THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

STUDENTS' ITEM RESPONSE ANALYSIS REPORTON THE FORM TWO NATIONAL ASSESSMENT(FTNA) 2024

CHEMISTRY

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032 CHEMISTRY

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FOREWORD

This report presents the Students' Items Response Analysis (SIRA) on Form Two National Assessment, Chemistry subject which was conducted in November 2024.

The Form Two National Assessment (FTNA) is a formative assessment designed to monitor students' learning and provide feedback that teachers, students and other education stakeholders can use to improve teaching and learning. Generally, the performance in Chemistry subject was average, with 34.29 per cent of students passing the assessment. The students who performed well demonstrated mastery of the basic concepts, theories, terminologies, experiments and principles in Chemistry.

On the other hand, the students who scored low marks were not well-conversant with basic concepts, theories, scientific procedures and principles in Chemistry. Additionally, they failed to respond according to the requirements of the questions in justifying scientific facts. Furthermore, some students demonstrated poor drawing skills.

This report will help teachers to identify the challenging areas and take appropriate measures during teaching. It will also help students identify strengths and weaknesses for them to improve learning before sitting for the Certificate of Secondary Education Examination.

The National Examinations Council of Tanzania expects that the feedback provided in this report will clarify the challenges for which education stakeholders should take proper measures to improve teaching and learning of Chemistry subject. Consequently, students will acquire knowledge, skills and competences indicated in the syllabus for better performance in future assessments and examinations.

The National Examinations Council of Tanzania appreciates the contribution of all those who prepared this report.

Dr. Said Ally Mohamed
EXECUTIVE SECRETARY

1.0 INTRODUCTION

This report analyses the performance of the students who sat for the Form Two National Assessment (FTNA) 2024 in Chemistry subject. The Chemistry paper was set according to the 2021 revised format, developed from the 2007 Chemistry Syllabus for Ordinary Level Secondary Education, reprinted in 2017.

The assessment paper consisted of sections A, B and C. Section A consisted of two objective questions: 1 and 2. Question 1 consisted of ten multiple choice items carrying ten (10) marks. Question 2 comprised five matching items carrying five (5) marks. Section B consisted of seven short answer questions each carrying ten (10) marks, whereas section C comprised of one subjective/structured question carrying fifteen (15) marks. The students had to answer all the questions in sections A, B and C.

Students' performance in this analysis is categorized into the percentage intervals of 0 - 29, 30 - 64 and 65 - 100, which are classified as weak, average and good, respectively.

A total of 796,830 students sat for the Chemistry paper in which 272,960 (34.29%) students passed the assessment. This indicates that the overall performance of students was average. Table 1 shows the students' performance by grade, ranging from A to F.

Table 1: The Performance of Students by Grade in 2024

S/N	Grade	Number of Students	Percentage of Students
1.	A	10,188	1.28
2.	B	19,944	2.51
3.	C	91,832	11.54
4.	D	150,996	18.96
5.	F	523,138	65.71

Table 1 shows that the number of students who failed the assessment amounts to 65.71 per cent, and only 1.28 per cent scored grade A.

In the year 2023, a total of 195,506 (28.16%) students out of 694,343 passed the assessment. Thus, students' performance in the year 2024 has increased by 6.13 per cent compared to the performance in 2023.

2.0 ANALYSIS OF STUDENTS' PERFORMANCE IN EACH QUESTION

2.1 Section A: Objective Questions

This section consisted of two objective questions, namely multiple choice and matching items.

2.1.1 Question 1: Multiple Choice Items

The question consisted of 10 multiple choice items, set from six (6) topics as follows: *Atomic Structure; Matter; Heat Sources and Flames; Water; Periodic Classification* and *Laboratory Techniques and Safety*.

This question was attempted by 796,830 (100%) students. The analysis of the students' performance shows that 16.15 per cent scored from 0 to 2 marks, 77.00 per cent scored from 3 to 6 marks, while 6.85 per cent scored from 7 to 10 marks. Generally, the performance in this question was good with 83.85 per cent of the students scoring 3 marks or above. Figure 1 summarizes the students' performance in this question.

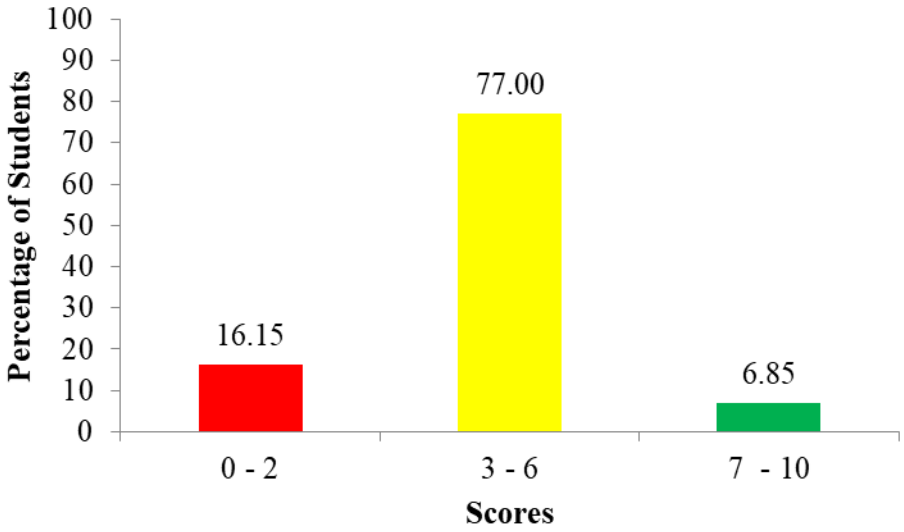


Figure 1: *Students' Performance in Question 1*

The students who scored high marks (7-10) attempted most items of the question correctly. This shows that the students had mastered the basic concepts, theories, terminologies, experiments and principles across various topics which were tested in question 1.

Conversely, students who scored low marks (0-2) failed to attempt most of the items correctly due to inadequate knowledge on the basic concepts, theories, terminologies, experiments and principles across the topics from which the items were set. The overall analysis of the students' responses to each item is as follows:

In item (i), students were required to identify the term that refers to different atoms that occupy the same group and period in the Periodic Table. The correct answer was *A, Isotopes*. Students who chose the correct answer were well-versed on the use of electronic configurations to locate the positions of elements in the Periodic Table. The students who chose alternative *B, Isomers* had insufficient knowledge about isomers, which are chemical substances with the same molecular formula but different structural formula. Likewise, those who opted for *C, Monomers,* did not understand that monomers are typically small molecules with a specific structure that allows them to bond with either monomer to create larger, more material. Moreover, students who opted for alternative *D, Isobars* had inadequate knowledge of isobars, which simply means atoms of different elements having the same mass number but different atomic numbers.

In item (ii), the students were tasked to point out the method that was not suitable for separating the components of air. The correct answer was *A, Chemical Means.* Students who opted for the correct answer were conversant with the properties of mixture. Those who chose either alternative *B, Physical Means* and *C, Freezing Method* had insufficient knowledge that air is a mixture of gases which retain their own properties rather than forming a new chemical specie. Those who chose alternative *D, Precipitation Method* failed to realize that the air exists in gaseous form, whereas the precipitation method involves the mixing of two aqueous solutions to yield solid substance.

In item (iii), the students were required to identify the heat source that produces a non-luminous flame. The correct answer was *D, Bunsen burner* Students who chose the correct answer understood that when air holes of Bunsen burner are opened, non-luminous flame produced due to complete combustion. Those who chose either *A, Candle*; *B, Tin lamp* and C, *Kerosene stove* failed to realize that the heat sources produce soot, which leads to the formation luminous flame.

In item (iv), the students were asked how water could be changed from

vapour to liquid state. The correct answer was *D, By condensation.* Students who wrote the correct answer had enough knowledge that when water vapour loses heat/energy, it changes to liquid state. Those who opted for alternative *A, By sublimation* did not understand that sublimation is the change of solid substance directly to gaseous state. Those who chose *B, Evaporation* failed to realize that evaporation is the change of substance from liquid into gaseous state which is the opposite of condensation process. Students who opted for *C, By Melting* failed to realize that melting is the change of a substance from solid state to liquid state.

In item (v), the students were required to account for the fact that "water is regarded as the universal solvent". The correct answer was *C, Because most of substances dissolve in it.* Students who got the correct answer had adequate knowledge about solubility of different substance in water. Those who opted for either *A, Because it is found all over the world*; *B, Because it contain hydrogen and oxygen elements* and *D, Because it contains a variety of minerals* had insufficient knowledge on the concept of solubility of different substance in water and organic solvents.

In item (vi), the students were asked: "What is the total number of electrons in hypothetical ion Q^{2+} whose atomic number is 12?" The correct answer was *C, 10.* Students who chose the correct answer demonstrated adequate knowledge on the concept of *electronic configuration* and relationship between atomic number and number of protons. Those who opted for *A, 12* lacked adequate knowledge that the hypothetical ion has di-positive charge which implies the loss of two electrons. Students who opted for *B, 14* and *D, 24* had notion that presence of positive charge indicates electron deficiency, caused by removal of electrons rather than their addition.

In item (vii), the students were required to identify the term that was not part of the Bunsen burner. The correct answer was *C, Gas tap.* Students who chose the correct answer had adequate knowledge that gas tap allow the gas to enter in the Bunsen burner from a source. Students who chose alternative *A, Jet* failed to realize that jet is a small opening at the base of the Bunsen burner through which gas exits. Those who opted for *B, Barrel* did not realize that the barrel is a vertical metal tube of Bunsen burner where the gas and air mixes before combustion. Students who chose *D, Air hole* did not realize that air hole is the small adjustable opening near the bottom of barrel which control the amount of air that mixes with gas before combustion.

In item (viii) the students were required to identify the apparatus for stirring substances. The correct answer was *B, Glass rod.* Students who gave the correct answer had adequate understanding on the concepts of laboratory apparatuses. Those who chose *A, Desiccator* failed to realize that desiccator, is used to remove moisture from a substance or to keep material dry. Students who opted for alternative *C, Spatula* were not aware that spatula is used for scooping small quantities of powder or crystalline chemicals. Those who opted for alternative *D, Deflagrating spoon* did not know the role of deflagrating spoon which is to heat small amount of substance in a gas jar.

In item (ix), students were supposed to specify the way in which contaminants can be removed from water. The correct answers was *A, Through sedimentation.* Those who opted for either of distractor *B, Through sedimentation; C, Through electrolysis* and *D, Through decantation* confused the concept of water treatment and water purification.

