



THE UNITED REPUBLIC OF TANZANIA  
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY  
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA



**CANDIDATES' ITEM RESPONSE ANALYSIS  
REPORT FOR THE PRIMARY SCHOOL LEAVING  
EXAMINATION (PSLE) 2023**

**SCIENCE AND TECHNOLOGY**



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Published by:  
The National Examinations Council of Tanzania,  
P.O.BOX 2624,  
Dar es salaam, Tanzania.

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## FOREWORD

The Candidates' Items Response Analysis Report (CIRA) for the Primary School Leaving Examination (PSLE) 2023 has been prepared to give feedback to teachers, policy makers, curriculum developers and other education stakeholders on how the candidates responded to the examination questions. The Science and Technology examination was prepared to assess candidates' competencies in Science and Technology and the effectiveness of the implementation of the Science and Technology syllabus for standard III – VII. This is because the quality of the candidates' responses to the questions is among the indicators of the extent to which the candidates have learned effectively during the period of seven years of primary education.

The analysis showed that the candidates who had good performance were competent in the examined concepts and understood the questions thus, they answered correctly. On the other hand, candidates' weak performance was due to being incompetent in the examined concepts, misunderstanding the task of the questions and failure to follow examination instructions.

The Examinations Council of Tanzania expects that the feedback provided in this report will enlighten education stakeholders on the challenges encountered by the candidates during answering examination questions and proper measures to be taken to improve the candidates' performance in future examinations.

Finally, the National Examinations Council of Tanzania expresses sincere gratitude to Examination Officers and all others who participated in the preparation of this report.



Dr. Said A. Mohamed  
**EXECUTIVE SECRETARY**

## 1.0 INTRODUCTION

The Primary School Leaving Examination (PSLE) 2023 for Science and Technology subject measured the competencies stipulated in the 2016 Science and Technology syllabus for Standard III - VII and it was set as per the 2020 examination format. The examination paper consisted of 45 questions divided into Sections A and B. Section A had 40 multiple choice questions and Section B consisted of five (5) short answer questions. The candidate was required to answer all the questions from each section. Each question in Section A carried one (1) mark making a total of 40 marks. In Section B, each question carried two (2) marks, making a total of 10 marks in this section. Thus, the whole paper had of a total of 50 marks.

A total of 1,397,293 candidates were registered for the PSLE out of whom, 1,356,313 (97.07%) sat for the exam. A few candidates 40,980 (2.93%) did not sit for the examination due to various reasons such as absenteeism and prolonged illness. Data shows that 1,004,654 (74.08%) candidates had good performance.

In section A, analysis of candidates' responses based on their choices: **A**, **B**, **C**, **D** and **E**. The reasons for candidate's choices in each question were elaborated. The letter of the correct answer was marked with a star (\*) in tables and charts for illustration. Furthermore, the percentage of candidates who failed to follow the instructions on how to answer a question and those who did not answer a question for various reasons, has been provided in the analysis under the heading "others" in the respective tables and in charts in this report.

The analysis of candidates' responses in section B was based on the quality of candidates' responses and their performance in a particular question. Extracts of good and poor responses have been used to illustrate the quality of responses given by the candidates. The statistics of performance of the candidates in each question are presented using a table or figure. The summary of performance in each competence is shown in the Appendix at the end of the report.

The performance of the candidates in each question is in three categories: *good*, *average* and *weak*. These levels depended on the percentage of the candidates who passed the particular question. If the candidates' percentage lies in the range of 60 – 100, 40 – 59 and 0 – 39 the performance is categorized as good, average and weak respectively.

