

SECTION A

(Compulsory questions)

QUESTION 1

- a) Outline the critical steps involved in sample collection to ensure consistency in laboratory analysis. (6 marks)
- b) Explain how atomic structure and periodicity play a role in laboratory sample processing. (4 marks)
- c) Describe three different techniques used for sample decomposition before analysis, explaining how each method improves accuracy. (10 marks)

QUESTION 2

- a) What is the significance of sample storage conditions in laboratory analysis? Provide examples of common storage methods. (5 marks)
- b) Explain three (3) types of contamination that can occur during sample processing and their effects on test results. (5 marks)
- c) Discuss the application of stoichiometry in laboratory sample processing, particularly in preparing standard solution, including numerical examples. (10 marks)

SECTION B

(Answer any three (3) questions.)

QUESTION 3

- a) Define the process of standardization and its importance in laboratory sample processing. (6 marks)
- b) Explain why primary standard solutions are preferred in laboratory analysis over secondary standard solutions. (4 marks)
- c) Outline three (3) different sample extraction techniques commonly used in chemical analysis discussing their advantages and challenges. (10 marks)

QUESTION 4

- a) Identify three (3) essential components of a laboratory sample processing report, explaining their relevance. (6 marks)
- b) Explain the importance of using data visualisation tools (groups, tables) in laboratory reports. (4 marks)
- c) Discuss how statistical analysis is used to validate laboratory sample processing results, providing examples. (12 marks)

QUESTION 5

- a) Vitamin C, contains 40.92% carbon, 4.58% hydrogen and 54.5% oxygen by mass. Molecular mass is 176g.

Calculate the empirical formula and hence the chemical formula of Vitamin C. (10 marks)
- b) Calculate the volume of concentrated HCl, (37% w/w $\approx 1.19\text{g/cm}^3$) required to make 500cm^3 of a 0.025M solution. State any two (2) safety precautions to be taken. (10 marks)

QUESTION 6

a) Copy and complete the following table:

Particle	Relative charge	Relative mass	Location in atom
Proton		1	
Electron	-1		
Neutron			Nucleus

(6 marks)

b) An atom is represented as $^{31}_{15}\text{P}$

i) Determine the number of protons, neutrons and electrons. (3 marks)

ii) Write down the electronic configuration of this atom using the Aufbau's principle. (4 marks)

c) Use the IUPAC system to show the structural formulae of the following:

- i) 2 – methyl propene (2 marks)
- ii) 1,4 – dichloropentane (2 marks)
- iii) 1,4 – pentane -diol (3 marks)

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**MINISTRY OF HIGHER AND TERTIARY EDUCATION,
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DEVELOPMENT**

**HIGHER EDUCATION EXAMINATIONS COUNCIL
(HEXCO)**

NATIONAL CERTIFICATE

IN

LABORATORY TECHNOLOGY

MODULE: Laboratory Quality Controlling PAPER NO: 360/22/M01

DURATION: 3 Hours

JUNE 2026 EXAMINATION

REQUIREMENTS

Scientific calculator.

INSTRUCTIONS TO CANDIDATE

- 1. Answer ALL questions in Section A.**
- 2. Answer ANY THREE questions in Section B.**
- 3. Each question in Section B has a total of 20 marks.**
- 4. Do not write anything on the question paper.**
- 5. Do not write your name on your Answer Booklet.**

This paper consists of 5 printed pages.

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SECTION A

Answer ALL questions.

QUESTION 1

(a) State any five Base units. (5 marks)

(b) (i) The Nernst equation

$$E = E_o - \frac{0.0592}{n} \log Q$$

Is used for oxidation reactions given that $E_o = 1.1V$ $E = 1.13V$
and $n = 2$

Calculate value of Q (3 marks)

(ii) The bacterial population of a certain culture is given by
 $N = 1000(1.5)^T$. How long does it take for the population to reach
10000 if; T is measured in hours. (2 marks)

QUESTION 2

(a) (i) List five items a formal agenda should always contain. (5 marks)

(b) (i) Define quality (3 marks)

(ii) Give three elements of quality (3 marks)

QUESTION 3

(a) Define the following terms

(i) Sensitivity (2 marks)

(ii) Accuracy (1 mark)

(iii) Precision (1 mark)

(iv) Resolution (1 marks)

(b) State any five situations in the natural sciences where indices and
logarithms are applied. (5 marks)

QUESTION 4

- (a) Explain the following
- (i) Analytical reports (2 marks)
 - (ii) Research reports (2 marks)
 - (iii) Define communication (1 mark)
- (b) For an experiment to determine the density of aluminium. Three students obtained the following results.