In item (x), the students were required to state number of protons present in a molecule of oxygen gas. The correct answer was *D, 16.* Students who chose the correct answer demonstrated sufficient knowledge on the concept of molecule and atom. Those who opted for A, *8* lacked adequate knowledge on differences between the number of protons present in oxygen atom and oxygen molecule. Students who opted for either alternative *C, 9* or *B, 17* had insufficient knowledge about relationship between atomic number and number of protons.

2.1.2 Question 2: Matching Items

In this question students were required to Match the elements in **List A** with the number of protons in **List B** by writing the correct response beside the corresponding item number in the table provided.

List A		List B	
(i)	Hydrogen	A	Six
(ii)	Helium	B	Five
(iii)	Carbon	C	Four
(iv)	Fluorine	D	Ten
(v)	Beryllium	E	Nine
		F	Zero
		G	Two

The question was attempted by 796,830 (100%) students. The percentage of students who scored from 0 to 1 mark was 19.08, from 2 to 3 marks was 17.54 and from 4 to 5 marks was 63.38 per cent. Generally, the performance of students in this question was good as 80.92 per cent scored 2 marks or above. Summary of the students' performance in this question is shown in Figure 2.

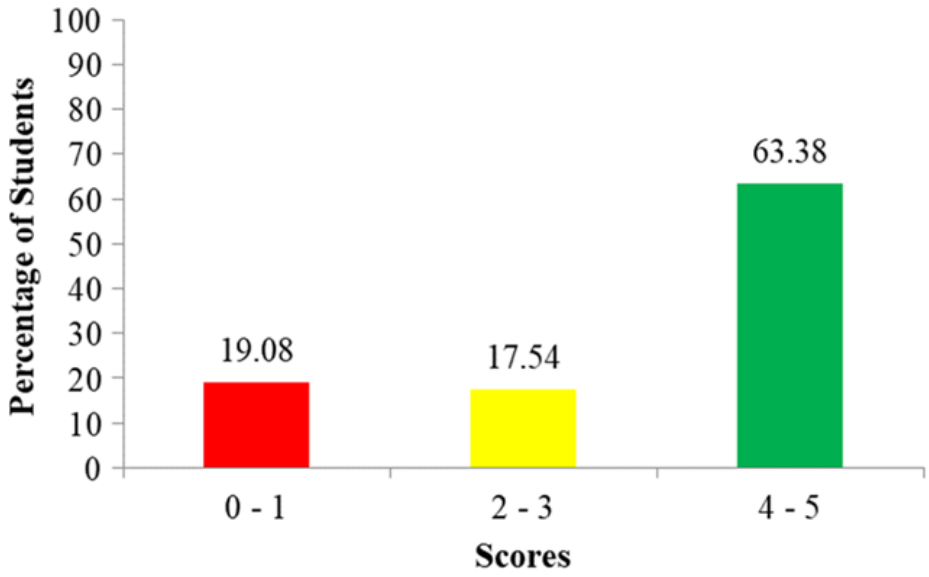


Figure 2: *Students' Performance in Question 2*

Students who scored high marks (3 to 5) correctly matched the elements with corresponding number of protons. This pointed to the fact that, they are proficient on the relationship between atomic number and protons number. Moreover, they exhibited extensive familiarity on the use of electronic configurations to locate the position of elements in the Periodic Table.

On the other perspective, students who scored low marks (19.08%) failed to attempt most of the items in this question. Most of them related every element provided with inappropriate number of protons. For instance, some opted for *E, nine* as number of protons for carbon instead of opting for *C, four*. Others chose *A, six* as number of protons in item (iii). This reveals that, they had inadequate understanding on the relationship between atomic number and proton number. Hence, the students had unsatisfactory knowledge about the use of electronic configurations to locate the position of elements in the Periodic Table.

2.2 Section B: Short Answer Questions

This section consisted of seven (7) short answer questions, weighing ten (10) marks each. Students were required to answer all questions. The pass score for each question was 3 marks.

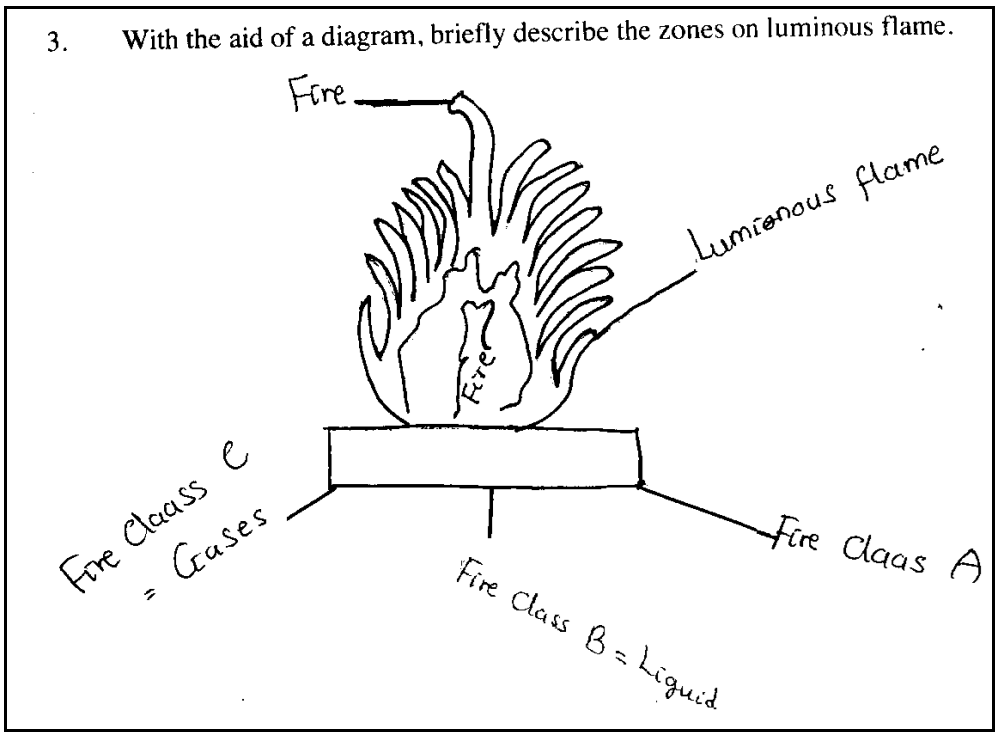
2.2.1 Question 3: Heat Sources and Flames

Students were supposed to briefly describe the zones on luminous flame with the aid of a diagram. The question was attempted by 796,830 (100%) students out of which 93.78 per cent scored from 0 to 2.5 marks, 4.31 per cent scored from 3 to 6 marks and 1.91 per cent scored from 6.5 to 10 marks. The general performance in this question was weak as only 6.22 per cent of the students scored 3 marks or above. The distribution of students' scores in this question is shown in Table 2.

Table 2: Students' Performance in Question 3

Scores' Range	Percentage of Students
0.0 – 2.5	93.78
3.0 – 6.0	4.31
6.5 – 10.0	1.91

Table 2 shows that 93.78% of the students did not perform well on this question. Students who scored low marks (0-2.5) failed to attempt most parts of the question. Some students sketched diagrams of a luminous flame but included an incorrect number of flame zones. For instance, some students drew diagrams of luminous flames with only one labeled zone, while others included five zones instead of the correct four. Additionally, a few students incorrectly drew diagrams of a non-luminous flame instead of a luminous flame. Furthermore, some students incorrectly stated that the thin outer zone represents a region of incomplete combustion. This misunderstanding suggests that the students were not proficient in recognizing that the thin outer zone forms due to an ample supply of air, which leads to complete combustion. Generally, students in this category lacked sufficient knowledge of the characteristics of a luminous flame. A sample of incorrect responses to question 3 is shown in Extract 3.1.



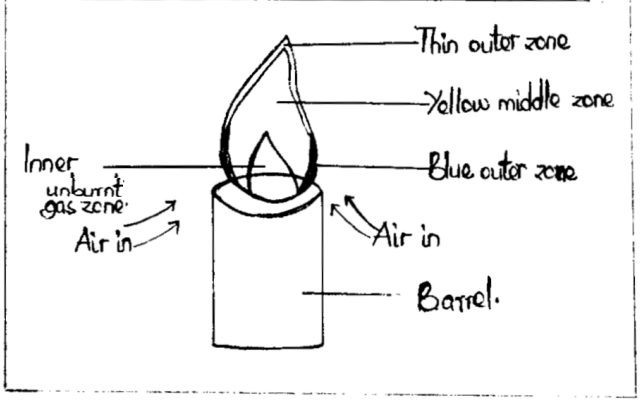
Extract 3.1: A sample of incorrect responses to Question 3

In Extract 3.1, the student sketched a diagram of a warning sign for a flammable liquid instead of a luminous flame and provided incorrect labelling.

In contrast, students who scored high marks (6.5-10) on this question demonstrated good understanding of the diagram for a luminous flame. They also correctly described the four zones of the luminous flame. Extract 3.2 shows a sample of correct responses from one of the students.

3. With the aid of a diagram, briefly describe the zones on luminous flame.

A LABELLED DIAGRAM OF LUMINOUS FLAME:



Zones of luminous flame;

(i) Thin outer zone:- This is the outermost zone of the luminous flame where complete combustion takes place as it exposed to the air. It is not easily seen by our eyes.

(ii) Yellow middle zone:- This is the largest zone of the luminous flame. There is incomplete combustion in this zone causing production of soot and a yellow bright colour.

(iii) Inner unburnt gas zone:- In this zone, no combustion takes place since it does not receive oxygen, therefore the gas remains unburnt in this zone.

(iv) Blue outer zone:- This is the hottest part of the flame. There is complete combustion since it receives maximum oxygen. It is found in the lower part of the flame with blue colour.

Extract 3.2: A sample of correct responses to Question 3

In Extract 3.2, the student correctly drew a labelled diagram and gave correct explanations of four zones of the flame.

2.2.2 Question 4: Atomic Structure

This question comprised of two parts, namely (a) and (b). In Part (a) (i), students were asked to *give three assumptions of Dalton's Atomic Theory.* In (a) (ii) students were asked to *write the nuclide notation of an arbitrary element X having atomic number Z and neutron number A.* In part (b) the question was as follows: *"A sample of chlorine gas was found to contain*

75% of the isotope $^{35}_{17}\mathrm{Cl}$ *and 25% of isotope* $^{37}_{17}\mathrm{Cl}$*. Calculate the relative atomic mass of chlorine."*

The question was attempted by 796,830 (100%) students of which 72.79 per cent scored from 0 to 2.5 marks, 21.42 per cent scored from 3 to 6 marks and 5.79 per cent scored from 6.5 to 10 marks. Generally, the performance in this question was weak since only 27.21 per cent of the students scored 3 marks or above. The distribution of students' performance is summarized in Figure 3.

