



Technical University of Mombasa

Faculty of Applied and Health Sciences

DEPARTMENT OF PURE AND APPLIED SCIENCES

DIPLOMA IN ANALYTICAL CHEMISTRY

(DAC 11M)

ACH 2309 : CHEMICAL ANALYTICAL METHODS III

SEMESTER: EXAMINATIONS

SERIES: DECEMBER 2013

TIME: 2 HOURS

INSTRUCTIONS:

You should have the following for this paper

- *Answer booklet*

This paper consists of **FIVE** questions.

Answer Question **ONE (compulsory)** and any other **TWO** questions

This paper consists of 3 PRINTED pages

Question ONE

- (a) Briefly explain any TWO factors affecting thermol analysis method (4marks)
- (b) A solution contain 1g of iodine dissolved in 20cm³ of potassium iodine solution. If the solution is shaken with 20cm³ of organic solvent (CCl₄) how much iodine is transferred into the organic solvent layer given partition co-efficient of iodine between water and CCl₄ at 25°C is 85 (4marks)
- (c) State any FOUR properties of an ideal precipitating reagent (4marks)
- (d) Differentiate between differential scanning calorimeter (DSC) and thermo gravimetric analysis (TGA) (4marks)
- (e) State any THREE limitation of using filter acid (3marks)
- (f) Define the term coagulation and crystallization (3marks)
- (g) Explain the effect of ZnCl₂ additives on membrane permeability (4marks)
- (h) Differentiate between glass transition temperature and thermal transition temperature (4marks)

Question TWO

- (a) Explain any FOUR factors affecting the nature and purity of crystals formed during precipitation (12marks)
- (b) State any THREE types of impurity which may be present in a precipitate (3marks)

Question THREE

Describe how differentiae scanning calometry (DSC) technique is used to study the behavior of polymer when subjected to heat (15marks)

Question FOUR

- a) Describe the procedure of solvent extraction (6marks)
- b) State any FOUR properties of an ideal washing liquid (4marks)
- c) Explain how filterability of a precipitate can be improved (5marks)

Question FIVE

A sample of 17.61ms CaC_2O_4 was heated from room temperature to 1000°C at a rate of 20°C per minutes, volatile product was lost in three step, loss of 2.17mg from $100\text{-}250^\circ\text{C}$, 3.38mg from $350\text{-}550^\circ\text{C}$ and 5.30mg from $600\text{--}8090^\circ\text{C}$

- a) Using the above information draw the thermogram of $\text{CaC}_2\text{O}_4\cdot\text{H}_2\text{O}$ (6marks)
- b) Calculate percentage loss of volatile product in each step (6marks)
- c) In each step in themogram, identify the volatilization product and solid residue that remain (3marks)