Actual density of Al = 2.70g/ml

	Student A	Student B	Student C
Trial 1	3.21g/ml	2.69g/ml	3.31g/ml
Trial 2	3.31g/ml	2.68g/ml	3.91g/ml
Trial 3	3.19g/ml	2.71g/ml	2.09g/ml
Trial 4	3.20g/ml	2.70g/ml	4.00g/ml

Which student obtained

- (i) Accurate results (1 mark)
- (ii) Precise results (1 mark)
- (iii) Calculate the percentage error made by student A. (2 marks)

SECTION B

Answer ANY THREE questions. Each question carries 20 marks.

QUESTION 5

- (a) Discuss the characteristics of a report. (10 marks)
- (b) Explain the purpose of a report. (4 marks)
- (c) Outline any three types of reports used in formal organisations. (6 marks)

QUESTION 6

- (a) What do you understand by in-process checks? (2 marks)
- (b) Outline what one has to pay attention to during in-process checks in the following stage of production
 - (i) Manufacturing (9 marks)
 - (ii) Packaging (9 marks)

QUESTION 7

- (a) Describe with the aid of a diagram the four stages of bacterial growth. (8 marks)
- (b) State briefly how you could distinguish between a solution of sucrose and lactose. (4 marks)
- (c) State the functions of the following parts of the microscope.
 - (i) Objective lens (1 mark)
 - (ii) Diaphragm (1 mark)
 - (iii) Light source (1 mark)
- (d) State the difference between light and electron microscope. (5 marks)

QUESTION 8

- (a) The following results were obtained for the concentration of chlorine in a sample.

Test 1	Test 2	Test 3	Test 4
0.105	0.0991	0.1016	0.1017

Calculate:

- (i) The mean (2 marks)
 - (ii) Standard deviation (2 marks)
 - (iii) **95%** confidence limits (4 marks)
 - (iv) Mean deviation (4 marks)
- (b) Apply the Q – test to the following data set to determine whether the outlying result showed be retained or rejected at 95% confidence level.

7.295	7.284	7.388	7.292
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(8 marks)

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IN

LABORATORY TECHNOLOGY

**MODULE: Safety Health Environmental
Management**

**PAPER NO: 360/22/M03
PAPER NO: 360/24/M03**

DURATION: 3 Hours

JUNE 2026 EXAMINATION

REQUIREMENTS

Answer Booklet

INSTRUCTIONS TO CANDIDATES

- 1. Answer all questions in SECTION A (40 marks)**
- 2. Answer any three (3) questions in SECTION B (60 marks)**

This paper consists of 3 printed pages.

SECTION A (40 marks)

Answer all questions.

QUESTION 1

- a) Define the following terms giving an example.
- i) Risk (3 marks)
 - ii) Hazard (3 marks)
- b) Discuss in detail the following relevant legal frameworks.
- i) Health and Safety at work Act (4 marks)
 - ii) Factories and works Act (4 marks)
 - iii) Explosives Act (3 marks)
 - iv) Pneumocomosis Act (3 marks)
- c) Discuss the importance of workplace safety culture in preventing accidents and injuries. (10 marks)
- d) List different types of workplace hazards. (6 marks)
- e) State examples of protective equipments. (4 marks)

SECTION B

QUESTION 2

- a) i) Outline any four important safety signs at workplace. (4 marks)
- ii) Outline the key features of effective safety signs. (4 marks)
- b) Describe in detail the following forms of risk mitigation:
- i) Avoidance (3 marks)
 - ii) Reduction (3 marks)
 - iii) Transference (3 marks)
 - iv) Acceptance (3 marks)

QUESTION 3

- a) Describe four (4) classes of accidental industrial fires and how each can be extinguished. (12 marks)
- b) Outline the precaution to be taken when working with toxic chemicals. (8 marks)

QUESTION 4

- a) State any eight (8) aspects considered when designing a science laboratory. (8 marks)
- b) Outline any ten (10) rules/Code of conduct of good behaviour in the laboratory. (10 marks)
- c) Identify the hazards associated with the use of acids. (2 marks)

QUESTION 5

Describe the importance of personal protective equipment in the workplace and list any five (5) examples and their uses. (20 marks)

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IN

LABORATORY TECHNOLOGY

**MODULE: Laboratory Stock Management PAPER NO: 360/22/M05
360/24/M05**

DURATION: 3 Hours

NOVEMBER/DECEMBER 2025 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

- 1. Answer ALL questions in Section A. 40 marks**
- 2. Answer ANY THREE (3) questions from Section B. 60 marks**
- 3. Each question in Section B carries twenty marks.**
- 4. Do not write anything on the question paper.**
- 5. Do not write your name on the answer booklet.**

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SECTION A

40 MARKS

Answer ALL questions.

