



ZIMBABWE

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

**HIGHER EDUCATION EXAMINATIONS COUNCIL
(HEXCO)**

NATIONAL CERTIFICATE

IN

LABORATORY TECHNOLOGY

**MODULE: Laboratory Communication and Computer Applications PAPER NO: 360/24/M08
360/25/M08**

DURATION: 3 Hours

JUNE 2026 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

- 1. Answer all questions in Section A, forty (40) marks.**
- 2. Answer any three (3) questions from Section B sixty (60) marks.**

This paper consists of 3 printed pages.

SECTION A

Answer all questions, forty (40) marks

QUESTION 1

- a) i) State any five (5) ethical practices when using a computer in a laboratory. (5 marks)
- ii) Explain any two (2) factors that influence the choice of a software in a laboratory. (5 marks)
- b) Discuss the notion that “Microsoft excel is the best for capturing data that has tables and graphs than using Microsoft word” (10 marks)

QUESTION 2

- a) You are meeting with a potential laboratory equipment supplier to discuss supply of some reagents. During the meeting, you notice the supplier's body language and facial expressions change when discussing about invoices and date of delivery.
- Describe the characteristics of face-to-face communication highlighting its advantages as demonstrated in the scenario above. (10 marks)
- b) You receive verbal instructions from your supervisor to complete a report by the end of the day. Later you also receive an email with the same instructions but with additional details.
- Evaluate the advantages and disadvantages of both verbal and written communication in this scenario. (10 marks)

SECTION B

Answer any three (3) questions, sixty (60) marks.

QUESTION 3

Describe the communication process in detail explaining the function of each communication elements. (20 marks)

QUESTION 4

Describe the major hardware components of a computer system and explain their functions. (20 marks)

QUESTION 5

With the aid of relevant examples, describe types of visual communication and provide examples of their practical applications. (20 marks)

QUESTION 6

Discuss the applications of the following Microsoft office packages

- a) Microsoft Word (5 marks)
- b) Microsoft Excel (5 marks)
- c) Microsoft PowerPoint (5 marks)
- d) Microsoft Access (5 marks)

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MODULE: Laboratory Communication and Computer Applications **PAPER NO: 360/24/M08
360/25/M08**

DURATION: 3 Hours

JUNE 2026 EXAMINATION

REQUIREMENTS

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1. Answer all questions in Section A, forty (40) marks.
2. Answer any three (3) questions from Section B sixty (60) marks.

This paper consists of 3 printed pages.

PAPER NO: 360/24/M08 – LABORATORY COMMUNICATION AND
COMPUTER APPLICATIONS

SECTION A

Answer all questions, forty (40) marks

QUESTION 1

- a) i) State any five (5) ethical practices when using a computer in a laboratory. (5 marks)
- ii) Explain any two (2) factors that influence the choice of a software in a laboratory. (5 marks)
- b) Discuss the notion that “Microsoft excel is the best for capturing data that has tables and graphs than using Microsoft word” (10 marks)

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- Describe the characteristics of face-to-face communication highlighting its advantages as demonstrated in the scenario above. (10 marks)
- b) You receive verbal instructions from your supervisor to complete a report by the end of the day. Later you also receive an email with the same instructions but with additional details.
- Evaluate the advantages and disadvantages of both verbal and written communication in this scenario. (10 marks)

SECTION B

Answer any three (3) questions, sixty (60) marks.

QUESTION 3

Describe the communication process in detail explaining the function of each communication elements. (20 marks)

QUESTION 4

Describe the major hardware components of a computer system and explain their functions. (20 marks)

QUESTION 5

With the aid of relevant examples, describe types of visual communication and provide examples of their practical applications. (20 marks)

QUESTION 6

Discuss the applications of the following Microsoft office packages

- a) Microsoft Word (5 marks)
- b) Microsoft Excel (5 marks)
- c) Microsoft PowerPoint (5 marks)
- d) Microsoft Access (5 marks)

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IN

LABORATORY TECHNOLOGY

**MODULE: Laboratory Equipment and Maintenance PAPER NO: 360/22/M04
360/24/M04**

DURATION: 3 Hours

JUNE 2026 EXAMINATION

REQUIREMENTS

Non programmable calculator.