## 2.0 ANALYSIS OF THE CANDIDATES' RESPONSES IN EACH QUESTION

This part analyses the candidates' responses in each question. The questions from each of the sections A and B were analysed as follows:

### 2.1 Section A: Multiple Choice Items

This section consisted of 40 questions. The candidate was required to answer all questions by choosing the correct answer and then shade its corresponding letter in the answer sheet (OMR) provided. The analysis of candidates' response in this section is as follows:

**Question 1:** Which organ in the body is mostly affected by the excessive drinking of alcohol?

- A Liver                      B Kidney                      C Lungs  
D Heart                      E Brain

The question tested the candidates' competence in identifying various systems of the human body specifically the disorders in the digestive system. The performance of the candidates in this question was weak since 835,664 (61.6%) failed the question 520,649 and (38.4%) candidates responded correctly. Table 1 shows number and percentage of candidates who selected each option.

**Table 1: Number and percentage of candidates each option**

Option	A*	B	C	D	E	Others
No. of candidates	520649	275904	287509	49457	205729	17065
% of candidates	38.39	20.34	21.20	3.65	15.17	1.26

Table 1 shows that 38.4 percent of the candidates attempted the question correctly by choosing alternative A, *Liver*.

Analysis of data shows that, 61.6 percent of the candidates chose the incorrect responses. These candidates lacked adequate knowledge to identify the organ that is mostly affected by excessive drinking of alcohol. For example, those who chose alternative B, *Kidney* did not understand that kidney is a part of the excretory system that removes urea, salts, chemical by-products of medicines and excess water through urination. Those who chose alternative C, *Lungs* did not understand that lungs are part of the respiratory system that is mostly affected by inhaling polluted air, smoking cigarettes and respiratory tract infections. The candidates who chose alternative D, *Heart* did not understand that the heart is a part of the circulatory system mostly affected by the use of food with a lot of salt and fat. Those who chose alternative E, *Brain* did not understand that brain is a part of the nervous system affected by high blood pressure causing the rupture of blood capillaries and eventually leading to a stroke.

On the other hand, 38.4 percent of the candidates attempted this question correctly. Those candidates were aware that the liver is an organ which fights and removes toxins from the body. It breaks alcohol into a less toxic substance that can be eliminated from the body. However, this process generates harmful byproducts that may damage liver cells.

**Question 2:** Which waste products are excreted by the lungs during breathing?

- A Water and oxygen
- B Carbondioxide and water
- C Water and salt
- D Urea and water
- E Carbondioxide and oxygen

The question tested the candidates' competence in understanding various systems of the human body specifically in identifying the waste products excreted by lungs during breathing. The performance of the candidates in this question was average since



767,105 (56.6%) candidates did not respond correctly and 589,208 (43.40%) candidates responded correctly. Table 2 shows the number and percentage of the candidates' that responded to each option.

**Table 2: Number and percentage of candidates in each option**

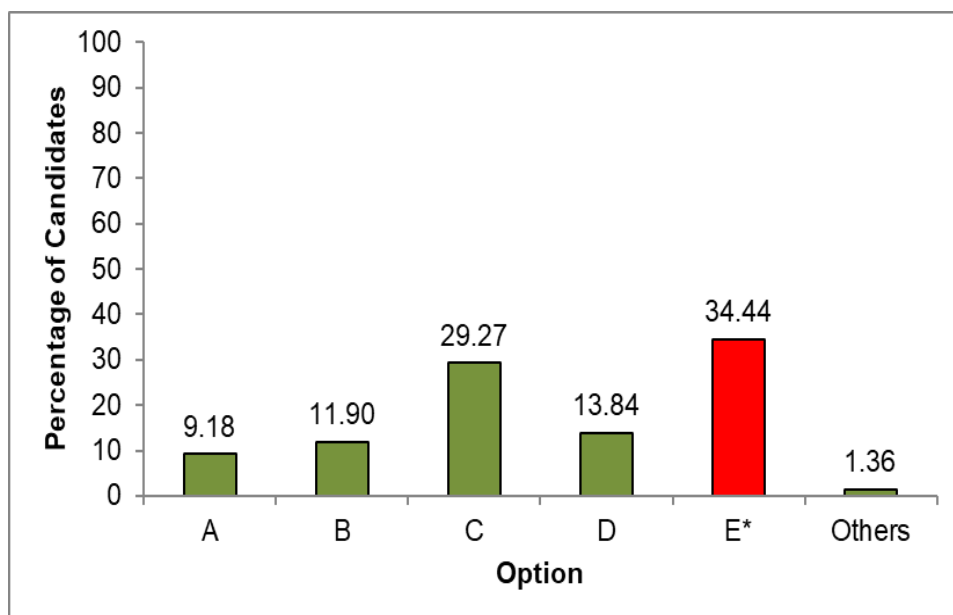
<b>Option</b>	<b>A</b>	<b>B*</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>Others</b>
<b>No. of candidates</b>	114978	589208	192680	109685	333696	16066
<b>% of candidates</b>	8.48	43.44	14.21	8.09	24.60	1.18

