



# 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

## ACH 4309 : DRUG ANALYSIS

SPECIAL/SUPPLEMENTARY EXAMINATION

FEBRUARY 2013 SERIES 2  
HOURS

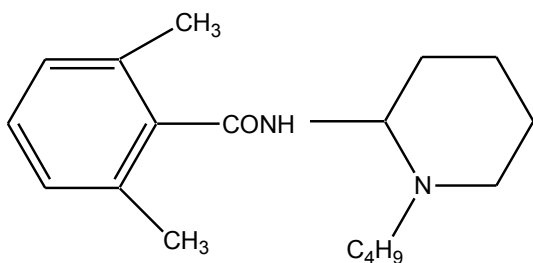
Instructions to candidates:

This paper consist of **FIVE** questions

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

### Question ONE

- a) Define the following terms (6marks)
- (i) Centrifugation
  - (ii) Retention time
  - (iii) Enzyme mutipured immunoassay (EMIT)
- b) State FOUR conditions that determine vetention times in HPLC (4marks)
- c) Using equation explain the principle behind Karl-Fishcher titration and its importance in pharmaceutical analysis (5marks)
- d) List THREE components of the EMIT assay method (3marks)
- e) (i) List any TWO applications of mass spectrometry in drug analysis (2marks)
- (ii) Consider the drug bupiracaine below. Its mass spectrum showed a base peak at  $m/z$  140. Account for the fragment giving the mass unit (4marks)



- f) (i) Name TWO substances used as stationary phases in TLC **(2marks)**
- (ii) State the stationary and the mobile phase in each type of chromatography below
- I. TLC
  - II. Column
  - III. Gas
  - IV. HPLC **(4marks)**

### Question TWO

- a) An infusion stated to contain 0.95% w/v NaCl was diluted so that its Na content could be determined by flame photometry. The following dilutions were carried out:
- (i) 10ml of the sample was diluted to 250ml with water
  - (ii) 10ml of the diluted sample was further diluted to 200ml with water.
- The sample was found to contain 0.74mg /100ml of Na calculate the % w/v of NaCl in the infusion **(6marks)**
- b) State FOUR applications of UV-Vis spectroscopy in pharmaceutical analysis **(4marks)**
- c) State THREE differences between solid-phase and liquid-liquid extraction techniques. **(6marks)**
- d) List any FOUR methods of detecting compounds on a TLC plate following its development with a mobile phase. **(4marks)**

### Question THREE

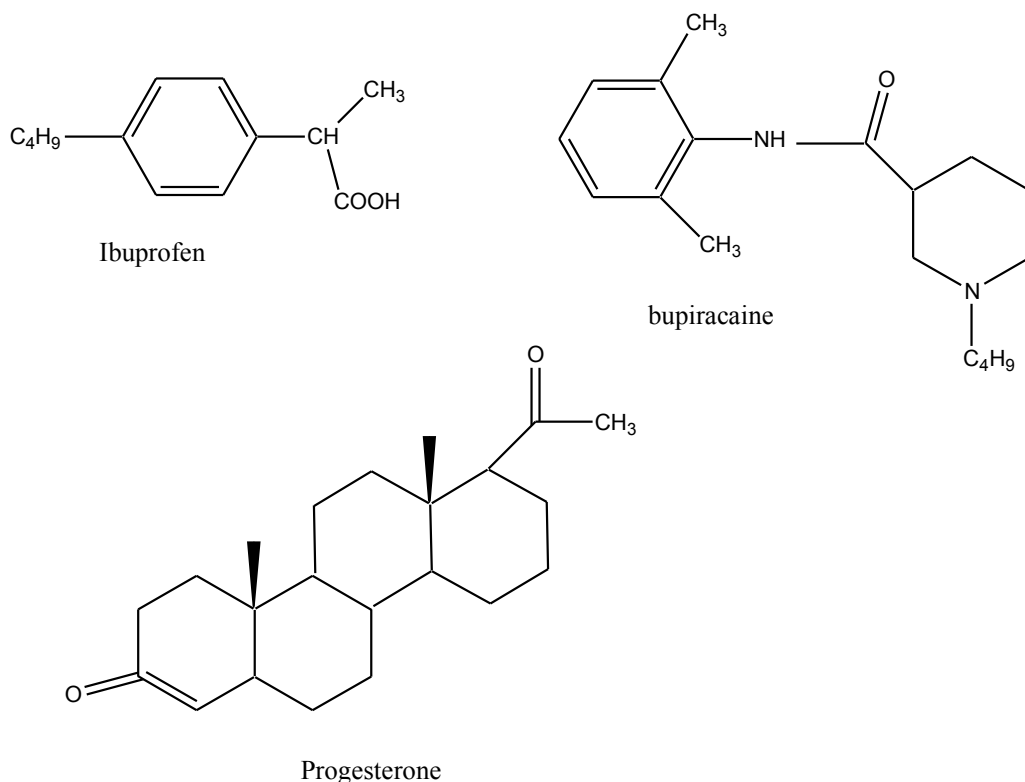
- a) List any TWO advantages of liquid-liquid extraction **(2marks)**
- b) List FOUR limitations of GC in drug analysis **(4marks)**

