



# **MAASAI MARA UNIVERSITY**

**REGULAR UNIVERSITY EXAMINATIONS  
2023/2024 ACADEMIC YEAR  
FIRST YEAR SECOND SEMESTER**

**SCHOOL OF PURE APPLIED AND HEALTH  
SCIENCES  
MASTER OF SCIENCE IN CHEMISTRY**

**COURSE CODE: CHE 8105**

**COURSE TITLE: ADVANCED COORDINATION  
CHEMISTRY**

**DATE: 31/1/2024**

**TIME: 0830-1130 HRS**

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## **INSTRUCTIONS TO CANDIDATES**

Answer Question **ONE** and any other **TWO** questions.

### QUESTION ONE

- a) With one example in each case, describe any two types of ligands **(4mks)**
- b) What is the respective central-metal oxidation state, coordination number, and the overall charge on the complex ion in  $\text{NH}_4[\text{Cr}(\text{NH}_3)_2(\text{NCS})_4]$  **(3mks)**  $\text{K}_3[\text{Fe}(\text{CN})_6]$  **(4mks)**
- c) With an example describe coordination isomerism **(4mks)**
- d) Illustrate how the compound  $[(\text{C}_5\text{H}_5)\text{Fe}(\text{CO})_2\text{Cl}]$  obeys the EAN rule **(3mks)**
- e) What is the respective central-metal oxidation state, coordination number, and the overall charge on the complex ion in  $\text{NH}_4[\text{Cr}(\text{NH}_3)_2(\text{NCS})_4]$  **(3mks)**
- f) State the two structures that describe six coordinate compounds **(2mks)**

### QUESTION TWO (20mks)

- a) Account for the fact that  $[\text{Fe}(\text{CN})_6]^{4-}$  and  $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$  are of have different colours in dilute solutions **(4mks)**
- b) Name and explain any two factors that affect insertion reactions **(4mks)**
- c) The following represents a reaction of a coordination compound. The letters are not actual symbols of elements.

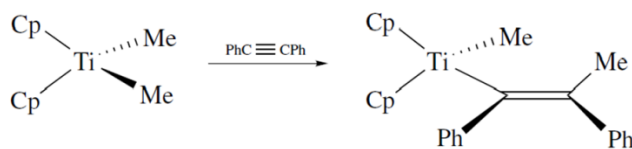


- i) Name the forward and reverse processes

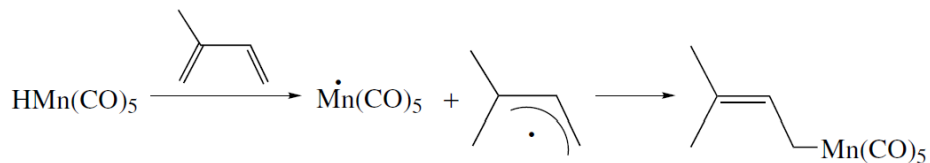
ii) State the effect of the reaction on electron count, coordination number, oxidation state of the metal centre M. **(4mks)**

d) Distinguish 1,1- and 1,2-insertion reactions and name ligands that exhibit these reactions respectively **(2mks)**

e) Describe in detail the type of reaction illustrated below **(3mks)**

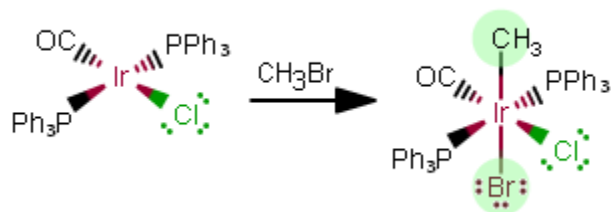


f) Name and describe the reaction illustrated below **(2mks)**



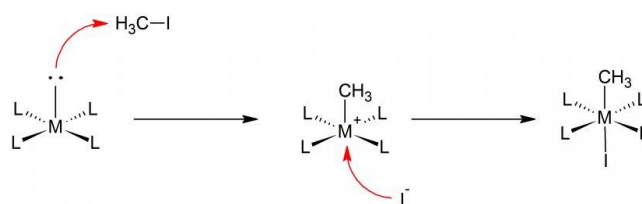
### QUESTION THREE

a) Name the forward and reverse reactions of the following reaction and justify the naming of the forward reaction **(4mks)**

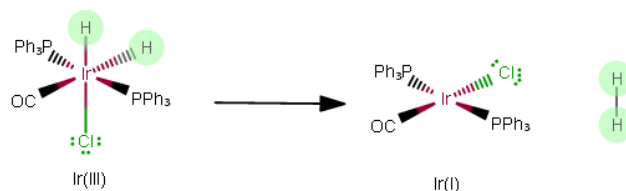


b) Explain any two requirements of the reaction in (a) above **(4mks)**

c) Explain the mechanism in the reaction shown below  
(3mks)



d) Give an elaborate account of the reaction illustrated below (4mks)



#### QUESTION FOUR

a) Distinguish two types of catalysis giving one advantage and one disadvantage of each (5mks)

b) Describe what is happening in the reactions below (3mks)

c) During catalysis by transition metal coordination compounds, hydrogen can undergo activation for hydrogenation. Explain any two ways the hydrogen molecule can undergo activation. (4mks)

d) Discuss the reaction illustrated below (3mks)