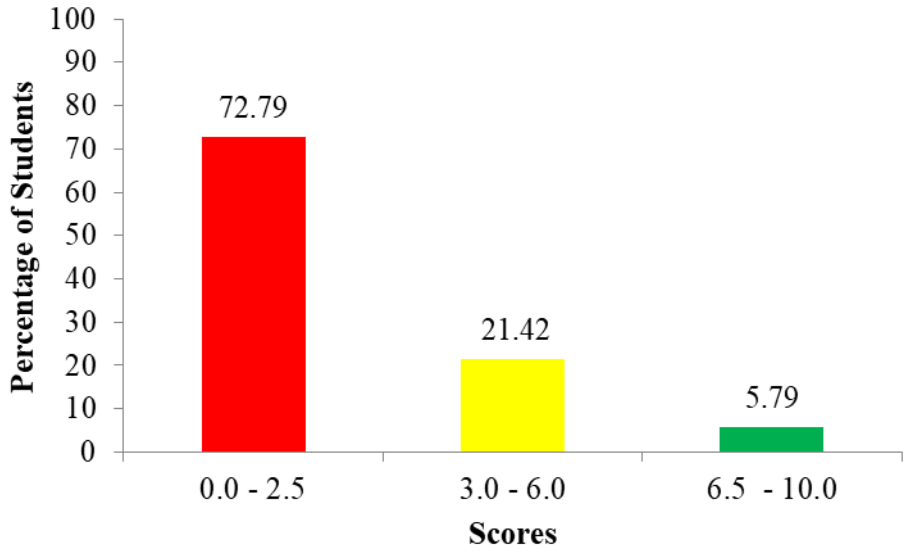
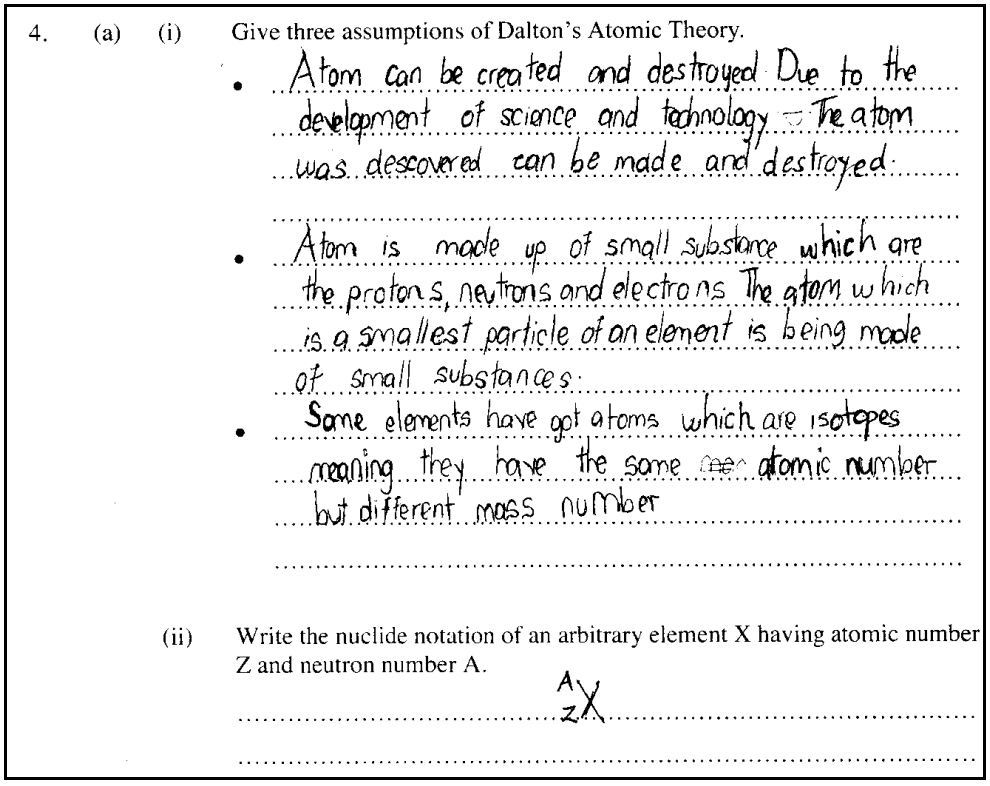


Figure 3: *Students' Performance in Question 4*

Students who scored low marks (0-2.5) failed to attempt most parts of the question correctly. Most of students wrote amendments of Dalton's atomic theory instead of its assumptions. Other students wrote definitions of different terms associated with atoms. For example, in part (a) (i) one student wrote assumption of Dalton's atomic Theory as "atom is the smallest particle of an element which can take part of chemical reaction". Similarly, another student incorrectly wrote "isotopes have same atomic number but different mass number". This indicates that the students had inadequate knowledge on the contribution of Dalton to atomic structure. In item (a) (ii) some students wrote nuclide notations by using atomic number and neutrons number instead of atomic mass and atomic number. For example, one student wrote nuclide notation as $^{A-Z}_{Z}X$ in which the super script indicates number of neutrons instead of atomic mass. Such incorrect

responses reveal that, the students had inadequate mathematical skills in calculating mass number of an atom by using number of protons and neutrons, and lacked skills in writing nuclide notation. In part (b) some students wrote incorrect formula of calculating relative atomic mass. For instance, one student wrote,

RAM = (mass number + atomic number + percentage). Another student wrote the correct formula but did not divide by 100 percent and hence got atomic mass equal to 3550, which is quite wrong. Generally, such students who had unsatisfactory mathematical skills in calculating relative atomic mass and mass number had inadequate understanding about contribution of Dalton to the atomic structure. Extract 4.1 shows a sample of incorrect responses from one of the students in question 4.



4. (a) (i) Give three assumptions of Dalton's Atomic Theory.

- Atom can be created and destroyed Due to the development of science and technology The atom was descovered can be made and destroyed.
- Atom is made up of small substance which are the protons, neutrons and electrons The atom which is a smallest particle of an element is being made of small substances.
- Some elements have got atoms which are isotopes meaning they have the same ~~ee~~ atomic number but different mass number

(ii) Write the nuclide notation of an arbitrary element X having atomic number Z and neutron number A.

$^{A}_{Z}X$

(b) A sample of chlorine gas was found to contain 75% of the isotope $^{35}_{17}Cl$ and 25% of isotope $^{37}_{17}Cl$. Calculate the relative atomic mass of chlorine.

solution

$(75 + 35) \quad (25 + 37)$

$\frac{115}{10} = \quad \frac{62}{10} =$

$\frac{(75+35}{10} + \frac{25+37)}{10} = \frac{735}{10} = 21$

The relative atomic mass of chlorine is 1 34 21 3.5

Extract 4.1: A sample of incorrect responses to Question 4

In Extract 4.1, the student wrote amendments of Dalton's atomic theory instead of its assumptions in part (a). Also, in part (b) he/she used incorrect formula in calculating relative atomic mass.

On the other hand, students who scored high marks (6.5-10) managed to write correct answers in most parts of the question. This signifies that, in part (a) the students had enough knowledge on the contribution of Dalton's atomic theory to the atomic structure. Furthermore, in part (b), students demonstrated good mathematical skills by using proper formula in calculating the relative atomic mass. Extract 4.2 shows a sample of correct responses from one of the students.

4. (a) (i) Give three assumptions of Dalton's Atomic Theory.

- All matter are made up with tiny particles called atoms.
- Atoms of the same kind have same mass and properties Atoms of one element posses the same characteristics and the same mass. They are identical.
- Atoms of different kinds or elements can be distinguished by their respective relative weights. This is because he assumed different kinds of atoms have different relative masses.

(ii) Write the nuclide notation of an arbitrary element X having atomic number Z and neutron number A.

Mass number = Z+A

Atomic number = Z

∴ The nuclide notation of an element is $^{Z+A}_{Z}X$

(b) A sample of chlorine gas was found to contain 75% of the isotope $^{35}_{17}Cl$ and 25% of isotope $^{37}_{17}Cl$. Calculate the relative atomic mass of chlorine.

Solution.

R.A.M = Sum of isotopic mass × % abundance

$R.A.M = \left(35 \times \frac{75}{100}\right) + \left(37 \times \frac{25}{100}\right)$

$R.A.M = \frac{2625 + 925}{100}$

$R.A.M = \frac{3550}{100} = 35.5$

∴ The relative atomic mass of chlorine is 35.5

Extract 4.2: A sample of correct responses to Question 4

2.2.3 Question 5: Periodic Classification

The question comprised two parts, namely (a) and (b). The question was as follows: *Study the following part of the Periodic Table and then answer the questions that follow.*

I							*VIII*
	III	*III*	*I V*	*V*	*VI*	*VII*	

(a) Place the elements having proton number 1, 10, 14, 16 and 20 in the Periodic Table by using letters A, B, C, D and E respectively.

(b) Identify the element which:

(i) has the highest electronegativity

(ii) has a valency of four

(iii) is among the inert gases

(iv) belongs to alkaline earth metals' block

(v) burns in oxygen to form water

The question was attempted by 796,830 (100%) students out of which 53.31 per cent scored from 0 to 2.5 marks, 26.38 per cent scored from 3 to 6 marks and 20.31 per cent scored from 6.5 to 10 marks. The general students' performance in this question was average since 46.69 per cent of the students who attempted this question scored 3 marks or above. The distribution of students' scores in this question is summarized in Figure 4.

