



MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS 2018/2019 ACADEMIC YEAR SECOND YEAR, SECOND SEMESTER

**SCHOOL OF SCIENCE
BACHELOR OF SCIENCE CHEMISTRY**

COURSE CODE: CHE 2213

**COURSE TITLE: TRANSITION METAL
CHEMISTRY**

DATE: 24/4/2019

TIME: 1430 - 1630 HRS

INSTRUCTIONS TO CANDIDATES

1. Answer Question **ONE** and any other **TWO** questions in section **B**
2. No writing on the Question paper

Question One (20 marks)

- a. Define the following terms **(8 Marks)**
i.Coordination number
ii.Ligand
iii.Chelate
iv.Paramagnetism
- b. Giving examples name any three types of ligands **(6 Marks)**
- c. Briefly describe how you can achieve separation of niobium and tantalums if you are supplied with an ore containing the two elements. **(6 Marks)**
- d. Write own the oxidation state and the electronic configuration of the metal in each of the following ions; $\text{Cu}(\text{NH}_3)_4^{2+}$, TaO_4^{3-} , OsO_4 and ZrOF_3^- (Cu=29, Ta=73, Os=76 and Z=40) **(6 Marks)**
- e. Give the electronic configuration of the following species. **(4 Marks)**
i) Niobium (iv)
ii) Manganese (ii)
iii) Iron (iii)
iv) Zirconium (ii)

Question Two (20 marks)

- a. Briefly explain the following observations;
i. Whereas $\text{Ni}(\text{CO})_4$ is known, $\text{Ca}(\text{CO})_4$ is not known. **(3 Marks)**
ii. When AgNO_3 is added to a solution of NbCl_3 in water only a third of the halide ions is precipitated as AgCl . **(4 Marks)**
- b. Briefly explain why the zinc group of elements (group2) is not classified among transition elements. **(5 Marks)**
- c. Explain why in any given group of transition metals, stability of higher oxidation states increases with increasing atomic number. **(8 Marks)**

Question Three (20 marks)

- a. Explain why TiO_2 is preferred to PbCO_3 and Pb(OH)_2 as white paint pigment. **(4 Marks)**
- b. Describe the sulphate processes of producing pigment grade TiO_2 **(6 Marks)**
- c. Name four other industrial uses of titanium and give a reason for each use. **(4 Marks)**
- d. i) Generally transition metal have high thermal and electrical conductivity, tensile strength, density and melting points. **(4 Marks)**
- ii) Most industrial catalysts are either transition metals or their compounds. **(2 Marks)**

Question Four (20 marks)

- a. State and explain the general trend down the group for each of the following properties in transition elements;
- Density
 - Ionization energy
 - Polarizing power. **(9 Marks).**
- b. Write a balanced and net ionic equation when a solution of $\text{Na}_2\text{Cr}_2\text{O}_7$ turns from orange to yellow on addition of an alkali. **(3 Marks)**
- c. Explain why the third row of the d-block elements have only marginally larger atomic radii than the second row elements. **(3 Marks)**
- d. Explain why metallic tantalum is used to repair badly damaged bones while metallic calcium cannot be used even though bone is a compound of calcium. **(5 Marks)**

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