



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

FIRST SEMESTER EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE

SCH 502: ADVANCED CO-ORDINATION CHEMISTRY

DATE: Friday 25th November 2011

TIME: 9.00a.m – 1.00p.m

INSTRUCTIONS: Answer All Questions.

1. Give Possible reasons for the following observations and, where applicable, support your answers with balanced chemical equations :-
 - (a) When the first few drops of ammonium hydroxide are added to a solution of nickel sulphate, a light green solid is precipitated. On addition of excess ammonium hydroxide, the precipitate dissolves with formation of deep blue solution. (5marks).
 - (b) Whereas titanium forms all the complexes, $[\text{TiX}_6]^{2-}$ (X= F, Cl, Br, I), copper which is in the same series does not. (5 marks)
 - (c) Whereas iron forms a stable iron carbonyl, namely, $\text{Fe}(\text{CO})_5$, and even derivatives such as the tertiary phosphine complexes of the type, $\text{Fe}(\text{CO})_3(\text{PR}_3)_2$, calcium does not. (5 marks)
 - (d) When chromium(III) chloride, CrBr_3 , is dissolved in water, all the halogens are ionized and yet when tungsten (III) iodide, WI_3 , is dissolved in water, only a third of the halogens are ionized (5 marks).

(Total for Q1....20 marks)

- (2) (a) Explain what you understand by the phrase “Chelate Effect”. (5marks).
- (c) Draw the structure of a general complex formed by the anion ethylenediaminetetraacetic acid and explain why, this anion is such a versatile analytical Reagent. (15 marks)

Total for Q2.....(20marks)

- (3) (a) Give both the raw materials and products in :-
- (i) Fischer –Tropsch Process
- (ii) Ziegler Natta Catalysis. (6marks)
- (b) Choose one of these processes and outline briefly the possible reaction mechanism for the , showing clearly the role of the transition metal.

(14marks)

(Total for Question 3.....20marks).

- (4) (a) Ferrocene behaves as a typical aromatic system in many of its reactions.
- (i) State the necessary conditions for aromaticity (2marks)
- (ii) Give the systematic name for ferrocene (2marks)
- (b) Describe very briefly how a sample of:-
- (i) ferrocene
- (ii) bis(π - cyclopentadienyl)tungstenII), Cp_2W , may be prepared if one is provided with iron and tungsten wires and all reagent one may require.

(16 marks)

- (5) (a) Give examples of any three dinitrogen complexes and outline very briefly how two of them may be prepared. (6 marks)
- (b) Whereas a free dinitrogen molecule, N_2 , cannot be detected using the IR technique, the technique is a standard method in studying dinitrogen complexes. Explain. (4 marks)

During the process of Biological Nitrogen Fixation, it is believed that a dinitrogen molecular is co-ordinated to one of the metals in the enzyme. Describe very briefly a simple experimental that supports this point of view.

(10 marks)

(Total for Q 5...20 marks)