



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2010/2011

INSTITUTIONAL BASED PROGRAMME (IBP) (AUGUST SESSION)

EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE

SCH 502: ADVANCED COORDINATION CHEMISTRY

DATE: Monday 2nd January 2012

TIME: 9.00a.m – 12.00p.m

Instructions to Candidates: Answer ALL

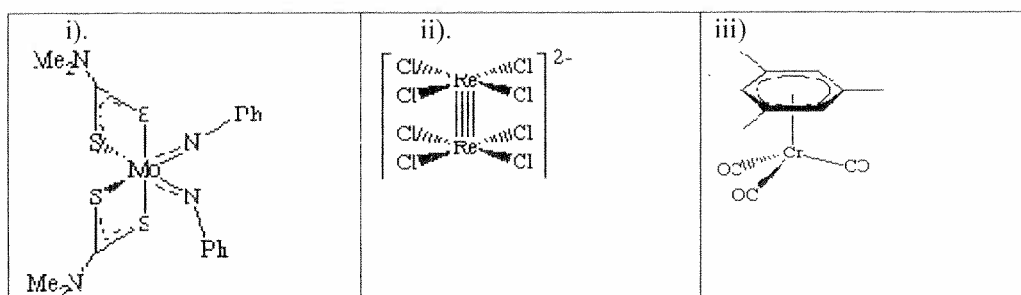
Question 1

- Explain what you understand by the following terms. Cite relevant examples.
 - Coordination entity
 - Chelate effect
 - Coordinatively unsaturated

(6 marks)
- Briefly describe the coordination of CO to transition metals and hence or otherwise explain why it is able to stabilise low oxidation state metal atoms/ions.

(5 marks)
- Describe briefly the changes in chemical characteristics of a given metal ion/atom when coordinated to
 - π -acid ligands
 - π -basic ligands. Give relevant examples in each case.

(6 marks)
- Show the electron counting in the following coordination compounds



(Re = 77, Mo = 42, Cr = 24)

(6 marks)

Question 2

With the help of suitable examples distinguish between

- Insertion and migration reactions.
- Oxidative addition and reductive elimination.

Demonstrate how these are involved in the mechanism of homogeneous hydroformylation of alkenes.

(12 marks)

Question 3

Give an account of the Iridium based Cativaacetic acid process under the following headings:

- i) The catalyst used
- ii) The reactions involved in each step of the mechanism
- iii) Electron count in the steps involving CH_3I uptake and CH_3COI elimination catalytic steps

How does this process differ from rhodium based Monsanto process and why has it replaced it (rhodium based Monsanto process)?

(15 marks)

Question 4

The Fischer-Tropsch synthesis involves the hydrogenation of CO over heterogeneous catalysts. Briefly discuss the three proposed mechanisms that account for the formation of hydrocarbons and oxygenates. From the coordination chemistry point of view, why is it not possible to use natural gas (CH_4) or CO_2 as feed instead of CO?

(20 marks)