Data from the Table 2 shows that 56.6 percent of the candidates gave incorrect responses to this question because they lacked knowledge of the body systems especially on waste products excreted by the lungs during breathing. For example, those who chose alternative A, *Water and oxygen* and E, *Carbon dioxide and oxygen* failed to realise that oxygen gas is inhaled during breathing and is not an excretory product. The candidates who chose alternatives C, *Water and salt* and D, *Urea and water* lacked an understanding that salt and urea are wastes removed from the body through the excretory system by the organs such as skin in form of sweat and kidneys as urine and not through the lungs.

On the other hand, 43.40 percent of the candidates attempted the question correctly and chose the correct alternative B, *Carbon dioxide and water*. These candidates understood that during the energy production process in the body (respiration), the food eaten is burnt in the presence of oxygen gas. This process results into the production of carbondioxide gas and excess water in vapour form as waste products. The wastes must be eliminated from the body as their accumulation harms the body. Since they are in respiratory system in form of gas hence, they are eliminated by the lungs.

**Question 3:** Suppose you have been invited to educate villagers about ulcers, which type of food will you advise them to avoid once they are affected by that disease?  
 A Sugary food    B Hot food    C Cold food  
 D Salty food    E Acidic food

The question assessed the candidates' understanding of the effect of acidic food to a person suffering from ulcers. The performance of the candidates in this question was weak since 889,158 (65.56%) candidates gave incorrectly responses and 467,155 (34.44%) responded correctly. Figure 1 shows the percentage of the candidates that responded to each option.



**Figure 1:** *Percentage of candidates in each option*

Figure 1 indicates that 65.56 percent of the candidates who responded incorrectly lacked understanding that eating acidic foods triggers ulcers thus, it should be avoided by people with ulcers. For example, those who chose distractor A, *Sugary food* failed to realize that sugary foods produce energy during respiration. Those who chose B, *Hot food* failed to understand that hot foods stimulate digestion by increasing blood flow rate to the stomach walls that promotes the secretion of digestive enzymes which break down food particles more effectively. Those who chose distractor C, *Cold food*, failed to realise that cold foods cannot trigger ulcers and so it's not dangerous to a person who suffers from ulcers. Candidates who chose distractor D, *Salty food* failed to realize that moderate salty foods are important for different life processes and has no effect to a