INSTRUCTIONS TO CANDIDATE

- 1. Answer all questions in Section A – 40 marks.**
- 2. Answer any three (3) questions in Section B – (60 marks).**
- 3. Do not write your name on the answer booklet.**
- 4. A formulae and constants sheet is provided at the back of this examination paper.**

This paper consists of 5 printed pages.

This paper consists of 5 printed pages.

SECTION A – (40 MARKS)

Answer all questions.

QUESTION 1

- a) i) Define the term preventive maintenance. (2 marks)
- ii) List any four (4) preventive maintenance practices or tasks. (4 marks)
- b) State a suitable measuring instrument for the following:
- i) Mass
 - ii) Thickness of a material
 - iii) Fluid pressure
 - iv) Current
 - v) p.H
 - vi) Fluid velocity
 - vii) Voltage
 - viii) Liquid volume (8 marks)
- c) Show that: $v = wr$ (4 marks)
- d) Define rectification (2 marks)

QUESTION 2

- a) Define the following terms as they are used in Laboratory.
- i) Uncertainty
 - ii) Tolerance
 - iii) Systematic error
 - iv) Precision
 - v) Random error
 - vi) Accuracy (12 marks)
- b) An object of mass 0.2kg is tied to a string 0.8m long. The object is whirled in a horizontal circle. The object takes 10 seconds to make one revolution.
- Determine:
- i) Angular speed (2 marks)
 - ii) Centripetal acceleration (3 marks)
 - iii) Tension in the string (3 marks)

SECTION B – (60 MARKS)

Answer any three (3) questions.

QUESTION 3

- a) Name the three radiations emitted by radioactive materials and their main properties. (10 marks)
- b) State Bernoulli's equation and identify all symbols used. (4 marks)
- c) Determine the potential difference across a $4\mu\text{F}$ capacitor when with 5mC charge. (4 marks)
- d) Give two (2) objectives that are fulfilled by calibration. (2 marks)

QUESTION 4

- a) A flask of volume $5 \times 10^{-3}\text{m}^3$ contained 4.00g of oxygen. Calculate the pressure exerted by the gas at a temperature of 127°C .
Given that $R = 8.31\text{J/mol.K}$ (5 marks)
- b) State three (3) properties of an ideal gas. (3 marks)
- c) Distinguish between laminar and turbulent flow. (4 marks)
- d) List any four (4) basic quantities and their SI units. (8 marks)

QUESTION 5

- a) Describe the procedure for calibrating a p.H meter using standards. (8 marks)
- b) Define the following terms:
 - i) Gross error (2 marks)
 - ii) Random error (2 marks)
 - iii) Systematic error (2 marks)
- c) State the functions of the following parts of a vernier caliper.
 - i) External jaws (1 mark)
 - ii) Internal jaws (1 mark)
 - iii) Tail (1 mark)
- d) i) Express 0.0000023m in a suitable magnitude (i.e using a prefix). (1 mark)
- ii) Convert 150mg to kg expressing it in standard form. (2 marks)

