



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BTAC, Y2S1

ACH4310: SPECIAL ANALYTICAL TECHNIQUES

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 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. Answer question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question one

- a) Briefly discuss the following terms:
- Isotope dilution (3 marks)
 - Glass electrodes (3 marks)
 - Potentiometric titration (3 marks)
- b) Briefly explain the principles behind differential thermal analysis, DTA. (6 marks)
- c)
- Define the following terms as are used in kinetic methods of analysis: (8 marks)
 - First order reaction
 - Pseudo-first order
 - Enzyme
 - Substrate

- ii. Calculate the time required for a first order reaction with $K = 0.05005^{-1}$ to proceed to 99% completion. (7 marks)

Question two

- a) Outline the major differences between anodic stripping voltammetry and cathode stripping voltammetry. (8 marks)
- b)
- What is polarography? (2 marks)
 - Give four advantages of using dropping mercury electrodes (DME) in polarography. (4 marks)
 - Outline the types of current involved in polarography. (6 marks)

Question three

- a)
- What is x-ray spectroscopy? (2 marks)
 - Outline four ways in which x-rays can be generated. (6 marks)
- b)
- Briefly describe four methods used to sample surfaces for analysis. (9 marks)
 - Explain the principles behind spectroscopic surface studies. (3 marks)

Question four

- a)
- State the three factors that characterize a radionuclide. (3 marks)
 - Gamma rays lose energy on passage through matter. Give three mechanisms by which this happens. (3 marks)
- b) A sample gave a counting rate of 200cpm in a 10 min counting period. The background gave a counting rate of 40cpm in a 5 min counting period.
- What is the fractional error of the sample corrected for background when it is desired to achieve a 0.95% error?
 - How much time should be to counting the sample and the background individually? (14 marks)

Question five

- a) Give five advantages or disadvantages of ion-selective electrodes. (10 marks)
- b)
- What is the fundamental requirement of coulometric analysis? (3 marks)
 - Briefly discuss the instrumentation of controlled-potential coulometry. (3 marks)

iii. Give an application of controlled-potential coulometry. (4 marks)