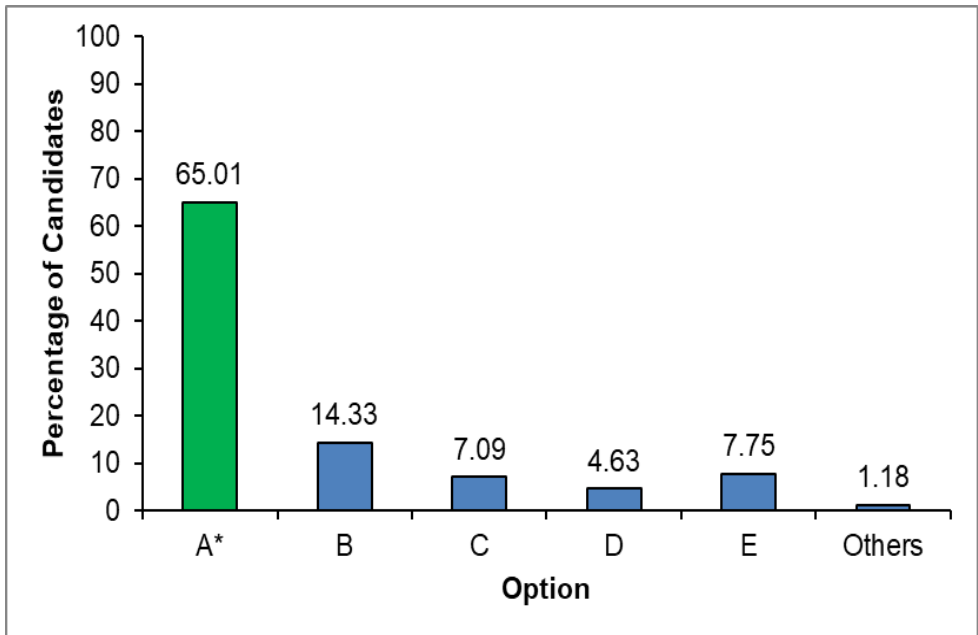
person with ulcers but when the amount of salt exceeds in foods it may causes high blood pressure.

However, 34.44 percent of the candidates chose the correct alternative E, *Acidic food*. These candidates understood that eating acidic foods trigger ulcers by increasing the amount of acid in the stomach that burns the stomach walls causing the increase of stomach ulcers so this must be avoided by the people suffering from ulcers.

**Question 4:** What is the importance of white blood cells in the human body?

- A Protect the body against germs causing diseases
- B Clot blood on a new wound
- C Transport oxygen gas from the heart
- D Regulate body temperature
- E Prevent germs from entering the body

The question assessed the candidates' understanding on the role of white blood cells in the human body. Generally, the performance of the candidates in this question was good since 881,794 (65.01%) candidates responded correctly and 474,519 (34.99%) candidates failed. Figure 2 shows the percentage of candidates that responded to each option.



**Figure No.2:** *Percentage of candidates in each option*

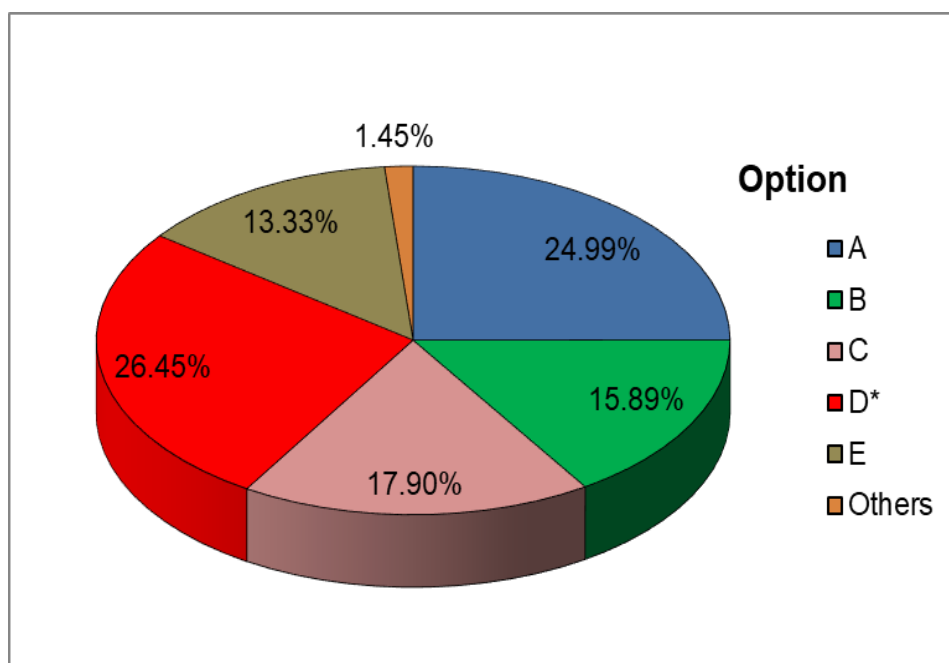
Figure 2 shows that 65.01 percent of the candidates attempted the question correctly by choosing alternative A, *Protect the body against germs causing diseases*. Those candidates knew that white blood cells protect the body against disease causing micro-organisms.

