



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)

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- i) Resolution (1 mark)
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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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NATIONAL DIPLOMA

IN

APPLIED BIOLOGICAL TECHNOLOGY

MODULE: Safety, Health and Environmental Management PAPER NO: 503/23/M02

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 script.
- 3) Each question carries 20 marks.

This paper consists of 3 printed pages.

PAPER NO: 503/23/M02-SAFETY, HEALTH AND ENVIRONMENTAL
MANAGEMENT

QUESTION 1

- a) State any three (3) importance of TLVs. (3 marks)
- b) Discuss the three (3) categories of TLVs. (9 marks)
- c) Explain the safe transportation of hazardous substances. (8 marks)

QUESTION 2

- a) Outline the considerations when purchasing and selecting equipment. (10 marks)
- b) Discuss five (5) ways in which occupational accidents can be classified. (10 marks)

QUESTION 3

- a) Define the following terms:
 - i) Risk assessment (2 marks)
 - ii) Pests (2 marks)
 - iii) Hazards (2 marks)
 - iv) Occupational health (2 marks)
 - v) Personal hygiene (2 marks)
- b) Explain the standard operating procedures in safely selecting equipment. (10 marks)

QUESTION 4

- a) Explain the first aid that is conducted in the following scenarios:
 - i) Haemorrhage (2 marks)
 - ii) Poisoning (2 marks)
 - iii) Fractures (2 marks)
 - iv) Asphyxia (2 marks)
 - v) Shock (2 marks)

PAPER NO: 503/23/M02-SAFETY, HEALTH AND ENVIRONMENTAL
MANAGEMENT

- b) Explain any three (3) legislations related to occupational health and safety in the microbiological industries. (10 marks)

QUESTION 5

- a) Define the term industrial hygiene (2 marks)
- b) Explain the role of industrial hygienists on the safety of workers. (10 marks)
- c) Outline the principles of industrial hygiene (8 marks)

QUESTION 6

Explain the importance of industrial waste water treatment (20 marks)

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NATIONAL DIPLOMA

IN

APPLIED BIOLOGICAL TECHNOLOGY

SUBJECT: Biochemical Analysis

PAPER NO: 503/23/M01

DURATION: 3 hours

NOVEMBER/DECEMBER 2025 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

- 1. Do not write your name on any of the pages on the answer booklet.**
- 2. Answer any five (5) questions.**

This paper consists of 3 printed pages.

PAPER NO: 503/23/M01 – BIOCHEMICAL ANALYSIS

QUESTION 1

- a) Explain how enzyme activity is affected by the following factors:
- i) pH (5 marks)
 - ii) Substrate concentration (5 marks)
 - iii) Temperature (5 marks)
- b) Describe enzyme inhibition. (5 marks)

QUESTION 2

Describe the structure and function of the following lipids:

- a) Triglyceride (5 marks)
- b) Glycolipid (5 marks)
- c) Phospholipid (5 marks)
- d) Lipoprotein (5 marks)

QUESTION 3

- a) With the aid of a diagram, outline the formation of a peptide bond. (4 marks)
- b) Describe the four (4) levels of protein organisation. (16 marks)

QUESTION 4

- a) Draw the structure of α -glucose. (3 marks)
- b) Outline the synthesis of cellulose with the aid of a diagram. (10 marks)
- c) Outline any simple test for reducing sugars. (7 marks)

QUESTION 5

- a) List any three (3) water soluble vitamins and four fat soluble vitamins. For each vitamin, state the function and one source. (14 marks)
- b) State three (3) examples of coenzymes and give functions of each. (6 marks)

QUESTION 6

- a) Outline any four (4) minerals and their roles in biochemistry. (8 marks)
- b) Describe with the aid of well-labelled diagrams, the mechanism of enzyme action. (12 marks)

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NATIONAL DIPLOMA

IN

APPLIED BIOLOGICAL TECHNOLOGY

SUBJECT: Industrial Management

PAPER NO: 503/23/M08

DURATION: 3 Hours

NOVEMBER/DECEMBER 2025 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

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

This paper consists of 2 printed pages.

QUESTION 1

Describe the following types of managers

- (a) top level (5 marks)
- (b) middle (5 marks)
- (c) first line (5 marks)
- (d) team leader (5 marks)

QUESTION 2

- (a) State and explain three managerial roles. (10 marks)
- (b) Outline the major functions of management. (10 marks)

QUESTION 3

- (a) Describe the appraisal cycle. (10 marks)
- (b) Discuss the advantages and disadvantages of appraisals. (10 marks)

QUESTION 4

- (a) Identify the various types of disputes. (6 marks)
- (b) Outline five (5) major causes of disputes. (10 marks)
- (c) Highlight the consequences of failure to resolve disputes. (4 marks)

QUESTION 5

Briefly explain the barriers to effective planning and how the organisation can overcome them. (20 marks)

QUESTION 6

- (a) Define organisational culture. (2 marks)
- (b) Describe the four main organisational cultures. (18 marks)

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NATIONAL DIPLOMA

IN

ALL BIOLOGICAL SCIENCES

**MODULE: Research Methods and
Statistics**

PAPER NO: 503/23/M09

DURATION: 3 Hours

NOVEMBER/ DECEMBER 2025 EXAMINATION

REQUIREMENTS

Pen, Pencil, Ruler, Rubber

INSTRUCTIONS TO CANDIDATE

1. Answer any five (5) questions.
2. Each question carries 20 marks.
3. Do not write your name on the answer scripts.

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IN

ALL BIOLOGICAL SCIENCES

**MODULE: Research Methods and
Statistics**

PAPER NO: 503/23/M09

DURATION: 3 Hours

NOVEMBER/ DECEMBER 2025 EXAMINATION

REQUIREMENTS

Pen, Pencil, Ruler, Rubber

INSTRUCTIONS TO CANDIDATE

1. Answer any five (5) questions.
2. Each question carries 20 marks.
3. Do not write your name on the answer scripts.

This paper consists of 3 printed pages.

QUESTION 1

Briefly explain the research process.

(20 marks)

QUESTION 2

a) List sources of information.

(10 marks)

b) Outline data collection method used.

(10 marks)

QUESTION 3

a) Define the following terms:

- i) Validity
- ii) Reliability
- iii) Nominal data
- iv) Measure at central tendency
- v) Statistics

(3 marks)

(3 marks)

(3 marks)

(3 marks)

(3 marks)

b) Explain hypothesis testing.

(5 marks)

QUESTION 4

A genetics engineer was attempting to cross nemonetta and rodade. She predicted a phenotype outcome at the traits she was observing to be in the following ratio 4 large fruits only, 3 small fruits only, a trait for both sizes when the cross was performed and she counted the fruits she found 50 large fruits only, 41 small fruits and 85 with both. According to chi-square test, did she get the predicted outcome.

(20 marks)

QUESTION 5

A bag has 10 different fruits basket. Each basket has 5 fruits, only one has basket has the same type of fruits. Pat plans to get all the fruits. Find the probability that part gets:

a) One basket with all fruits.

(10 marks)

• PAPER NO: 503/23/M09 – RESEARCH METHODS AND STATISTICS

b) All 10 fruits (10 marks)

QUESTION 6

Citing examples, discuss measures of dispersion. (20 marks)

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