Data

acceleration of free fall

$$g = 9.81 \text{ m s}^{-2}$$

speed of light in free space

$$c = 3.00 \times 10^8 \text{ m s}^{-1}$$

elementary charge

$$e = 1.60 \times 10^{-19} \text{ C}$$

rest mass of proton

$$m_p = 1.67 \times 10^{-27} \text{ kg}$$

rest mass of electron

$$m_e = 9.11 \times 10^{-31} \text{ kg}$$

Avogadro constant

$$N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$$

molar gas constant

$$R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$$

Boltzmann constant

$$k = 1.38 \times 10^{-23} \text{ J K}^{-1}$$

Formulae

uniformly accelerated motion

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

$$\Delta p = \rho g \Delta h$$

hydrostatic pressure

$$F = \rho g V$$

upthrust

$$R = R_1 + R_2 + \dots$$

resistors in series

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$$

resistors in parallel

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \dots$$

capacitors in series

$$C = C_1 + C_2 + \dots$$

capacitors in parallel

$$x = x_0 e^{-\lambda t}$$

radioactive decay

$$\lambda = \frac{0.693}{t_{\frac{1}{2}}}$$

decay constant

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NATIONAL CERTIFICATE

IN

LABORATORY TECHNOLOGY

MODULE: Laboratory Equipment Maintenance 1 PAPER NO: 360/25/M04/1

DURATION: 3 Hours

JUNE 2026 EXAMINATION

REQUIREMENTS

1. Non-programmable calculator.
2. Answer booklet and graph paper.

INSTRUCTIONS TO CANDIDATE

1. Answer all questions in Section A and any three (3) questions in Section B.
2. Section A carries 40 marks and Section B carries 60 marks.
3. Formula sheet and constant data sheet is attached in this question paper.

This paper consists of 5 printed pages.

Constants and Basic Formulae

Constants

acceleration of free fall	$g = 9.81 \text{ m s}^{-2}$	Rest mass of electron	$m_e = 9.11 \cdot 10^{-31} \text{ kg}$
speed of light in free space	$c = 3.00 \times 10^8 \text{ m s}^{-1}$	Avogadro constant	$N_A = 6.02 \cdot 10^{23} \text{ mol}^{-1}$
Elementary charge	$e = 1.60 \cdot 10^{-19} \text{ C}$	molar gas constant	$R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$
unified atomic mass unit	$1 \text{ u} = 1.66 \cdot 10^{-27} \text{ kg}$	Boltzmann constant	$k = 1.38 \cdot 10^{-23} \text{ J K}^{-1}$
Rest mass of proton	$m_p = 1.67 \cdot 10^{-27} \text{ kg}$	Planck constant	$h = 6.63 \cdot 10^{-34} \text{ J s}$

Formulae

uniformly accelerated motion

$$v = u + at$$

$$v^2 = u^2 + 2as$$

$$s = ut + \frac{1}{2}at^2$$

Circular motion

$$w = 2\pi f$$

$$v = \omega r$$

$$a = v^2/r$$

$$T = \frac{1}{f}$$

Uncertainties

$$\Delta Q = \Delta a + \Delta b$$

$$\frac{\Delta Q}{Q} = \frac{\Delta a}{a} + \frac{\Delta b}{b}$$

Ideal fluid

$$A_1 V_1 = A_2 V_2 = \text{constant}$$

$$P + \frac{1}{2}\rho V^2 = \text{constant}$$

$$p = \rho gh$$

$$\text{Upthrust} = \rho g V$$

Ideal gases

$$w = p\Delta v$$

$$pv = nRT$$

$$pv = NKT$$

$$PV = \frac{1}{3} Nm \langle c^2 \rangle$$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

Thermal Properties

$$T/K = T/^{\circ}\text{C} + 273.15$$

$$Q = mc\Delta\theta$$

$$Q = mL$$

$$\frac{\theta}{100^{\circ}\text{C}} = \frac{(X_{\theta} - X_{0^{\circ}\text{C}})}{(X_{100^{\circ}\text{C}} - X_{0^{\circ}\text{C}})}$$

Electric circuits

$$\text{Electric charge } Q = It$$

$$\text{Electric current } I = nAvq$$

$$\text{Series resistors } R_T = R_1 + R_2 + \dots$$

$$\text{Parallel resistors } \frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$$

$$\text{Electrical Energy } E = IVt$$

Mathematic Formulae

$$\text{Pythagoras Theorem: } c^2 = a^2 + b^2$$

$$\text{One Sample t-test: } t_{\text{calc}} = \frac{(\bar{x} - \mu)}{s/\sqrt{n}}$$

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{var} = (\text{standard deviation})^2$$

$$F\text{-value} = \frac{(s_1^2)}{(s_2^2)^2}$$

$$Q_{\text{exp}} = \frac{\text{gap}}{\text{range}} = \frac{X_{\text{suspected}} - X_{\text{nearest}}}{X_{\text{max}} - X_{\text{min}}}$$