On the other hand, 34.99 percent of the candidates failed to choose the correct response. Those candidates lacked competence in identifying the functions of the white blood cells in the human blood circulatory system. Those who chose distractor B, *Clot blood on a new wound* failed to understand that clotting of blood on new wounds is a function of blood plasma and platelets. Those who chose option C, *Transport oxygen gas from the heart* did not know that transportation of oxygen is done by red blood cells. The candidates who chose alternative D, *Regulate body temperature* failed to realise that body temperature is regulated by the nervous system. Moreover, those who chose distractor E, *Prevent germs from entering the body* failed to understand that the skin plays the role of preventing germs from entering the body.

**Question 5:** The middle ear consists of three tiny bones connected in series which receive the vibration of sound waves and send it to the inner ear. What is the correct series of those three tiny bones?

- A Incus, malleus, stapes
- B Stapes, incus, malleus
- C Stapes, malleus, incus
- D Malleus, incus, stapes
- E Malleus, stapes, incus

The question assessed the candidates' ability to identify parts of the ear and its arrangement. Generally, the performance of the candidates in this question was weak because 997,618 (73.55%) candidates responded incorrectly and 358,695 (26.45%) candidates responded correctly. Figure 3 shows the percentage of candidates who responded to each option.



**Figure 3:** Percentage of candidates in each option

Figure 3 shows that 26.45 percent of the candidates responded correctly by choosing the correct alternative D, *Malleus, incus, stapes*

The analysis illustrates that 73.55 percent of the candidates failed to identify the correct response. These candidates lacked knowledge of the structure of the middle ear. Those who chose distractors A, *Incus, malleus, stapes*; B, *Stapes, incus, malleus*; C, *Stapes, malleus, incus* and E, *Malleus, stapes, incus* did not realize that the bones listed in those distractors are not arranged in the correct order.

On the other hand, 26.45 percent of the candidates attempted the question correctly by choosing the correct alternative D, *Malleus, incus, stapes*. These candidates knew that the middle ear consists of three tiny bones connected in series. The bones are arranged serially from malleus, incus to stapes. They receive sound wave vibrations and direct them to the inner ear.

**Question 6:** In the plants growth, roots grow towards the earth. Why do plants grow in such a manner?

- A To follow air and water
- B To follow water and light
- C To follow light and minerals
- D To follow water and minerals
- E To follow moderate heat and air

The question tested the candidates' ability to investigate things that are in the environment especially the stimuli and requirements for plant growth. Generally, the performance of the candidates in this question was average since 710,945 (52.42%) candidates failed and 645,368 (47.58%) responded correctly. Table 3 shows the number and percentage of candidates who responded to each option.

**Table 3: Number and percentage of candidates in each option**

Option	A	B	C	D*	E	Others
No. of Candidates	222853	236468	76382	645368	159869	15373
% of Candidates	16.43	17.43	5.63	47.58	11.79	1.13

Table 3 shows that 47.58 percent of the candidates responded correctly by choosing D, *to follow water and minerals*.

