marks)**

1. Suggest three importance of each of the following metals **(12 marks)**
2. Hafnium
3. Zirconium
4. Using a labelled 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**)