



MACHAKOS UNIVERSITY
University Examinations for 2022/2023 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES
DEPARTMENT OF BIOLOGICAL SCIENCES
FOURTH YEAR SUPPLEMENTARY/SPECIAL EXAMINATION FOR
BACHELOR OF SCIENCE IN ANALYTICAL CHEMISTRY

SAN 403: BIOANALYTICAL TECHNIQUES AND INSTRUMENTATION

DATE:

TIME:

INSTRUCTIONS

1. Answer **all** questions in **SECTION A** (compulsory) and **any two** questions
2. Use clean well labelled diagrams wherever appropriate.

QUESTION ONE (30 MARKS)

- a) Describe the types of stationary phases used in gel permeation chromatography (GPC) of biological molecules, in terms of general composition and properties (3 Marks)
- b) What are some of the applications of High-Performance Liquid Chromatography (HPLC) in analysis of biological molecules (3 marks)
- c) Describe the general principle of flow cytometry. (1 mark)
 - i. What are the limitations of flow cytometry techniques? (3 marks)
- d) Describe the working principle of a centrifuge. (3 marks)
- e) Describe the general principle of Mass spectroscopy (1 mark)
 - i. What are the three main parts of mass spectrometers (3 marks)
- f) What is the Isoelectric point of a protein? (1 mark)
 - i. How does increasing or decreasing the pH buffer alter the charge of a protein? (2 marks)
- g) What are the advantages of quantitative PCR (q-PCR)? (3 marks)
- h) What is a calibration curve? (2 mark)
 - i. How is a calibration curve used in spectroscopy? (2 marks)
- i) What are the various steps involved in a typical microarray experiment? (3 marks)

QUESTIONS TWO (20 MARKS)

- a) Describe the working principle of Polymerase Chain Reaction (4 marks)
- b) Discuss the components of a Polymerase Chain Reaction (8 marks)
- c) Describe in details the steps in a Polymerase Chain Reaction (8 marks)

QUESTIONS THREE (20 MARKS)

- a) Discuss the principle and the major steps involved in Pulse Field Gel Electrophoresis (8 marks)
- b) What are the limitations, advantages and application of Pulse Field Gel Electrophoresis (12 marks)

QUESTIONS FOUR (20 MARKS)

- a) Differentiate between qualitative and quantitative ELISA (4 marks)
- b) Discuss the 4 types of ELISA techniques (12 marks)
- c) What are the applications of ELISA technique (4 marks)

QUESTION FIVE (20 MARKS)

- a) Discuss the Components/ Instrumentation of Gel Permeation Chromatography (12 marks)
- b) What are the steps involved in Gel Permeation Chromatography (5 marks)
- c) List some of the applications of Gel Permeation Chromatography (3 marks)