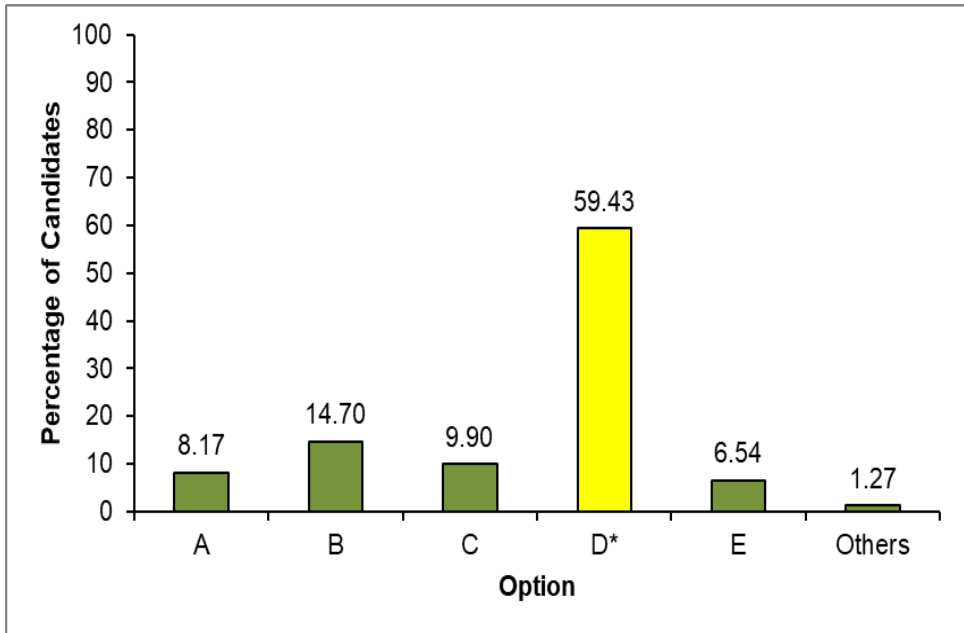
Data analysis from Table 3 shows that 52.42 percent of the candidates chose wrong responses. These candidates lacked adequate knowledge of investigating things that are in the environment especially the stimuli and the requirements for plant growth. Candidates who chose distractor A, *to follow air and water* For example, failed to recognise that air needed by a plant is mostly found on the earth's surface and the plant makes it available through plant leaves. Plant roots grow deep into the ground in response to pull of gravity (geotropism) not air. Those who opted for distractor B, *to follow water and light* and C, *to follow light and minerals* did not realise that light comes from the sun and the shoots grow towards light (phototropism). The candidates who chose E, *to follow moderate heat and air* failed to understand that moderate heat and air reach the plant easily from the Earth's surface and on the ground the plant takes for water and minerals.

On the other hand, 47.58 percent of the candidates got the correct response and understood that during growth plant roots respond positively to gravitational force (geotropism) and hence grow deep into the ground to get water and dissolved minerals which are important for a plant's life and growth.

**Question 7:** You have been asked to help your young sister to identify living and non-living things. Which group would you choose to represent living things?

- A Tree, tree log, butterfly and frog
- B Water, maize plant, fish and frog
- C Butterfly, frog, water and tree
- D Fish, lizard, tree and butterfly
- E Water, bee, grass and housefly

The question assessed the candidates' ability of investigating things that are in the environment specifically on the concept of living things. The performance of the candidates in this question was average since 806,006 (59.43%) candidates responded correctly and 550,307 (40.57%) candidates chose wrong responses. Figure 4 shows the percentage of candidates who responded to each option.



**Figure 4:** *Percentage of candidates in each option*

Figure 4 shows that 59.43 percent of the candidates chose the correct response D, *Fish, lizard, tree and butterfly*. These candidates understood that living things are characterized by the ability to grow, feed, move, excrete, reproduce, respire and being sensitive to environmental changes.

Nevertheless, 40.57 percent of the candidates failed. These candidates had inadequate knowledge of differentiating living from non-living organisms. The candidates who chose distractor A, *Tree, tree log, butterfly and frog* for example did not realise that a tree log is no longer living since it contains dead cells. Those who chose distractors B, *Water, maize plant, fish and frog*; C, *Butterfly, frog, water and tree* and E, *Water, bee, grass and housefly* failed to recognise that water is a non-living thing that was included in these alternatives.



