



# TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN ANALYTICAL CHEMISTRY (DAC 15S)

ACH 2106: FUNDAMENTALS OF INORGANIC CHEMISTRY

END OF SEMESTER EXAMINATION

**SERIES: APRIL 2016**

**TIME: 2 HOURS**

**DATE:** Pick Date Select Month Pick Year

## 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

1a) Explain the relationship between the atomic size and the ionisation energy (4 marks)

b) The pH of 0.01 mol dm<sup>-3</sup> of ethanoic acid (acetic acid), CH<sub>3</sub>COOH is 3.40 at 25 °C.

What is the dissociation constant of ethanoic acid at this temperature? (6 marks)

c) Explain why alkenes are the only hydrocarbons able to form stereoisomers (4 marks)

d) Draw any two possible isomer using molecules given below and name them

i) Pentane (2 marks)

ii) Heptene (2 marks)

e) Write the equilibrium expression for K<sub>c</sub> and K<sub>p</sub> for each of the following reactions

i)  $\text{CO}_{2(g)} + \text{H}_{2(g)} \rightleftharpoons \text{CO}_{(g)}$  (2 marks)

ii)  $\text{SnO}_{2(s)} + \text{CO}_{(g)} \rightleftharpoons \text{Sn}_{(s)} + 2\text{CO}_{2(g)}$  (2 marks)

f) Define the following terms

i) Ionization Energy (2 marks)

ii) Electron affinity (2 marks)

g) Explain why 2-methylbutane have higher boiling point than 2,2-dimethylpropane (4 marks)

## Question TWO

- Define binding energy and explain the relationship between binding energy and mass deficiency of a nucleus atom (6marks)
- State any four precautions that should be taken against corrosive liquids (4 Marks)
- Find the pH of a solution containing  $0.100 \text{ mol dm}^{-3}$  of ammonia and  $0.0500 \text{ mol dm}^{-3}$  of ammonium chloride given that  $K_a$  value for the  $\text{NH}_4^+(\text{aq})$  is  $5.62 \times 10^{-10} \text{ mol dm}^{-3}$  (5 marks)

## Question THREE

- State any six common source of hazards encountered in the laboratory (3 marks)
- Explain any FOUR sources of hazards mentioned above can be prevented (12 marks)

## Question FOUR

- a buffer solution containing  $0.10 \text{ mol dm}^{-3}$  of ethanoic acid and  $0.20 \text{ mol dm}^{-3}$  of sodium ethanoate calculate its pH given  $K_a$  for ethanoic acid is  $1.74 \times 10^{-5} \text{ mol dm}^{-3}$ . (7marks)
- Chlorination of methane is a chain reaction give equation for
  - the chain initiation step (2 marks)
  - two equation for chain propagating steps (2 marks)
  - three equation for chain terminating step (3 marks)
  - formation of the least chlorinated methane (1 marks)

## Question FIVE

Describe the periodic trend of the following giving reason in each case

- Ionization energy (3 marks)
- Electronegativity (3 marks)
- melting point (3 marks)
- Atomic radius (3 marks)
- Reactivity (3marks)