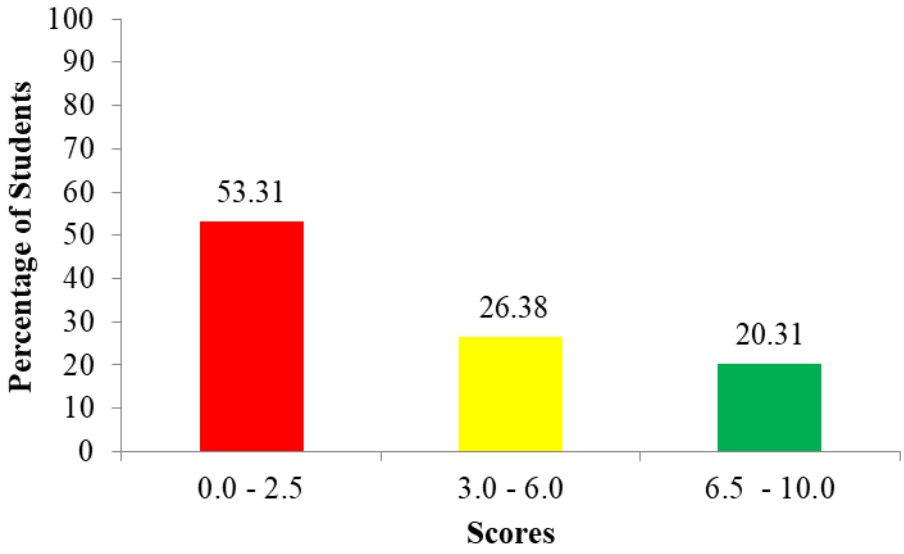
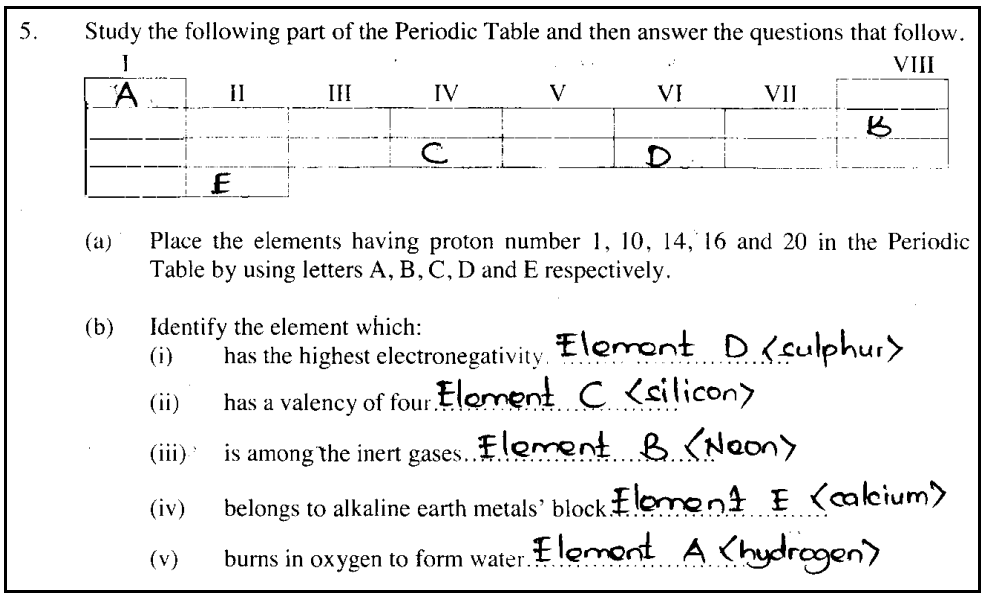


Figure 4: *Students' Performance in Question 5*

Students who scored high marks (6.5-10) on this question correctly placed elements in the periodic table in part (a). Similarly, in part (b), these students accurately identified each element based on the given properties. This suggests that the students had good understanding of how the properties of elements change across periods and down the groups. Moreover, they were well-versed in electronic configurations, which helped them determine the positions of elements in the periodic table. Furthermore, the students demonstrated a solid understanding of the relationship between atomic number and proton number. Extract 5.1 shows a sample of correct responses from one of the students.



Extract 5.1: A sample of correct answers in Question 5

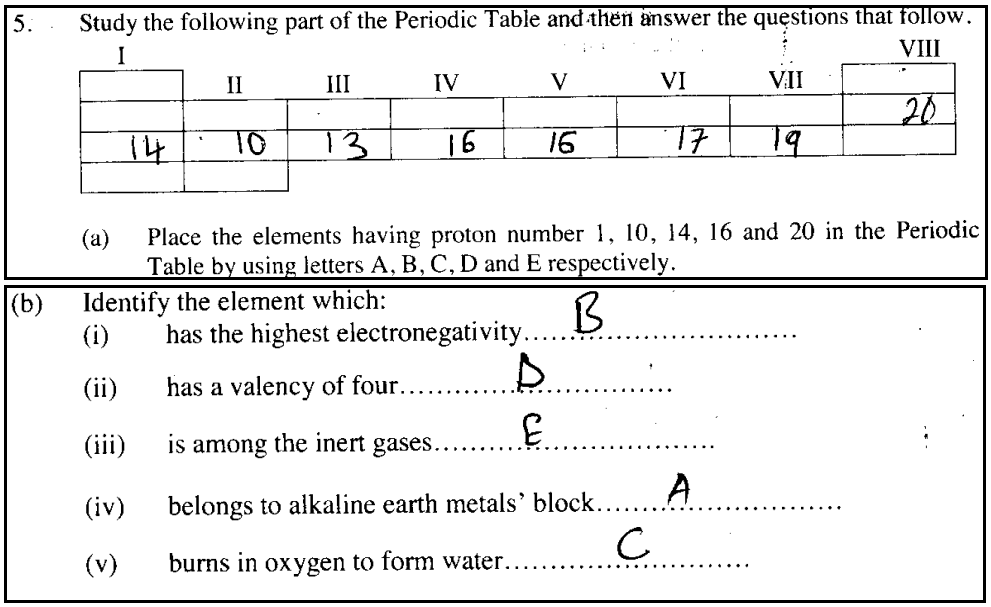
In Extract 5.1, the student correctly placed elements in the periodic table in part (a) and identified the elements according to their properties in part (b).

Conversely, students who scored low marks (0-2.5) failed to attempt most parts of the question. Some students wrote the positions of elements interchangeably. For example, one student exchanged the position of element B (Helium) with that of element D (Sulphur) in part (a). In part (b) some students failed to write the correct elements based on their properties. For instance, one student incorrectly wrote that the element with high electronegativity is A (Hydrogen) instead of Sulphur. The student failed to comprehend the fact that element A (Hydrogen) has one proton thus the force of attraction exerted by positive charged particle (nucleus) towards electron is small compared to other elements such as D (Sulphur) which has 16 protons.

Another student wrote the answer for item (i) as element B (Neon) instead of D (Sulphur). The student was not aware that electronegativity is a measure of an atom's ability to attract electrons when it forms a chemical bond with another atom. Thus, element B is less electronegative because it does not react. Moreover, another student in (b) (ii) wrote element with a valency of four is E (Calcium) instead of C (Carbon). This portrays that the student failed to realize that, element E with atomic number 20 and electronic configuration of 2:8:8:2 has a valency of 2 instead of 4 because it

contains two electrons in its outer most shell. Another student in part (b) (v) wrote that the element which burn in oxygen to produce water is D (Sulphur) instead of A (Hydrogen). This student demonstrated inadequate understanding on the chemical properties of oxygen and hydrogen gas.

Generally, the students had insufficient knowledge on the changes of properties of elements across the periods and down the groups. Thus, they were not well-familiar with using electronic configurations to locate the positions of elements in the Periodic Table. Extract 5.2 shows a sample of incorrect responses from one of the students.


5. Study the following part of the Periodic Table and then answer the questions that follow.

I	II	III	IV	V	VI	VII	VIII
							20
14	10	13	16	16	17	19	

(a) Place the elements having proton number 1, 10, 14, 16 and 20 in the Periodic Table by using letters A, B, C, D and E respectively.

(b) Identify the element which:

(i) has the highest electronegativity..... B

(ii) has a valency of four..... D

(iii) is among the inert gases..... E

(iv) belongs to alkaline earth metals' block..... A

(v) burns in oxygen to form water..... C

Extract 5.2: A sample of incorrect responses to Question 5

In Extract 5.2, the student wrote atomic numbers in the Periodic Table instead of letters A to E in part (a). Similarly, in part (b) the student identified incorrect names of elements that do not match with the given properties.

2.2.4 Question 6: Atomic Structure

The question comprised two parts, namely (a) and (b). The question was as follows:

(a) *Give reasons for the following safety measures towards fire accidents in the laboratory.*
   (i) *It is advised to close all windows before leaving the laboratory after work.*
   (ii) *If a person is surrounded by smoke to the extent of not being able to access the exits, it is advised to lie flat on the floor while searching for the exit points.*

(b) *Briefly explain three classes of fire by focusing on the nature of burning materials and recommended fire extinguishers.*

The question was attempted by 796,830 (100%) students, out of which 37.71 per cent scored from 0 to 2.5 marks, 57.01 per cent scored from 3 to 6 marks, while 5.28 per cent scored from 6.5 to 10 marks. The general students' performance in this question was average since 62.29 per cent of the students scored 3 marks or above. The students' performance in this question is summarized in Figure 5.

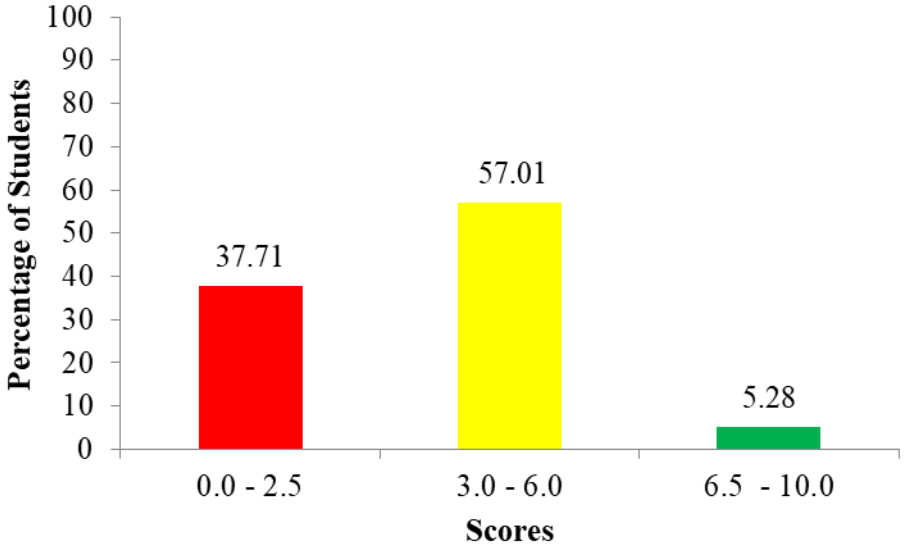


Figure 5: *Students' Performance in Question 6*

Students who scored high marks (6.5-10) were knowledgeable in classifying the types of fire according to their causes. They were also proficient in identifying the different types of fire extinguishers used for extinguishing various types of fire. Furthermore, these students

demonstrated good understanding of safety measures in the chemistry laboratory and the necessary conditions for starting a fire. Extract 6.1 shows a sample of correct responses from one of the students.

6. (a) Give reasons for the following safety measures towards fire accidents in the laboratory.

(i) It is advised to close all windows before leaving the laboratory after work.

To prevent the entrance of Oxygen gas when a fire accidents occur which Oxygen entering will speed up the rate of combustion

(ii) If a person is surrounded by smoke to the extent of not being able to access the exits, it is advised to lie flat on the floor while searching for the exit points.

