TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BTAC

ACH4209 : **Comparative Study of Transition Elements** Type unit name.

Special/Supplementary Examinations

SERIES: AUGUST Pick year

TIME: 2 HOURS

DATE: Pick Date Sep 2017

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

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

Do not write on the question paper.

Question ONE

(a) Write down the electronic configuration for each of the following transition metal atoms and ions:

(i) Cu

(ii) Mn^{2+}

(iii) Cr^{3+}

(iv) Ni^{2+}

(4 marks)

(b) Give the coordination number and the oxidation number of the transition metal in each of the following coordination compounds and complexes:

(i) Na[Co(edta)]

(ii) $K[Ag(CN)_2]$

(iii) $Na_4[Co(C_2O_4)Br_2]$

(iv) $[Cr(edta)]^-$

(2marks each)

(c) Name each of the following compounds according to the IUPAC rules.

Na2[Ni(CN)$_4$]

$[Mn(en)_2I_2]ClO_4$

(2 marks)

(d) Draw the crystal field energy level diagrams for each of the following complexes and indicate the occupancy of the d orbitals.

$[Co(en)_2]^{2+}$ (square planar)

$[FeF6]^{3-}$ (octahedral)

(8 marks)

(e) Give an outline of the extraction of hafnium from HfO_2. **(8 marks)**

Question TWO

Vanadium forms oxides with oxidation states of +2 to +5. Give succinct description of the reactions of the Oxides with sulphuric acid and other reagents leading to the formation of: the oxo- ions; vanadyl, vanadous, and hypovanadous sulphates; and alum; and double salts **(20 marks)**

Question THREE

(a) Explain the meaning of the term transition element**.(3 marks)**

(b) Give an account of the principal physical and chemical properties of the elements in the first transition series **(17 marks)**

Question FOUR

Give an account of molybdenum and tungsten with respect to:

(a) Extraction from their ores **(10 marks)**

(b) Principal reactions **(5 marks)**

(c) Uses (**2 marks)**

(d) Molybdenum and tungsten blue **(3 marks)**

Question FIVE

Give detailed outline of the extraction of cobalt from cobalt glance**.(20 marks)**