



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN ANALYTICAL CHEMISTRY (DAC 14S)

ACH 2305 : CHEMISTRY OF TRANSITION ELEMENTS PAPER 1

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2016

TIME: 2 HOURS

DATE: Pick Date Dec 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions

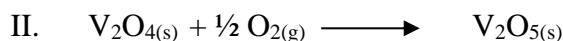
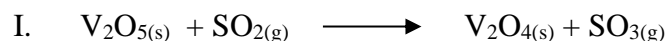
Do not write on the question paper.

Question ONE

1. (a) Calculate the oxidation number of
 - (i) Mn in MnO_3^{2-} (2 Marks)
 - (ii) Fe in FeO_4^{2-} (2 Marks)
 - (iii) Co in $[\text{CO}(\text{NH}_3)_6]^{3+}$ (2 Marks)
 - (iv) Mn in Mn_2O_7 (2 Marks)
- (b) State five differences between Kr($z = 36$) and Zn($Z=30$) (5 Marks)
- (c) Distinguish diamagnetism from paramagnetism and state the cause of each phenomenon (4 Marks)
- (d) List five metals found in dental alloy (5 Marks)
- (e) List eight advantages of potassium dichromate as a reagent in volumetric analysis. (8 Marks)

Question TWO

2. (a) The mechanism of a certain reaction involves the following steps



(i) State the rate played by V_2O_5 , SO_2 and O_2 and give a reason in each case

(6 Marks)

(ii) Determine the equation for the overall reaction

(2 Marks)

(b) (i) State the three principal steps that are carried out to obtain a metal from its ore

(3 Marks)

(ii) For each of the following ores name the metallic element present and give the corresponding formula of the its compound

A. Calcite

(2 Marks)

B. Rutile

(2 Marks)

Question THREE

3. (a) State and explain three factors that influence ionization energy of elements

(6 Marks)

(b) Determine the oxidation state of iron in the following

(i) $[\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}$

(3 Marks)

(ii) $\text{K}_3[\text{Fe}(\text{CN})_6]$

(3 Marks)

(iii) $[\text{Fe}(\text{H}_2\text{O})_6]\text{Cl}_2$

(3 Marks)

Question FOUR

4. (a) State three properties of cations that favour formation of stable complexes.

(3 Marks)

(b) Out of the following pairs of complexes identify the most stable complex and give a reason for your answer

(i) $\text{K}_4[\text{Fe}(\text{CN})_6]$ and $\text{K}_3[\text{Fe}(\text{CN})_6]$

(ii) $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{Co}(\text{NH}_3)_6]^{2+}$

(iii) $[\text{Cu}(\text{en})_2]\text{Cl}_2$ and $[\text{Cu}(\text{NH}_3)_4]\text{Cl}_2$

(iv) $[\text{Co}(\text{NO}_2)_6]^{4-}$ and $[\text{Co}(\text{NO}_3)_6]^{3-}$

(8 Marks)

(c) Identify the transition metal or its compound used as catalyst in the following

(i) Manufacture of polythene

(ii) Decomposition of H_2O_2

(iii) Haber process

(iv) Contact process

(4 Marks)

Question FIVE

5. (a) Give the IUPAC name of the following ligands:-

(i) CN^-

(ii) CH_3O^-

(iii) NH_2^-

(iv) CO

(v) O^{2-}

(5 Marks)

(b) Distinguish homogenous catalyst from heterogeneous

Catalyst and give two examples for each

(6 Marks)

(c) Define the term metalloid and give TWO examples

(4 marks)