This is because smoke is less denser than Oxygen gas thus it is found floating above and Oxygen gas is left down, for the person to prevent choking and suffocating one should lie flat on the floor for one to inhale oxygen found in beneath

(b) Briefly explain three classes of fire by focusing on the nature of the burning materials and the recommended extinguishers.

Classes of fire are:

(i) Class A - This class of fire is caused by burning of solid materials such as paper, plastics, furnitures or other domestic solid materials. This class of fire requires Air pressurized water (APW) extinguisher as the favourable extinguisher but other types of extinguishers can also be used except carbondioxide extinguisher.

(ii) Class B - This class of fire involves burning of flammable liquids such as kerosene, petrol and diesel. It can be extinguished using Dry powder extinguisher, Carbondioxide extinguisher or ABC extinguisher. Air pressurized extinguisher is not recommended as it may spread the fire.

(iii) Class C - This fire class is a result of burning of flammable gases such as methane, propane or pentane. It is mostly recommended to use ABC extinguisher or Dry chemical extinguisher to put of fire caused by burning of these gases.

Extract 6.1: A sample of correct responses to Question 6

In Extract 6.1, the student attempted correctly all parts of the question.

However, students who scored low marks (0-2.5) failed to attempt most parts of the question. Some students gave explanations without considering the requirement of the question based on fire accidents in part (a). For example, one student in (i) wrote "*windows should be all closed so as to avoid contamination"*. Another student wrote "*windows should be closed to prevent snake"*. This indicates that the students failed to understand the requirement of the question based on safety of fire accidents. Also, they did not understand that the presence of air (oxygen) support combustion.

Moreover, some students responded to part (ii) by stating that the "*person should lie down in order to see the way clearly"* which is not true. Others wrote that *"smoke is denser than air"*. Likewise, another student wrote "*because oxygen is denser than air".* This signifies that, they failed to understand that oxygen is part of air and it is denser than smoke thus, little amount of oxygen remained will be available at the beneath of the floor.

Generally, the students were not familiar with safety measures for Chemistry laboratory and necessary conditions to start fire. In part (b) some students gave types of fire extinguisher without considering safety measure. For example, one student wrote the fire extinguisher for class F (Cooking oils) is water. This student had insufficient knowledge about cooking oil which is immiscible with water and it is less dense than water. Thus, in this heterogeneous mixture, cooking oil will form upper layer and continue to burn. Others wrote Class A fire can be extinguished by carbon dioxide. This pointed out that, they were not aware that class A fire needs extinguisher which bring two effects, cooling and smothering (cut off oxygen). Hence, carbon dioxide is not suitable because does not cool burning material to lower temperature below its ignition point.

Another student wrote *"Fire class D"* (metal) can be extinguished by water. However, some students were not aware that metal will react with water and continue to burn. Moreover, others wrote that "*extinguishing fire of class E requires water"*. This signifies that the students did not know that water conduct electricity, thus fire would continue. Such responses indicate that the students had unsatisfactory knowledge on classification of the types of fire according to their causes and they lacked skills on the appropriate selection of fire extinguishers. Extract 6.2 shows a sample of incorrect responses from one of the students.

6. (a) Give reasons for the following safety measures towards fire accidents in the laboratory.

(i) It is advised to close all windows before leaving the laboratory after work.

Because to close all windows before to leaving the laboratory after work. It help for security : for example during the high wind or rainfall. It can cause the apparatus to break down and chemicals

(ii) If a person is surrounded by smoke to the extent of not being able to access the exits, it is advised to lie flat on the floor while searching for the exit points.

Because smoke cigarette in the Laboratory it can cause of accident. In the Labaratay we don't smoke.

(b) Briefly explain three classes of fire by focusing on the nature of the burning materials and the recommended extinguishers.

Fuel is the process of fire or material of used to fire

Oxygen is the gas in used to fire

Heat is the force of fire to burning material

Extract 6.2: A sample of incorrect responses to Question 6

In Extract 6.2, the student wrote safety measures which do not relate to fire accident in part (a). Similarly, in part (b) the student gave component of fire instead of classes of fire.

2.2.5 Question 7: Matter

Students were required to describe the fractional distillation process of a mixture of water and ethanol.

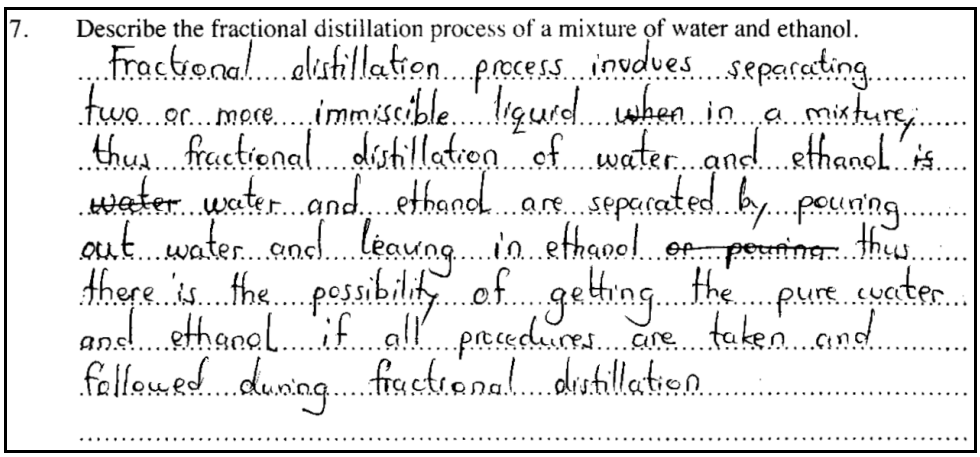
This question was attempted by 796,830 (100%) students. Statistics show that 96.81 per cent of the students scored from 0 to 2.5 marks, 2.46 per cent scored from 3 to 6 marks and 0.73 per cent scored from 6.5 to 10 marks. Generally, students' performance in this question was weak as only 3.19 per cent of the students scored 3 marks or above. The students' performance in this question is summarized in Table 3.

Table 3: Students' Performance in Question 7

Scores' Range	Percentage of Students
0.0 – 2.5	96.81
3.0 – 6.0	2.46
6.5 – 10.0	0.73

Students who scored low marks (0-2.5) failed to correctly attempt most parts of the question. Some of them wrote the definition of fractional distillation but did not provide a step-by-step explanation of the process. Others drew a diagram without any accompanying explanations. Furthermore, some students provided incorrect descriptions of the functions of the apparatus used in a fractional distillation setup. For example, one student wrote, *"In fractional distillation, ethanol and water are separated by filtering the mixture through the Liebig condenser, where ethanol remains as the residue and water as the distillate."* Another student wrote, *"The mixture of ethanol and water is vaporized in the Liebig condenser, with water being obtained as the distillate."*

Similarly, some students drew a fractional distillation setup that did not include a fractionating column or Liebig condenser. Moreover, one student incorrectly stated that the role of the fractionating column is to cool the mixture of ethanol and water. Such responses indicate that the students failed to understand the requirements of the question and lacked sufficient knowledge of the steps involved in separating mixtures through fractional distillation. Extract 7.1 shows a sample of incorrect responses.

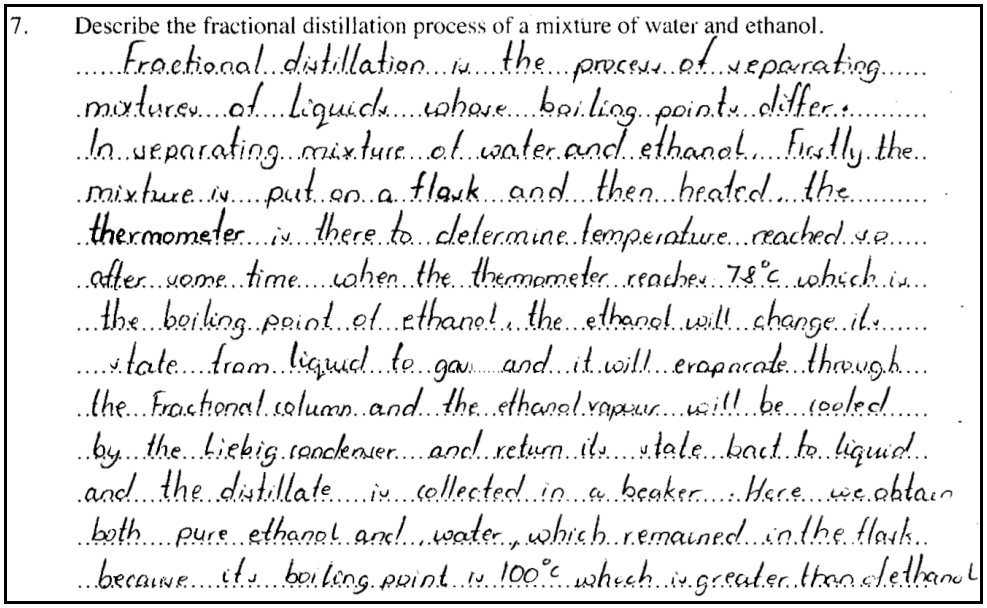

7. Describe the fractional distillation process of a mixture of water and ethanol.

Fractional distillation process involves separating two or more immiscible liquid when in a mixture, thus fractional distillation of water and ethanol is ~~water~~ water and ethanol are separated by pouring out water and leaving in ethanol ~~or pouring~~ thus there is the possibility of getting the pure water and ethanol if all procedures are taken and followed during fractional distillation

Extract 7.1: A sample of incorrect responses to Question 7

In Extract 7.1, the student described layer separation instead of fractional distillation process. He/she termed water with ethanol as immiscible liquids instead of miscible liquids.

On the other hand, students who scored high marks (3.19%) attempted correctly all parts of the question. This reflects that students had satisfactory knowledge on the concept of separating mixture using fractional distillation. A sample of correct responses is provided in Extract 7.2.


7. Describe the fractional distillation process of a mixture of water and ethanol.

Fractional distillation is the process of separating mixtures of liquids whose boiling points differ. In separating mixture of water and ethanol, Firstly the mixture is put on a flask and then heated, the thermometer is there to determine temperature reached e.g. after some time when the thermometer reaches 78°c which is the boiling point of ethanol, the ethanol will change its state from liquid to gas and it will evaporate through the Fractional column and the ethanol vapour will be cooled by the Liebig condenser and return its state back to liquid and the distillate is collected in a beaker. Here we obtain both pure ethanol and water, which remained in the flask because its boiling point is 100°c which is greater than ethanol

Extract 7.2: A sample of correct responses to Question 7

In Extract 7.2, the student correctly explained all steps used in fractional distillation to separate the mixture of water and ethanol.

