THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A constituent of JKUAT)

Faculty of Applied and Health Sciences

DEPARTMENT OF PURE AND APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF TECHNOLOGY IN APPLIED CHEMISTRY THREE YEAR

ACH 4310: SPECIAL ANALYTICAL TECHNIQUES

SPECIAL/SUPPLEMENTARY EXAMINATION

February 2013 SERIES 2 HOURS

Instructions to candidates:

This paper consist of **FIVE** questions

Answer question **ONE** (compulsory) any other **TWO** questions

Question ONE

a) Define the following terms
   (i) Limiting current
   (ii) Amperometry
   (iii) Biosensor **(6marks)**

b) Using an example explain the meaning of electrode of the first kind? **(4marks)**

c) Draw a schematic diagram of an ion-selective electrons **(5marks)**

d) Describe the basic components of an XRf instrument **(8marks)**

e) List the names of detectors used in radiochemical methods of analysis. **(4marks)**

f) How do we improve S/N in analytical instruments **(3marks)**

Question TWO

a) Define thermal analysis **(2marks)**

b) Name the two common TGA instruments **(2marks)**

c) List FOUR major applications of thermal analytical techniques. **(6marks)**

d) Give advantages and disadvantages of glass membrane electrodes. **(10marks)**

Question THREE

a) Describe the interferences encountered when using ion-selective electrodes **(6marks)**

b) Explain how a pH electrode work **(4marks)**

c) Given that at room temperature:

R = $8.316\ J^{-1}mol^{-1}Ka$

F = $96500Cmol^{-1}$

Calculate the standard potential for the reaction

$Ag_3ASO_4(g) + 3e \longrightarrow 3Ag(s) + ASO_4^{2-}$

For Ag_3ASO_4 $K_{SP} = 1.2 \times 10^{-22}$ **(5marks)**

d) Briefly describe how qualitative and quantitative analysis is carried out in polarography. **(5marks)**

Question FOUR

a) Give the major components of electron spectroscopy for chemical analysis **(12marks)**

b) List the advantages and disadvantages of mercury dropping electrode compared to platinum or carbon electrodes **(8marks)**

Question FIVE

a) Define the term:-

(i) Half life **(2marks)**

(ii) Radio tracer **(2marks)**

b) How is isotope dilution analysis carried out **(4marks)**

c) What are the advantages of istoped dilution method **(4marks)**

d) The 'cabalt treatments' used in medicine to arrest certain types of concern rely on the ability of gammer rays to destroy cancerous tissue. Cobalt-60 decays with the emission of beta parties and gamma rays, with a half-life of 5.27 years.

$${}^{60}_{27}CO \rightarrow {}^{60}_{28}N : + {}^{0}_{-1}\beta + {}^{0}_{0}\alpha$$

How much of a 3.42µg sample of cobarl-60 remains after 30.0 years. **(6marks)**