**Question 8:** A teacher taught his pupils that loam soil is better for cultivation than other types of soil. Which characteristic makes that soil better than the other type?

- A It has big particles which prevent water from passing
- B It consists of sand, clay and humus fossils
- C It allows water to pass easily
- D It allows water to pass through very slowly
- E It dries early than sand

The question measured the candidates' competence on investigating and identifying types of soil. The performance of the candidates in this question was weak since 1,064,271 (78.47%) candidates chose the wrong responses and 292,042 (21.53%) candidates responded correctly. Table 4 shows the number and percentage of candidates that responded to each option.

**Table 4: Number and percentage of candidates in each option**

Option	A	B*	C	D	E	Others
No. of Candidates	108586	292042	592349	276227	70236	16868
% of Candidates	8.01	21.53	43.67	20.37	5.18	1.24

Table 4 shows that 21.53 percent of the candidates answered the question correctly by choosing alternative B, *it consists of sand, clay and humus fossils*.

The analysis reveals that 78.47 percent of the candidates failed to identify the correct response. These candidates had inadequate knowledge to identify characteristics of different types of soil. The candidates who chose distractor A, *it has big particles which prevent water from passing* for example did not understand that plants need water for their growth. Therefore, soil with big particles which prevents water from passing through are not good for cultivation. Those who chose distractors C, *it allows water to pass* easily and E, *it dries early than sand* did not realise that those are characteristics of sandy soil. Candidates who chose option D, *it allows water to pass through very slowly* did not know that a such characteristic is for clay soil. Generally, candidates who chose alternative C, D and E

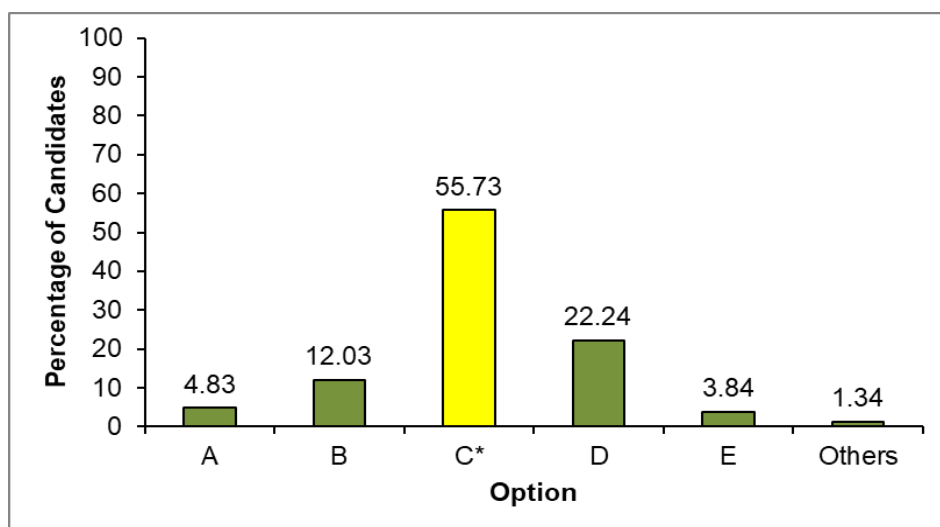
did not realise that sand and clay soil lack the combination of different types of soil and humus which are needed for land cultivation.

However, 21.53 percent of the candidates knew that the combination of sand, clay and humus fossils makes loam soil which has the ability to preserve many nutrients, air and moisture therefore, it is suitable for land cultivation.

**Question 9:** Our father taught us to cultivate by using crop rotation of leguminous plants and cereals. What could be the benefit of doing this?

- A It adds carbon
- B It simplifies growth of plants
- C It fertilizes the soil
- D It prevents soil erosion
- E It prevents diseases

This question measured the candidates' competence in identifying the importance of crop rotation using leguminous plants and cereals. The performance of the candidates in this question was average as 755,836 (55.73%) candidates answered correctly and 600,477 (44.27%) candidates responded incorrectly. Figure 5 shows the percentage of candidates who responded to each option.