2.2.6 Question 8: Laboratory Technique and Safety; Oxygen and Hydrogen

This question comprised of three parts. In part (a) students were asked to give three laboratory rules. In part (b) they were asked to identify three fields in which Chemistry is applied. In part (c) students were guided as follows: *What will be observed in the following simple experiments? (i) Red litmus paper is dipped into a flask containing dilute hydrochloric acid. (ii) A piece of white plain paper is placed above a luminous flame. (iii) A burning splint is lowered into a jar containing a mixture of hydrogen and oxygen gas.*

This question was attempted by 796,830 (100%) out of which 17.38 per cent scored from 0 to 2.5 marks, 63.72 per cent scored from 3 to 6 marks and 18.94 per cent scored from 6.5 to 10 marks. Students who scored 3 marks or above were 82.66 percent, indicating an overall good performance. The performance of students in this question is summarized in Figure 6.

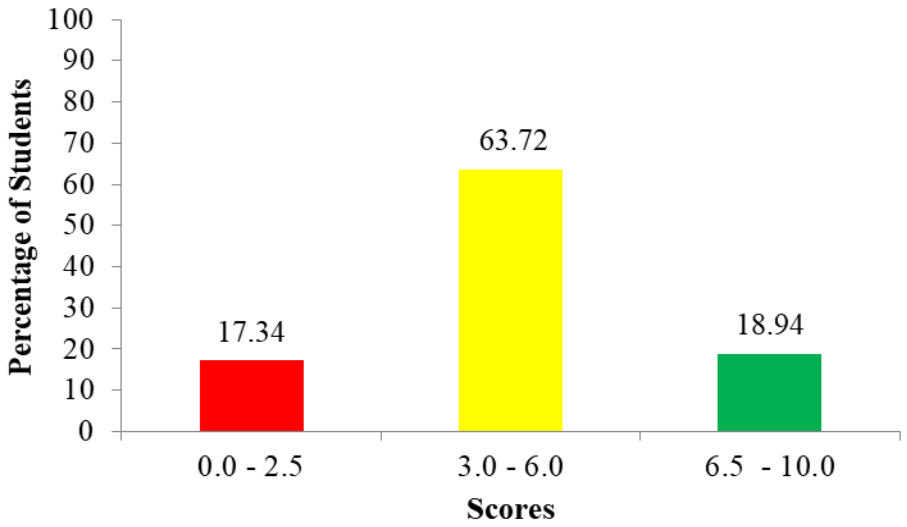


Figure 6: *Students' Performance in Question 8*

Students who scored high marks (6.5-10) in this question had adequate knowledge about the concept of laboratory rules, application of Chemistry and properties of hydrogen gas well as oxygen gas. Extract 8.1 is a sample of correct responses from one of the students in question 8.

8. (a) Give three laboratory rules.

(i) Do not enter in the laboratory without the permission of the teacher or the laboratory technician.

(ii) Do not perform any unauthorized experiments or interfere with other people's experiment to avoid accidents such as explosions.

(iii) Do not eat, drink, taste or smell any chemical in the laboratory to avoid poisoning or other accidents like corrosion.

(b) Identify three fields in which Chemistry is applied.

(i) Agriculture
(ii) Manufacturing industries
(iii) Home care and beauty products.

(c) What will be observed in the following simple experiments?

(i) Red litmus paper is dipped into a flask containing dilute hydrochloric acid.

There will be no colour change observed in the red litmus paper because dilute hydrochloric acid is acidic in nature therefore, it changes blue litmus paper to red colour.

(ii) A piece of white plain paper is placed above a luminous flame.

Some particles of black colour will be deposited on the white plain paper because a luminous flame produces soot which contains carbon components.

(iii) A burning splint is lowered into a jar containing a mixture of hydrogen and oxygen gas.

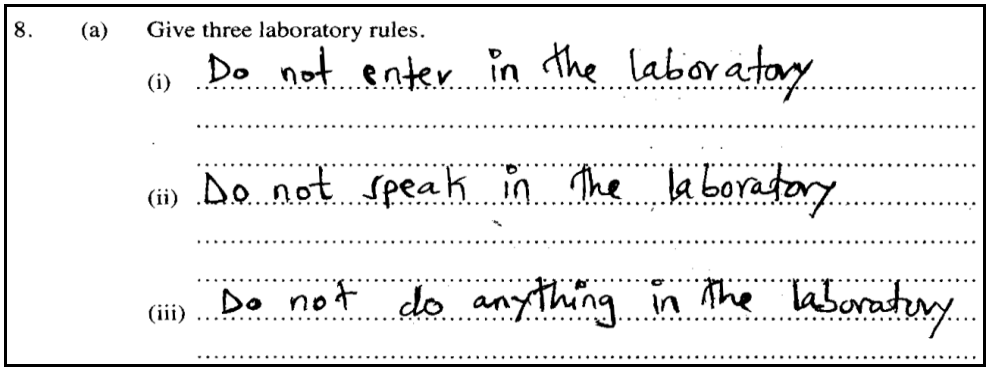
When a burning splint is lowered into gas jar containing oxygen and hydrogen, It will ignite with "pop" sound due to the presence of hydrogen and it will burn brightly due to the fact that oxygen gas supports combustion.

Extract 8.1: A sample of correct responses to Question 8

In extract 8.1, the student attempted correctly all parts of the question.

On the contrary, students who scored low marks (0-2.5) failed to attempt some or all the parts of the question. Most of the students gave incomplete sentences of laboratory rules in part (a). For instance, one student wrote “do not store in the laboratory”. This implies that, this student had insufficient knowledge about laboratory rules. In part (b) some students wrote the apparatuses instead of fields. For example, one student wrote “Fields where Chemistry is applicable are beaker, spatula and thermometer”. The student lacked proficiency in the English language, thus failed to interpret the requirement of the question.

In part (c) (i) some students wrote incorrect colour of blue litmus paper. For instance, some responded that the red colour of the litmus paper will change to blue. Another student wrote that the red litmus paper will be white”. This implies that those students were not conversant enough in properties of acid and bases as well as the role of indicator. In item (c)(ii) some students gave incorrect colour of white paper when subjected to luminous flame. For example, one of the students wrote “blue zone will be observed”. Others wrote that bright colour of white paper will increase. This implies that the students had inadequate grasp on properties of luminous flame. In item (c)(iii), some of the students wrote that the burning splint will start the reaction of hydrogen, oxygen and air. This signifies that students had insufficient knowledge on chemical test for hydrogen and oxygen gas. Extract 8.2 shows an example of incorrect responses from one of the students in question 8.


8. (a) Give three laboratory rules.

(i) Do not enter in the laboratory

(ii) Do not speak in the laboratory

(iii) Do not do anything in the laboratory

(b) Identify three fields in which Chemistry is applied.

(i) Teacher

(ii) Doctor

(iii) Engineer

(c) What will be observed in the following simple experiments?

(i) Red litmus paper is dipped into a flask containing dilute hydrochloric acid.

Red litmus paper when is dipped into a flask of dilute hydrochloric acid the called of red litmus that it is on the litmus paper is change into Orange of red blown or purple

(ii) A piece of white plain paper is placed above a luminous flame.

When a piece of white plain paper is placed above a luminous flame the white plain paper will appear yellow in colour

(iii) A burning splint is lowered into a jar containing a mixture of hydrogen and oxygen gas.

When the burning splint is lowered into a jar of hydroge and oxygen the hydrogen will go up and the oxygen gas will remain at the buttom

Extract 8.2: A sample of incorrect responses to Question 8

In Extract 8.2, the student's response in part (a) consists of incomplete commands that do not align with the laboratory rules. In part (b), the student listed professionals rather than fields where Chemistry is applied. Also, in part (c), the student provided incorrect observations.

2.2.7 Question 9: Formula Bonding and Nomenclature

This question had two parts: (a) and (b). In part (a), students were asked to provide two differences between covalent compounds and electrovalent compounds. In part (b) students were given information that, *"A compound is composed of 52.2% carbon, 13% hydrogen and the rest being oxygen. Calculate the molecular formula of the compound if its molecular mass is*

138."

The question was attempted by 796,830 (100%) students. Students who scored from 0 to 2.5 marks were 81.27 per cent, from 3 to 6 marks were 9.70 per cent and those who scored from 6.5 to 10 marks were 9.03 per cent. These data show that the general performance in this question was weak since only 18.73 per cent of all students scored 3 marks or above. The students' performance in this question is summarized in Table 4.

Table 4: Students Performance in Question 9

Scores' Range	Percentage of Students
0.0 – 2.5	81.27
3.0 – 6.0	9.70
6.5 – 10.0	9.03

Students who scored low marks (0-2.5) failed to attempt most parts of the question. Some students gave incorrect differences by interchanging those of covalent compounds with those of electrovalent compounds in part (a). For example, one student wrote *Covalent compounds conduct electricity in molten state while electrovalent compound does not conduct electricity*. Another student responded as *Covalent compounds formed by transfer of electron while electrovalent compound formed by sharing of electron*. This signifies that students had inadequate skills in grasping properties of covalent compounds and electrovalent compounds.

In part (b) some students failed to determine percentage of oxygen. For instance, others incorrectly determined percentage of oxygen by taking 100% - 13% = 87% instead of subtracting percentage of both carbon and hydrogen out of one hundred. Another student determined the empirical formula by using only the percentage of carbon and hydrogen without considering the percentage of oxygen. This reveals that the student had inadequate comprehension on mathematical skills in computing the relative molecular formula and molecular formula. Extract 9.1 shows a sample of incorrect responses to this question.

9. (a) Give two differences between covalent compounds and electrovalent compounds.

(i) Covalent compounds are the bonds where two elements combine but electrovalent have no combinations of elements

(ii) Covalent can react with other elements while electrovalent can't react with other elements

(b) A compound is composed of 52.2% carbon, 13% hydrogen and the rest being oxygen. Calculate the molecular formula of the compound if its molecular mass is 138.

