



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BTAC, Y2S1

ACH4310: SPECIAL ANALYTICAL TECHNIQUES

SPECIAL/SUPPLEMENTARY 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) Differentiate between controlled-current coulometry and controlled-potential coulometry. (4 marks)
- b) Discuss the following process in voltammetry methods:
 - i. Electrodeposition
 - ii. Stripping (4 marks)
- c)
 - i. Define pseudo-first order reaction? (4 marks)
 - ii. Define the following terms as used in kinetic methods of analysis: (9 marks)
 - Activators
 - Rate laws
 - Inhibitors
- d) Discuss the properties of ion-selective electrodes. (9 marks)

Question two

- a)
- i. Define thermal methods of analysis? (2 marks)
 - ii. Briefly explain how a thermal decomposition curve/thermogram is obtained. (4 marks)
 - iii. Write short notes on a beta particle. (5 marks)
- b)
- i. What order rate law does the decay of a radionuclide follow? Write the formula. (3 marks)
 - ii. Give the characteristics; half-life, natural abundance and major radiation of : (6 marks)
 - ^{14}C
 - ^{24}Na
 - ^{32}P

Question three

- a) Give a brief summary of the quantity measured and the typical application of the following thermal techniques: (10 marks)
- i. Differential scanning calorimetry (DSC)
 - ii. Differential thermal analysis (DTA)
 - iii. Thermo-gravimetric analysis (TGA)
- b) Discuss differential scanning calorimetry. (10 marks)

Question four

- a) Outline the problems that may arise in any measurement of radioactivity. (10 marks)
- b) Give five advantages of potentiometric titrations over indicator methods. (10 marks)

Question five

- a) In polarography, what are the advantages of the dropping mercury electrodes? (10 marks)
- b) Discuss any **TWO** factors given below which affect the current-voltage curve: (10 marks)
- i. Residual current
 - ii. Migration current
 - iii. Diffusion current
 - iv. Kinetic current