



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)
(A Centre of Excellence)

Faculty of Applied & Health Sciences

DEPARTMENT OF PURE & APPLIED SCIENCES

DIPLOMA IN INDUSTRIAL MICROBIOLOGY TECHNOLOGY

ACH 2203: INSTRUMENTATION

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: OCTOBER 2012

TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- Answer Booklet

This paper consists of **FIVE** questions

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

This paper consists of **THREE** printed pages

Question One (COMPULSORY – 30 Marks)

- a) A buffer solution was made by adding 3.28g of sodium ethanoate into 1dm³ of 0.01m ethanoic acid. Calculate PH of the buffer solution.

Take $k(\text{CH}_3\text{COOH}) = 1.7 \times 10^{-5} \text{ mol dm}^{-3}$ (5 marks)

C = 12, O = 16 H = 1

- b) Draw structures to show a protein molecule in the following condition.
i) Neutral condition
ii) Alkali condition
iii) Acidic condition (3 marks)
- c) Give reasons why protein form colloidal suspension instead of true suspension. (4 marks)
- d) List **SEVEN** general functions of protein in the body. (7 marks)
- e) Define the following terms and give an example in each case where possible.
i) Iso electric point
ii) Chiral carbon
iii) Conjugated protein
iv) Prosthetic group (6 marks)
- f) Differentiate between Fibrous protein and globular proteins. (5 marks)

Question Two (20 Marks)

- a) List **FOUR** types of paper that are used in paper chromatography. (4 marks)
- b) State **FOUR** advantages of using small particle size of adsorbent in HPLC. (4 marks)
- c) How is HPLC different from TLC (4 marks)
- d) Differentiate between the following:
i) Polar and non-polar amino acids
ii) Acidic and basic amino acids
iii) Primary and quaternary structures of proteins (8 marks)

Question Three (20 Marks)

- a) Briefly discuss the following types of chromatographic techniques:
i) Reverse phase
ii) Normal phase
iii) Ionic exchange (14 marks)

b) Briefly explain the **THREE** problems that are associated with TLC. (6 marks)

Question Four (20 Marks)

a) Define the following term molar absorptivity (2 marks)

b) Explain the source of 3 kinds of emission spectra (6 marks)

c) Discuss briefly the main components of a spectrophotometer (12 marks)

Question Five (20 Marks)

a) State:

(i) **SEVEN** disadvantages of using moving boundary electrophoreses (7 marks)

(ii) **TWO** types of buffers that are used in electrophoreses (4 marks)

b) Define an acid and a base according to the following theories:

i) Arrhenius theory

ii) Bronsted Lowry Theory

iii) Lewis Theory (6 marks)

c) Give **THREE** examples of detectors that are used in chromatographic techniques. (3 marks)