QUESTION 1

- (a) (i) What precaution must be taken when storing chemicals and reagents. (2 marks)
- (ii) List three methods that can be used for physical counting of stock items. (2 marks)
- (iii) Give the name of a record that is updated when goods are issued from the chemical stores. (2 marks)
- (b) (i) State two important criteria that should be verified when receiving incoming stock items. (2 marks)
- (ii) Identify the key steps involved in processing a requisition for laboratory supplies and give a reason why it is important to verify the completeness of the requisition. (6 marks)
- (iv) Briefly explain how to ensure that stock is stored in appropriate conditions. (6 marks)

QUESTION 2

- (a) (i) Explain a key advantage of a digital stock management system. (2 marks)
- (ii) Suggest four recommendations you would make if a stock take reveals near expiry items. (4 marks)
- (iii) Why is it important to record accurate stock balances and updates. (4 marks)
- (b) (i) What is meant by "First Expiry First Out" (FEFO) principle. (2 marks)
- (ii) Explain the importance of conducting physical counting of stock in line with organisational regulations and standards. (4 marks)
- (iii) Distinguish between "stock discrepancies" and "stock losses". (4 marks)

SECTION B

60 MARKS

Answer ANY THREE (3) questions.

QUESTION 3

You are lab technician in a research laboratory with allocated duties to: manage suppliers, creating documents overseeing storage and stock management. In your laboratory you receive a shipment of chemicals and equipment from a supplier. Outline the step-by- step process you would follow to ensure proper documentation, storage and stock management for these newly acquired items. (20 marks)

QUESTION 4

Discuss how to determine which items to select for stock issuing, highlighting the importance of following a standard operating procedure for stock issuing. (20 marks)

QUESTION 5

Outline a plan to better organise Laboratory Stock Area and ensure First Expiry First Out (FEFO). (20 marks)

QUESTION 6

Chief Lab technician John is required to recommend laboratory stock to be ordered based on the results of a physical count. Discuss the factors the chief lab technician would consider when making recommendations for ordering the stock. (20 marks)

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IN

LABORATORY TECHNOLOGY

MODULE: Laboratory Quality Controlling 2 PAPER NO: 360/24/M06

DURATION: 3 Hours

NOVEMBER/DECEMBER 2025 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

- 1) Answer all questions in section A (40 marks)
- 2) Answer any three (3) questions from section B (60 marks).
- 3) Do not write on the question paper.
- 4) Do not write your name on the answer script.

This paper consists of 3 printed pages.

SECTION A

Answer all questions in section A (40 marks)

QUESTION 1

- a) Define the following terms:
- i) Cell (2 marks)
 - ii) Polymer (2 marks)
 - iii) Enzyme (2 marks)
 - iv) Microscopy (2 marks)
 - v) Hydrogen bonding (2 marks)
- b) i) State five (5) key structural features of prokaryotic cells. (5 marks)
- ii) Explain with aid of relevant example what is a buffer solution. (5 marks)

QUESTION 2

- a) Differentiate between the following:
- i) Deoxyribonucleic acid (DNA) and Ribonucleic acid (RNA). (6 marks)
 - ii) Reducing sugars and non reducing sugars (6 marks)
 - iii) Resolution and magnification (6 marks)
- b) Describe the use of a centrifuge in biological analysis. (2 marks)

SECTION B

Answer any three (3) questions from section B (60 marks).

QUESTION 3

Discuss any four (4) factors that affect rate of enzyme catalysed reactions. (20 marks)

QUESTION 4

Give an overview of microbiological tests and their applications in biotechnology. (20 marks)

QUESTION 5

Explain any five (5) environmental conditions for a good and efficient biology laboratory. (20 marks)

QUESTION 6

- a) Describe the following structures of proteins:
- i) Primary structure (5 marks)
 - ii) Secondary structure (5 marks)
- b) Discuss the importance of sterilising and calibrating laboratory instruments. (10 marks)

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