Optics & Waves

$$n = \frac{1}{\sin c}$$

$$n = \frac{\sin i}{\sin r}$$

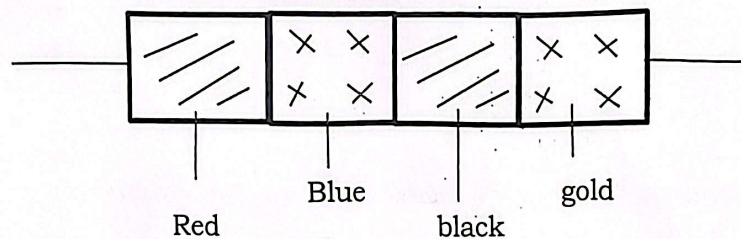
$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$M = \frac{v}{u}$$

SECTION A – (40 MARKS)

QUESTION 1

- a) State the differences between the following terms:
- i) Pascal's principle and Benoulli's principle. (2 marks)
 - ii) Heat capacity and latent heat. (2 marks)
 - iii) Transverse wave and longitudinal wave. (2 marks)
 - iv) Lamina flow and turbulent flow (2 marks)
 - v) Reflection and refraction (2 marks)
- b) A carbon resistor has the following four (4) colour codes as indicated on the diagram below:



Determine the magnitude of the resistance represented by the resistor above. (4 marks)

- c)
- i) Define the term transducer. (2 marks)
 - ii) Give two (2) examples of transducers. (2 marks)
 - iii) Two types of transducers are input and output. Give one (1) example of each type of transducer. (2 marks)

QUESTION 2

- a) State the differences between trouble – shooting and maintenance. (2 marks)
- b) Outline safety considerations when troubleshooting an experiment. (8 marks)
- c) Discuss best practices to be done for equipment maintenance. (10 marks)

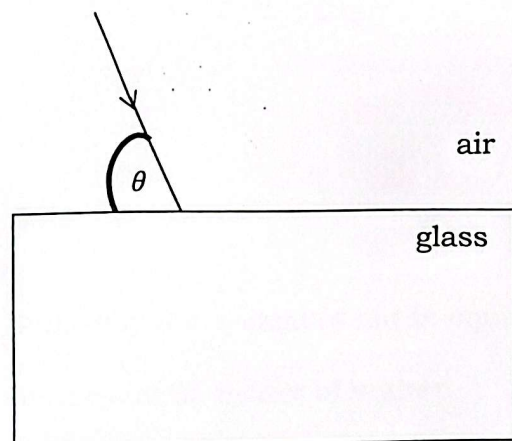
SECTION B – (60 MARKS)

QUESTION 3

- a) i) Define specific latent heat. (2 marks)
- ii) Calculate the specific latent heat of fusion of 5g of ice melted in 3 minutes by an electrical heater of 6kW. (5 marks)
- b) Describe the importance of the calibration documents in audits and quality assurance systems. (10 marks)
- c) State three (3) uses of the semiconductor materials. (3 marks)

QUESTION 4

- a) Define the following terms as they are applied in laboratory equipment maintenance.
- i) Obsolete equipment (2 marks)
- ii) Sensitivity (2 marks)
- iii) Accuracy (2 marks)
- iv) Calibration (2 marks)
- v) Traceability (2 marks)
- b) Diagram below shows light as it moves towards a glass prism from air.



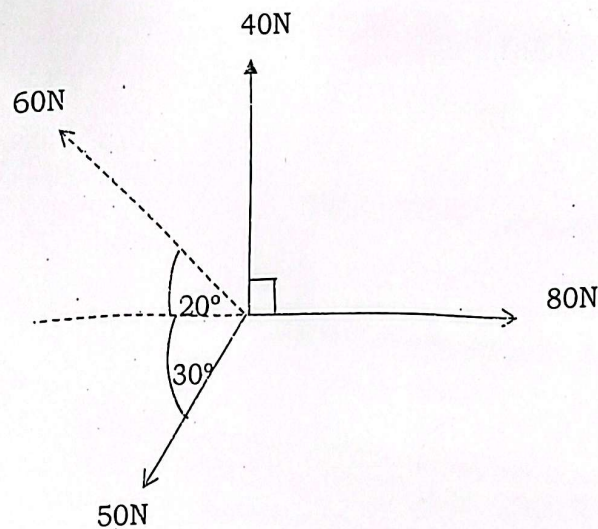
- i) Copy and complete the path followed by a ray as it passes through the prism and after passes the prism. (4 marks)
- ii) On your diagram in (b) (i) mark angle of incident, refractions and the emergent ray. (3 marks)
- c) State three (3) examples of laboratory instruments. (3 marks)