- c) State THREE applications of NMR spectroscopy in drug analysis **(3marks)**
- d) State THREE differences between normal and reverse phase as used in HPLC **(6marks)**
- e) Consider the following compounds. Rank them in the order of their retention times from lowest to highest on a DEGS-GC column. Explain your reasoning **(5marks)**

Compound	Boiling point (°C)
Propionic acid	141
2-Hexanol	140
Ethylpropanoate	142
3,4-dimethylheptane	140

#### Question FOUR

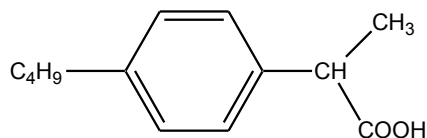
- a) List FOUR factors to be considered when choosing a solvent system for an acid-base extraction **(4marks)**
- b) Consider the following drugs mixture. Using a flow chart, describe how each drug would be separated and isolated based on its acid-base properties **(8marks)**



- c) A neutral compound has a partition coefficient of 5 between ether and water.
- (i) Define the term partition co-efficient **(2marks)**
  - (ii) What % of the compound would be extracted from 10ml of water if:-
    - (I) 30ml of ether were used to extract the compound
    - (II) Three 10ml volumes of ether were used in succession to extract the compound. **(6marks)**

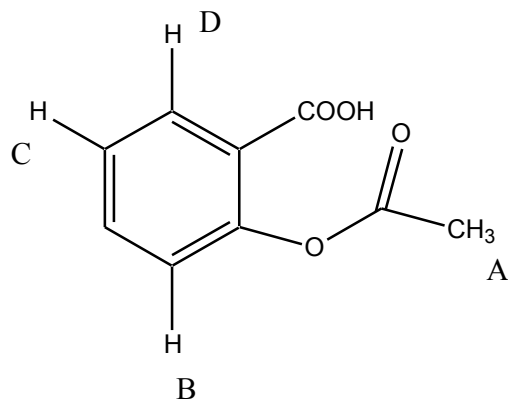
### Question FIVE

- a) Explain fully using equations diazotization titration and state its importance in drug analysis. **(4marks)**
- b) Differentiate between complexometric titrations and redox titrations. **(4marks)**
- c) Consider the drug ibuprofen below
  - (i) Draw the structure of the ionized form at pH = 7.0 **(2marks)**
  - (ii) Calculate its % ionization at pH = 7.0 **(4marks)**



$pK_a = 4.4$

- d) Consider the analgesic aspirin below
  - (i) How many H-NMR and  $^{13}O$ -NMR peaks can be observed? **(2marks)**
  - (ii) Predict the multiplicity of protons A,B,C and D **(4marks)**



Aspirin