ZIMBABWE

MINISTRY OF HIGHER AND TERTIARY EDUCATION, INNOVATION, SCIENCE AND TECHNOLOGY DEVELOPMENT

HIGHER EDUCATION EXAMINATIONS COUNCIL (HEXCO)

NATIONAL DIPLOMA

IN

APPLIED BIOLOGICAL TECHNOLOGY

MODULE: Instrumental Analysis PAPER NO: 503/23/M06

DURATION: 3 Hours

NOVEMBER/DECEMBER 2025 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

1) Answer any five (5) questions.
2) Do not write your name on the answer booklet.
3) Do not write anything on the question paper.

This paper consists of 3 printed pages.

QUESTION 1

a) Define the following:

i) Resolution (1 mark)

ii) Retention time (1 mark)

iii) Capacity factor (1 mark)

iv) Elution [(1 mark)

b) Draw a schematic diagram of an HPLC (High Performance Liquid Chromatography). (7 marks)

c) Describe the following types of chromatography:

i) Adsorption (3 marks)

ii) Partition (3 marks)

iii) Size exclusion chromatography (3 marks)

QUESTION 2

a) State and explain any two (2) factors that affect enzyme assays. (6 marks)

b) Distinguish using examples coupled enzyme assays and direct enzyme assay. (6 marks)

c) State and explain two (2) ways of expressing enzyme activity. (4 marks)

d) Distinguish normal phase and reverse phase chromatography. (4 marks)

QUESTION 3

Discuss the principle, instrumentation and applications of UV/visible spectrometry. (20 marks)

QUESTION 4

a) Discuss the application of radio isotopes in biochemical studies providing specific examples. (10 marks)

b) Describe the principles and application of centrifugation. (10 marks)

QUESTION 5

a) Discuss the importance of an equipment maintenance schedule. (10 marks)

b) Describe the principle of the following techniques:

i) Isoelectric focusing. (5 marks)

ii) SDS PAGE. (5 marks)

QUESTION 6

a) Outline the characteristics of an ideal detector in chromatography analysis. (10 marks)

b) Give an overview of describing column efficiency in chromatography with reference to plate height, number of theoretical plates and the Van Demeter equation. (10 marks)

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