



THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

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MAIN EXAMINATION

MAY – JULY 2015 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF CHEMISTRY

CHEM 400: DESCRIPTIVE CHEMISTRY OF TRANSITION ELEMENTS

SCHOOL FOCUSED PROGRAMME

Date: JULY 2015

Duration: 2 Hours

INSTRUCTIONS: Answer Question ONE and ANY OTHER TWO Questions

- Q1. a) Write an account on the following regarding the 1st, 2nd, and 3rd transition series.
- i Atomic radii. (5 marks)
 - ii Oxidation states. (5 marks)
 - iii Metallic character. (5 marks)
 - iv Ionisation energies (1st) (5 marks)
- b) Give the electronic configuration of the following
- i CU [CU = 29]
 - ii Nb [Nb = 41]
 - iii La [La = 57] (3 marks)
- c) Explain why the electronic configuration of tungsten does not follow the aufbau principle rule [W = 74] (5 marks)
- Q2. a) Define metallic carbonyl. (2 marks)
- b) The stability of a metallic carbonyl depends on the oxidation state of the metal. Explain. (4 marks)
- c) Metallic carbonyls can be classified into two ways

- i State the classifications. **(2 marks)**
ii Using suitable exams describe each classification. **(10 marks)**
- d) State the role of metal chelates in living systems. **(2 marks)**
- Q3. Explain the following observations
- a) A solution of iron (iii) sulphate has a PH less than 7. **(3 marks)**
- b) When a yellow solution is acidified it turns orange, which when reacted with hydrogen peroxide forms an unstable peroxo derivative. **(5 marks)**
- c) MnO_4^- is purple TCO_4^- is dark red and ReO_4^- is white. **(10 marks)**
- d) When copper (II) sulphate solution is added to potassium iodide in the presence of starch solution a blue solution is formed. **(2 marks)**
- Q4. a) Describe the extraction of titanium using the kroll process. **(10 marks)**
- b) Titanium has several uses that depend on the properties of the element and its compounds State FIVE uses of titanium in each case state the physical property of each use indicated. **(10 marks)**
- Q5. The F-block elements exhibit some similarities and differences
- a) Give the general name of each block of elements. **(2 marks)**
- b) State FIVE similarities that exist between the F- block elements. **(5 marks)**
- c) State FIVE differences that exist between the F- block elements. **(5 marks)**
- d) State THREE applications of each block. **(6 marks)**
- e) Describe the impacts of these elements on the environment. **(2 marks)**

END