C	H	O
$\frac{52.2}{12}$	$\frac{13}{1}$	$\frac{24.8}{16}$
$\frac{4.35}{4.35}$	$\frac{13}{4.35}$	$\frac{1.55}{4.35}$
1	3	1

CH_3O

molecular formula = n x empirical formula.

molecular formula = $n(CH_3O)$

$138 = 138n$

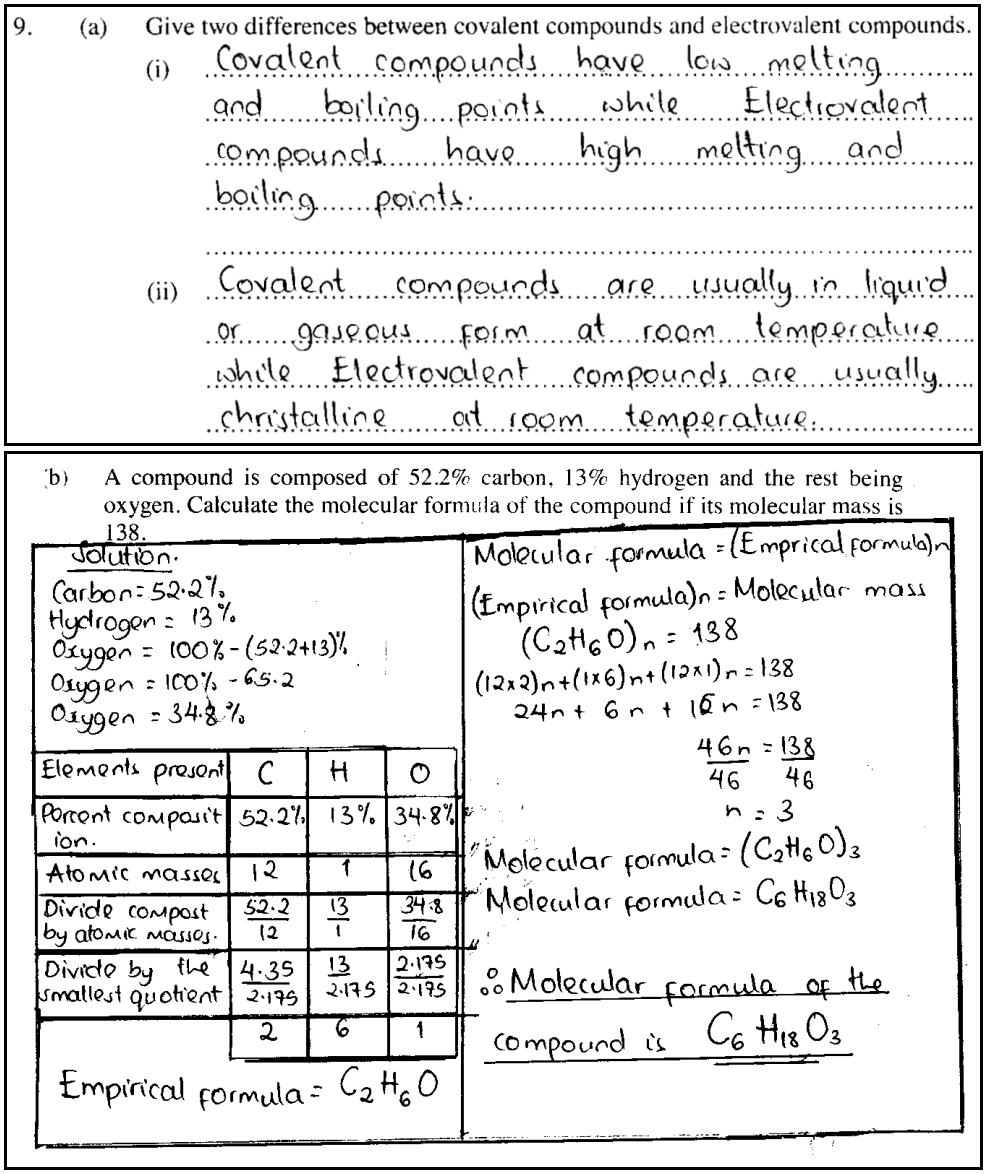
molecular formula = 1 $= C_4H_{12}O_4$

Extract 9.1: A sample of incorrect responses to Question 9

In Extract 9.1, the student wrote properties of bonds instead of compounds in part (a). Also, in part (b), he/she incorrectly calculated percentage of oxygen gas and divided the value obtained from $\frac{\text{percentage}}{\text{RAM}}$ by the largest value instead of the smallest value.

Conversely, students who scored high marks (6.5-10) gave correct responses in all parts of the question. This indicates that students were well acquitted with the properties of covalent and electrovalent compounds.

Similarly, the students had adequate knowledge on the concept of empirical formula and molecular formula. A sample of correct responses from one of the students in this question is shown in Extract 9.2.



9. (a) Give two differences between covalent compounds and electrovalent compounds.

(i) Covalent compounds have low melting and boiling points while Electrovalent compounds have high melting and boiling points.

(ii) Covalent compounds are usually in liquid or gaseous form at room temperature while Electrovalent compounds are usually christalline at room temperature.

(b) A compound is composed of 52.2% carbon, 13% hydrogen and the rest being oxygen. Calculate the molecular formula of the compound if its molecular mass is 138.

Solution.

Carbon = 52.2%
Hydrogen = 13%
Oxygen = 100% - (52.2+13)%
Oxygen = 100% - 65.2
Oxygen = 34.8%

Elements present	C	H	O
Percent composition.	52.2%	13%	34.8%
Atomic masses	12	1	16
Divide compost by atomic masses.	$\frac{52.2}{12}$	$\frac{13}{1}$	$\frac{34.8}{16}$
Divide by the smallest quotient	$\frac{4.35}{2.175}$	$\frac{13}{2.175}$	$\frac{2.175}{2.175}$
	2	6	1

Empirical formula = C_2H_6O

Molecular formula = (Emprical formula)n

(Empirical formula)n = Molecular mass

$(C_2H_6O)_n = 138$

$(12\times2)n + (1\times6)n + (12\times1)n = 138$

$24n + 6n + 16n = 138$

$\frac{46n}{46} = \frac{138}{46}$

$n = 3$

Molecular formula = $(C_2H_6O)_3$

Molecular formula = $C_6H_{18}O_3$

∴ Molecular formula of the compound is $C_6H_{18}O_3$

Extract 9.2: A sample of correct responses to Question 9

2.3 Section C: Essay/Structured Question

This section consisted of one (1) structured question, weighing fifteen (15) marks.

2.3.1 Question 10: Hydrogen

This question comprised of two parts (a) and (b). In part (a) students were asked to give four chemical properties of hydrogen gas. In part (b) the question was as follows: *Draw a well labelled diagram of apparati set up for the laboratory preparation of hydrogen gas. Include all chemicals involved.*

A total of 796,830 (100%) students attempted this question. Students who scored from 0 to 4 marks were 62.69 per cent, from 4.5 to 9.5 marks were 26.44 per cent and from 10 to 15 marks were 10.87 per cent. The general performance in this question was average since 37.31 per cent of the students scored 4.5 marks or above. The summary of performance of the students is shown in Figure 7.

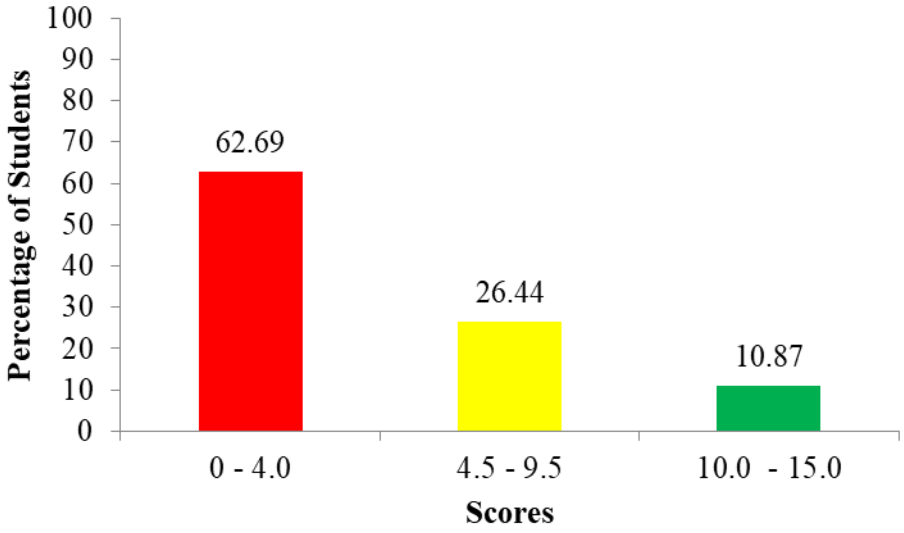


Figure 7: *Students' Performance in Question 10*

Students who scored high marks (10-15) wrote correctly the chemical properties of hydrogen gas in part (a). Furthermore, students correctly sketched a well labeled diagram for preparation of hydrogen gas including chemicals in part (b). This demonstrates that the students had adequate knowledge on properties of hydrogen gas and chemicals required for preparation of hydrogen gas. Extract 10.1 shows a sample of correct responses to question 10 from one of the students.

10. (a) Give four chemical properties of hydrogen gas.

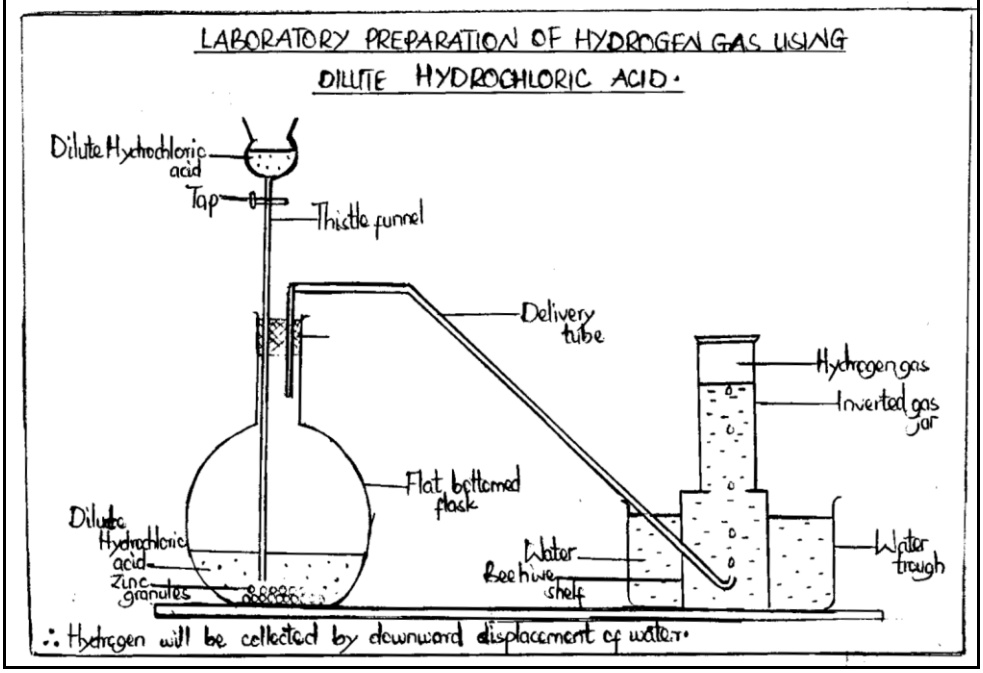
(i) It reacts with other elements at high temperature to form compounds.