QUESTION 5

- a) i) Define the term maintenance. (2 marks)
- ii) State and explain three (3) main types of maintenance. (6 marks)
- b) Design a disposal report that can be used by a company to dispose off equipments that may contain radiation sources. (7 marks)
- c) State the ideal gas equation with all terms explained. (5 marks)

QUESTION 6

- a) i) State two conditions for a body to be in equilibrium state. (2 marks)
- ii) Using the system of forces below. Find the resultant force in the system. (10 marks)



- iii) State why the system is not in equilibrium state. (1 mark)
- b) i) State the kinetic theory of matter. (2 marks)
- ii) Write five (5) conditions or assumptions of Kinetic theory of matter. (5 marks)

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NATIONAL CERTIFICATE

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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NATIONAL CERTIFICATE

IN

LABORATORY TECHNOLOGY

MODULE: Laboratory Sample Processing II

PAPER NO: 360/24/M07

DURATION: 3 hours

NOVEMBER/DECEMBER 2025 EXAMINATION

REQUIREMENTS

1. Non-programmable scientific calculator
2. Answer booklet

INSTRUCTIONS TO CANDIDATE

1. Answer all questions in Section A – 40 marks.
2. Answer any three (3) questions in Section B – 60 marks.
3. Do not write anything in the question paper.

SECTION A

QUESTION 1

Simplify the following without using a calculator:

a) $2^{-2} \times 64^{\frac{8}{5}}$ (3 marks)

b) $(0.125)^{-\frac{1}{3}}$ (3 marks)

c) The acidity of a substance is 1.6020. Find the $[H^+]$.
(3 marks)

QUESTION 2

a) Find the equation of a straight line, Q which passes through the points A(2, 2) and B(4, 8). (4 marks)

b) Find length of AB in (a). (3 marks)

c) Find the equation of the line passing through (3, -6) and

i) Parallel to Q (3 marks)

ii) Perpendicular to Q (3 marks)

QUESTION 3

a) Evaluate $\cos 75^\circ$ without using a calculator. (3 marks)

b) Using Completing Square method show that the quadratic equation $ax^2 + bx + c = 0$ can be reduced to $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ (6 marks)

c) Solve the following simultaneous equation:

$$x - y = 2$$

$$x^2 - 2y^2 = -1$$
 (6 marks)

PAPER NO: 360/24/M07 – LABORATORY SAMPLE PROCESSING II

- d) A student measured the period of a pendulum using the stop watch and calculated it using $T = 2\pi \sqrt{\frac{L}{g}}$

From this equation make L subject of formula.

(3 marks)

SECTION B

QUESTION 4

- a) Solve the following equations:

$$4^{2x+1} + 6(4^x) - 2 = 0$$

(6 marks)

b) $\frac{1}{2x-1} - 4 = 0$

(4 marks)

c) i) $\log_3(x-2) + \log_3(x+1) = 1$

(6 marks)

ii) $\frac{2-\sqrt{3}}{7+\sqrt{3}}$, simplify this without using a calculator.

(4 marks)

QUESTION 5

- a) Differentiate with respect to x the following functions:

i) $y^3x + 7y^2 = x^2$

(5 marks)

ii) $y = x^2 - 7x$

(2 marks)

iii) $y = 3x^2 + 10$

(3 marks)

iv) $y = (3x^2 - 7x)^{-10}$

(5 marks)

- b) Evaluate $\int \ln x \, dx$

(5 marks)

QUESTION 6

- a) The volumes from samples collected in a physics laboratory were tabulated in table form as below:

V/cm^3	Frequency
100 - 199	21
200 - 299	70
300 - 399	182
400 - 499	27
500 - 599	20

Use the data to determine:

- i) Mean (4 marks)
 - ii) Modal class (2 marks)
 - iii) Standard deviation (6 marks)
- b) A bag contains five (5) red balls and four (4) blue balls. Three balls were picked without replacement one after the other.
- i) Draw a tree diagram. (5 marks)
 - ii) Find probability of getting balls of the same colour (3 marks)

QUESTION 7

- a) Calculate the mean and the standard deviation of the following set of analytical results:
- 15.67g; 15.69g and 16.03g (10 marks)
- b) Discuss with aid of relevant examples the importance of statistical analysis during laboratory tests. (10 marks)

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NATIONAL CERTIFICATE

IN

LABORATORY TECHNOLOGY

MODULE: Laboratory Sample Processing II PAPER NO: 360/24/M07

DURATION: 3 Hours

JUNE 2026 EXAMINATION

REQUIREMENTS

Scientific calculator, periodic table and answer booklet.

INSTRUCTIONS TO CANDIDATE

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

This paper consists of 4 printed pages.

SECTION A

40 MARKS

QUESTION 1

(a) Define the following terms as they are applied in sample processing.

(i) Probability (2 marks)

(ii) Conditional probability (2 marks)

(iii) Mutually exclusive events (2 marks)

(iv) Mean (2 marks)

(v) Median (2 marks)

(b) Simplify the following without using a calculator.

(i) $\left(\frac{125}{27}\right)^{-2/3}$ (4 marks)

(ii) $\frac{(t^{1/2} + t^{-1/2})}{t^{3/2}}$ (4 marks)

(iii) $(2 - 3\sqrt{3})(3 + 2\sqrt{3})$ (4 marks)

(c) Solve the following equations

(i) $3^x = 27$ (2 marks)

(ii) $2^{2x} = 5$ (3 marks)

(iii) $2(2^{2x}) - 5(2^x) + 2 = 0$ (8 marks)

(d) An ore sample with a mass 12.6g known to contain iron was treated with nitric acid and a red-brown solution was produced. The solution was mixed with excess sodium hydroxide. A red -brown precipitate was formed, filtered off and dried. Its weight was found to be 2.3g. find the percentage of the iron in the sample by mass. (5 marks)

SECTION B

60 MARKS

QUESTION 2

Determine the t-test value for the following two sets of values

Set A : 7; 2; 9; 8

Set B : 1; 2; 3; 4

(20 marks)

QUESTION 3

(a) Differentiate the following: -

(i) $f(x) = x \sin x$

(5 marks)

(ii) $y = e^x \sin x$

(6 marks)

(b) There are six chocolates in the box, 4 of the chocolates are milk chocolates and the remaining are plain chocolates. A chocolate is taken out at random and is eaten. Find the probability that

(i) A second chocolate taken at random is plain.

(3 marks)

(ii) Two chocolates taken are different.

(3 marks)

(c) The concentration of hydrogen ions in glucose produced by a group of polytechnic students was determined and obtained as $0.034 \text{ mol dm}^{-3}$.

Determine the pH of this glucose and state the nature of this glucose.
(3 marks)

QUESTION 4

(a) Integrate the following:-

$$\int \left(\frac{3x^2}{2} - 5x + \frac{1}{x^2} \right) dx$$

(5 marks)

(b) $\int \ln \sqrt{x} \, dx$

(8 marks)

- (c) The table gives information about the holiday destination of 18 students in a class.

Country	Frequency
France	3
Wales	4
England	11

- (i) Calculate the percentage which correspond to each country. (3 marks)
- (ii) Draw a pie chart to represent this information. (4 marks)

QUESTION 5

- (a) Simplify, without using calculator

(i) $\frac{x^2y}{xy^2-xy}$ (3 marks)

(ii) $\log 100 - 2 \log 50$ (3 marks)

- (b) Solve the following equations: -

(i) $\begin{aligned} 3x - 2y &= 12 \\ x + 3y &= -7 \end{aligned}$ (6 marks)

(ii) $\log_3 x - \frac{4}{\log_3 x} + 3 = 0$ (8 marks)

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IN

LABORATORY TECHNOLOGY

MODULE: Chemical Sample Processing 1 PAPER NO: 360/25/M10

DURATION: 3 Hours

JUNE 2026 EXAMINATION

REQUIREMENTS

- 1) Non programmable scientific calculator.
- 2) A copy of the periodic table is attached to the question paper.

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 a total of twenty (20) marks.

This paper consists of 5 printed pages.