(ii) It slowly reacts with oxygen to form water. The chemical formula of water is H_2O.

(iii) A mixture of hydrogen and oxygen gas explodes when lit. For example oxyhydrogen flame is a mixture of hydrogen and oxygen.

(iv) It reacts with metal oxides and metal chlorides to form water and chlorine respectively with free metals. For example; Copper (II) oxide + Hydrogen gas ⟶ Copper + Water.

(b) Draw a well labelled diagram of apparati set up for the laboratory preparation of hydrogen gas. Include all chemicals involved.

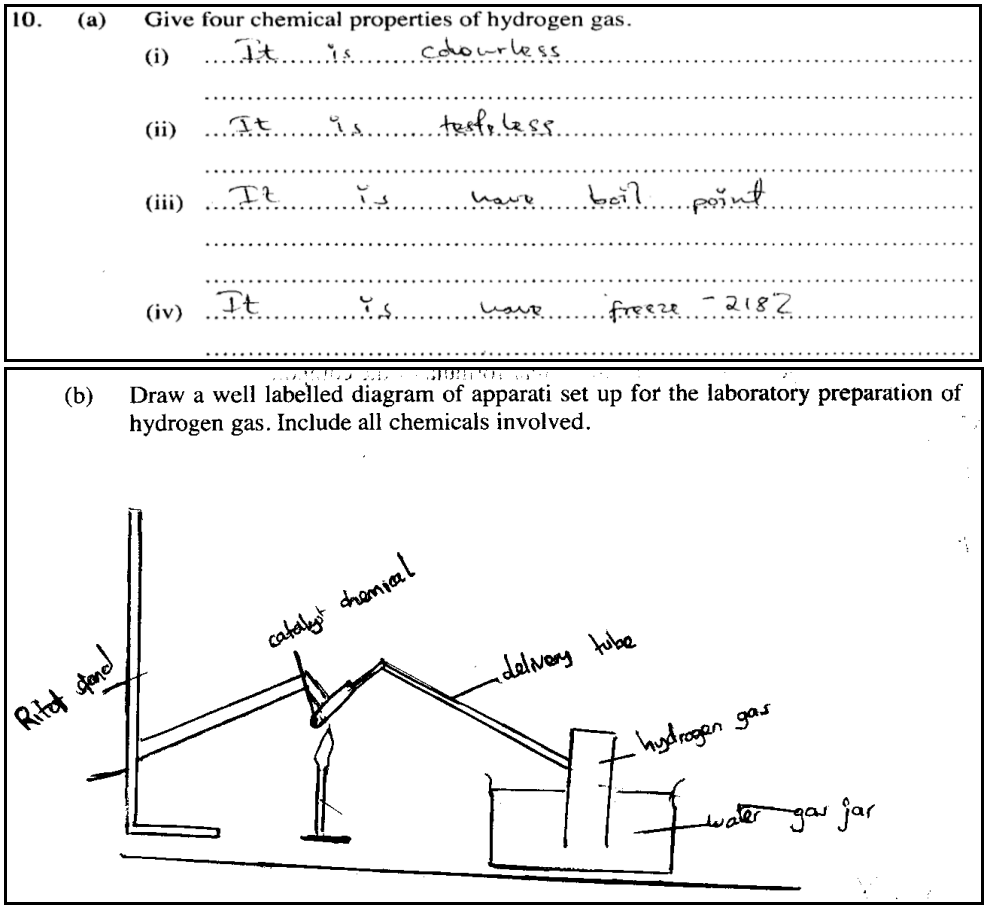


Extract 10.1: A sample of correct responses to Question 10

In Extract 10.1, the student wrote correct chemical properties of hydrogen gas and drew a well labeled diagram with required chemicals for hydrogen gas preparation.

On the other hand, students who scored low marks (0-4) failed to write correct responses in most parts of the question. Some students wrote physical properties instead of chemical properties in part (a). For example, one student penned that *hydrogen is colorless and tasteless*. Others wrote

that hydrogen is less than air. Some students wrote chemical properties of oxygen instead of hydrogen. For instance, there were students who wrote that oxygen supports combustion while others wrote that hydrogen is a strong oxidizing agent. Generally, such responses signify that students had insufficient knowledge on chemical properties of hydrogen gas. In part (b) some students drew a diagram for preparation of hydrogen gas but failed to label some parts. For example, one student labeled delivery tube as beehive shelve. Another one labeled the round bottomed flask as a beaker. Such responses show that students were not familiar with the setup for preparation of hydrogen gas in the laboratory. Furthermore, some students indicated incorrect chemicals for the preparation of hydrogen gas. For instance, there were those who cited hydrogen peroxide and manganese(IV) oxide which are used for preparation of oxygen gas rather than hydrogen gas. Extract 10.2 shows a sample of incorrect responses from one of the students.



Extract 10.2: A sample of incorrect responses to Question 10

In Extract 10.2, the student wrote physical properties of hydrogen gas instead of chemical properties in part (a) and sketched incorrect diagram in part (b) in which some apparatuses and appropriate reagents were not shown.

3.0 ANALYSIS OF STUDENTS' PERFORMANCE IN EACH TOPIC

In the 2024 Form Two National Assessment, a total of 10 topics were assessed. Those topics were*: Periodic Classification; Heat Sources and Flames; Atomic Structure; Laboratory Techniques and Safety; Air, Combustion, Rusting and Fire Fighting; Matter; Oxygen; Formula, Bonding and Nomenclature; Hydrogen* and *Water*.

The analysis shows that, question 1 which was comprised of 10 multiple choice items from different topics had good performance of 83.85 per cent. The question was set from the following topics: *Laboratory Techniques and Safety; Matter; Air, Combustion, Rusting and Fire Fighting; Hydrogen; Water; Fuels and Energy; Formula, Bonding and Nomenclature. Two topics of Laboratory Techniques and Safety;* and *Oxygen* together attained a good performance of 82.66 per cent.

The students had average performance in the topics of *Periodic Classification* (63.81%), *Air, Combustion, Rusting and Fire Fighting* (62.29%) and *Hydrogen* (59.99%). The average performance of students in these topics implies that students were partially competent on the concepts assessed from those topics.

On the other hand, students' performance was weak in four topics. Those topics were *Atomic Structure* (27.21%) *Formula, Bonding and Nomenclature* (18.73%), *Heat Sources and Flames* (6.22%) and *Matter* (3.19%). The weak performance of students was caused by a number of factors including superficial grasp of the subject matter, failure to predict observation based on scientific experiments, inadequate skills to interpret scientific results, poor mathematical skills and lack of basic drawing skills in Chemistry. A summary of the performance of students in different topics is presented in the Appendices I and II.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

Generally, the performance of students who sat for Chemistry paper in Form Two National Assessment 2024 was average. The percentage of students who passed the assessment was 34.29. The performance of students in 2024 has increased by 6.13 per cent compared to the performance in 2023. The analysis of students' performance in terms of topics showed that students achieved good performance in two topics of Laboratory Techniques and Safety; and Oxygen. The performance of students was average in three topics of Periodic Classification; Air, Combustion, Rusting and Fire Fighting; and Hydrogen.

Contrarily, students' performance was weak in four topics of Atomic Structure; Formula, Bonding and Nomenclature; Heat Sources and Flames; and Matter. Among other factors, the weak performance of students in those topics was due to lack of adequate knowledge in the subject matter, lack of adequate skills to predict and interpret scientific facts and poor numeracy skills.

4.2 Recommendations

In order to improve teaching and learning process the following recommendations are suggested:

(a) During teaching the topic of *Matter*, teachers are advised to guide students to discuss the methods and steps required in the separation of various mixtures such as the separation of a mixture of ethanol and water using the fractional distillation method.

(b) Through scientific experiments to produce luminous and non-luminous flame in the topic of *Heat Sources and Flames*, teachers are advised to guide the students to interpret the color zones that appear in the relevant flame.

(c) In the topic of *Formula, Bonding and Nomenclature*, teachers are encouraged to use models of compounds in guiding students to calculate relative atomic mass, empirical and molecular formulae.

(d) During teaching the topic of *Atomic Structure*, teachers may use pictures and wall charts showing the structure of atoms in a discussion to guide students to learn about the modern concept of Dalton's atomic structure.

(e) Since some incorrect attempts on the questions were caused by language problem, teaching of English language should be improved, as a way of enhancing competence in Chemistry and other subjects.

Appendix I: Analysis of Performance of Students in each Topic

S/N	Topic	Question Number	Percentage of Students who Scored an Average of 30% or Above	Average	Remarks
1	Atomic Structure; Matter; Heat Sources and Flames; Water; Air, Combustion, Rusting and Fire Fighting; Periodic Classification; and Laboratory Techniques and Safety	1	83.85	83.85	Good
2	Laboratory Techniques and Safety	8	82.66	82.66	Good
3	Oxygen	8	82.66	82.66	Good
4	Periodic Classification	2	80.92	63.81	Average
		5	46.69		
5	Air, Combustion, Rusting and Fire Fighting	6	62.29	62.29	Average
6	Hydrogen	8	82.66	59.99	Average
		10	37.31		
7	Atomic Structure	4	27.21	27.21	Weak
8	Formula, Bonding and Nomenclature	9	18.73	18.73	Weak
9	Heat Sources and Flames	3	6.22	6.22	Weak
10	Matter	7	3.19	3.19	Weak

Appendix II: Comparison of Students' Performance Topic-wise Between 2023 and 2024

S/N	Topic	FTNA 2023		FTNA 2024	
		% of Students who Scored an Average of 30% or Above	Remarks	% of Students who Scored an Average or Above	Remarks
1	Atomic Structure; Matter; Heat Sources and Flames; Water; Air, Combustion, Rusting and Fire Fighting; Periodic Classification; and Laboratory Techniques and Safety	91.13	Good	83.85	Good
2	Laboratory Techniques and Safety			82.66	Good
3	Oxygen			82.66	Good
4	Periodic Classification	16.67	Average	63.81	Average
5	Air, Combustion, Rusting and Fire Fighting	17.54	Average	62.29	Average
6	Hydrogen			59.99	Average
7	Atomic Structure	24.82	Weak	27.21	Weak
8	Formula, Bonding and Nomenclature	20.96	Weak	18.73	Weak
9	Heat Sources and Flames			6.22	Weak
10	Matter	19.66	Weak	3.19	Weak
11	The Scientific Procedure	3.16	Weak		