SECTION A (40 MARKS)

QUESTION 1

a) Write the electronic configuration for:

- i) Cl (2 marks)
- ii) Ca (2 marks)

b) Calculate:

- i) pH of $0.00010 \text{ mol/dm}^3 \text{ HCl}$ (2 marks)
- ii) pOH and pH of $0.020 \text{ mol/dm}^3 \text{ NaOH}$ at 25°C (4 marks)

c) i) The table below shows the relative abundance of the two naturally occurring isotopes of chlorine:

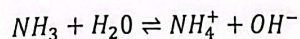
Isotope	Atomic mass	Relative abundance %
Chlorine -35	34.97	75.77%
Chlorine-37	36.97	24.23%

Calculate the relative atomic mass of chlorine to one decimal place. (5 marks)

ii) List five (5) properties of ionic compounds. (5 marks)

QUESTION 2

a) Given the reaction:



Use the Bronsted-Lowry theory to identify:

- i) Conjugate acid (2 marks)
- ii) Conjugate base (2 marks)

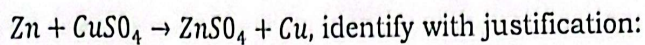
b) A volume of 25.0 cm^3 of a sulphuric acid solution was titrated with 0.200 mol/dm^3 potassium hydroxide (KOH) the average titre was 22.50 cm^3 . Calculate the concentration of sulfuric acid in mol/dm^3 . (6 marks)

c) Balance the following chemical equations:

- i) $\text{Al} + \text{HCl} \rightarrow \text{AlCl}_3 + \text{H}_2$ (3 marks)
- ii) $\text{C}_3\text{H}_8 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$ (3 marks)

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d) For the reaction:



i) Species oxidised

(2 marks)

ii) Oxidising agent

(2 marks)

SECTION B (60 MARKS)

QUESTION 3

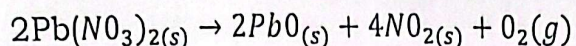
- a) Differentiate with aid of relevant examples, between random sampling and systematic sampling. (6 marks)
- b) A mine delivers twenty (20) drums of crushed ore powder to the laboratory for grade determination.
- i) Identify the nature of the sample and explain why representativeness is critical. (4 marks)
- ii) Propose a sampling plan and schedule showing how samples will be spread across the lot. (6 marks)
- c) Write the full meaning of "EDTA" and explain why pH control is important in EDTA titration of water hardness. (4 marks)

QUESTION 4

- a) Assign oxidation numbers to each element in $\text{Na}_2\text{Cr}_2\text{O}_7$. (6 marks)
- b) Identify suitable sampling equipment for powders, gases and rocks explaining why each equipment is appropriate. (6 marks)
- c) With aid of relevant examples differentiate between metallic bonding and hydrogen bonding. (8 marks)

QUESTION 5

- a) In an experiment 6dm^3 of NO_2 gas measured at r.t.p was produced by decomposing lead (ii) nitrate:



Calculate the mass of lead (II) oxide (PbO) produced in the reaction.
(6 marks)

- b) State the key requirements of a primary standard and outline the preparation of a primary standard solution of sodium carbonate.
(8 marks)
- c) State the purpose of mixing solutions during sample preparation and explain two (2) factors that influence proper homogeneity. (6 marks)

QUESTION 6

- a) i) Explain the purpose of proper sample logging in a laboratory before analysis. (4 marks)
- ii) Suggest suitable storage conditions for water samples before microbiological analysis. (4 marks)
- b) Examine trends across the periodic table based on the following:
- i) Metallic character and electrical conductivity. (6 marks)
- ii) Boiling points and melting points (6 marks)

Periodic Table

Group																		3	4	5	6	7	8
1	2																	2					
																				Ho holmium 4.0			
																				Ne neon 20.2			
																				Ar argon 39.9			
																				Kr krypton 83.8			
																				Xe xenon 131.3			
																				Rn radon —			



ZIMBABWE

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

**HIGHER EDUCATION EXAMINATIONS COUNCIL
(HEXCO)**

NATIONAL CERTIFICATE

IN

LABORATORY TECHNOLOGY

MODULE: Laboratory Sample Processing I PAPER NO: 360/24/M02

DURATION: 3 Hours

JUNE 2026 EXAMINATION

REQUIREMENTS

1. The periodic table is attached at the back of the question paper.
2. Non programmable calculator.

INSTRUCTIONS TO CANDIDATE

1. Answer all questions in Section A.
2. Answer any three (3) questions in Section B.
3. All questions carry 20 marks each.
4. Do not write anything on the question paper.

This paper consists of 6 printed pages.

Periodic Table

Group																						
1	2	3												4	5	6	7	8				
		1 H hydrogen 1.0																				
		Key atomic number atomic symbol name relative atomic mass																				
3	4															5	6	7	8	9	10	
Li lithium 6.9	Be beryllium 9.0															B boron 10.8	C carbon 12.0	N nitrogen 14.0	O oxygen 16.0	F fluorine 19.0	Ne neon 20.2	
11	12															Al aluminum 27.0	Si silicon 28.1	P phosphorus 31.0	S sulfur 32.1	Cl chlorine 35.5	Ar argon 39.9	
Na sodium 23.0	Mg magnesium 24.3																					
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36					
K potassium 39.1	Ca calcium 40.1	Sc scandium 45.0	Ti titanium 47.9	V vanadium 50.9	Cr chromium 52.0	Mn manganese 54.9	Fe iron 55.8	Co cobalt 58.9	Ni nickel 58.7	Cu copper 63.5	Zn zinc 65.4	Ga gallium 69.7	Ge germanium 72.6	As arsenic 74.9	Se selenium 79.0	Br bromine 79.9	Kr krypton 83.8					
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54					
Rb rubidium 85.5	Sr strontium 87.6	Y yttrium 88.9	Zr zirconium 91.2	Nb niobium 92.9	Mo molybdenum 95.9	Tc technetium -	Ru ruthenium 101.1	Rh rhodium 102.9	Pd palladium 106.4	Ag silver 107.9	Cd cadmium 112.4	In indium 114.8	Sn tin 118.7	Sb antimony 121.8	Te tellurium 127.6	I iodine 126.9	Xe xenon 131.3					
55	56	57-71 lanthanoids		72	73	74	75	76	77	78	79	80	81	82	83	84	85	86				
Cs cesium 132.9	Ba barium 137.3			Hf hafnium 178.5	Ta tantalum 180.9	W tungsten 183.8	Re rhenium 186.2	Os osmium 190.2	Ir iridium 192.2	Pt platinum 195.1	Au gold 197.0	Hg mercury 200.6	Tl thallium 204.4	Pb lead 207.2	Bi bismuth 209.0	Po polonium -	At astatine -	Rn radon -				
87	88	89-103 actinoids		104	105	106	107	108	109	110	111	112	113	114	115	116	117	118				
Fr francium -	Ra radium -			Rf rutherfordium -	Db dubnium -	Sg seaborgium -	Bh bohrium -	Hs hassium -	Mt meitnerium -	Ds darmstadtium -	Rg roentgenium -	Cn copernicium -	Nh nihonium -	Fl flerovium -	Lv livermorium -	Uu ununoctium -	Uus unseptium -	Uuh unhassium -				

57	La	lanthanum	138.9	58	Ce	cerium	140.1	59	Pr	praseodymium	140.9	60	Nd	neodymium	144.4	61	Pm	promethium	—	62	Sm	samarium	150.4	63	Eu	euroium	152.0	64	Gd	gadolinium	157.3	65	Tb	terbium	158.9	66	Dy	dyprosium	162.5	67	Ho	holmium	164.9	68	Er	erbium	167.3	69	Tm	thulium	168.9	70	Yb	yterbium	173.1	71	Lu	lutetium	175.0
89	Ac	actinium	—	90	Th	thorium	232.0	91	Pa	protactinium	231.0	92	U	uranium	238.0	93	Np	neptunium	—	94	Pu	plutonium	—	95	Am	americium	—	96	Cm	curium	—	97	Bk	berkelium	—	98	Cf	californium	—	99	Es	einsteinium	—	100	Fm	fermium	—	101	Md	mendelevium	—	102	No	nobelium	—	103	Lr	lawrencium	—

lanthanoids

actinoids