**Figure 5:** Percentage of candidates in each option

Figure 5 shows that 55.73 percent of the candidates attempted the question correctly by choosing the correct response C, *it fertilizes the soil*. These candidates recognised that crop rotation involving leguminous plants and cereals make the soil rich in fertility. They understood that leguminous plants improve soil fertility through their association with small organisms, such as rhizobia bacteria, which fix atmospheric nitrogen and make nitrogen available in the soil for the plants in the form of ammonia or ammonium.

Further analysis reveals that 44.27 percent of the candidates who provided wrong responses had inadequate knowledge to identify the importance of crop rotation. The candidates who chose distractor A, *it adds carbon* did not know that carbon is added into the soil as latter when plants die and decompose. Those who chose distractor B, *it simplifies growth of plants* were not aware that growth of plants depends entirely on the availability of light, water, nutrients and air. Likewise, those who chose D, *it prevents soil erosion* failed to realise that soil erosion is prevented by terracing, mulching, strip farming and planting cover crops. Those who chose option E, *it prevents diseases* did not know that crop diseases are prevented by pesticides.

**Question 10:** If you write the word SCHOOL on a white paper and put it in front of a plane mirror, which image will appear in front of that mirror?

- |   |        |   |        |   |        |
|---|--------|---|--------|---|--------|
| A | SCHOOF | B | TOOHCS | C | LOOHCS |
| D | JOOHCS | E | SCHOOF |   |        |

The question assessed candidates' ability to observe and identify the characteristics of the images that are formed in a plain mirror. The performance of the candidates in this question was weak since 1,065,778 (78.58%) candidates gave wrong responses while 290,535 (21.42%) responded correctly. Table 5 shows the number and percentage of candidates who responded to each option.

**Table 5: Number and percentage of candidates in each option**

Option	A	B	C	D*	E	Others
No. of Candidates	211464	551294	128436	290535	152626	21958
% of Candidates	15.59	40.65	9.47	21.42	11.25	1.62

Data from table 5 shows that, 78.58 percent of the candidates chose wrong options. These candidates lacked competence on the properties of light when it falls on a plane mirror. When light falls on a surface of plain mirror inverts the image laterally by changing the direction of light rays. Those who opted for A, **2CHOOT** and E, **SCHOOT** for example, did not know that letter S in option A and letter L in option A and E were inverted upside down. Those who opted for B, **TOOHCS** did not recognise that letter L was inverted both laterally and upside down, while those who chose C, **LOOHCS** failed to notice that the words were just rearranged.

However, statistics shows that 21.42 percent of the candidates answered the question correctly by choosing D, **LOOHCS**. These candidates had ability to understand the property of light on a plane mirror. They realised that the image formed in a plane mirror is inverted laterally.

**Question 11:** Fire has been used to warm up our bodies during cold weather. In which way does the heat reach our bodies?

- A Circulation    B Radiation    C Convection  
D Conduction    E Vaporisation

The question assessed the candidates' ability to identify different types of energy and their use especially in heat transfer methods. Generally, the performance of the candidates in this question was average since 766,703 (56.57%) candidates failed the question while 589,610 (43.47%) candidates responded correctly. Table 6 shows the number and percentage of candidates who responded to each option.

**Table 6: Number and percentage of candidates in each option**

Option	A	B*	C	D	E	Others
No. of Candidates	85416	589610	230216	316957	114034	20080
% of Candidates	6.30	43.47	16.97	23.37	8.41	1.48

Table 6 shows that 43.47 percent of the candidates answered this question correctly by choosing B, *radiation*.

About 56.57 percent of the candidates failed to identify the correct response. These candidates lacked knowledge of heat transfer methods. Those who chose distractor A, *Circulation* for example failed to understand that circulation is the movement of blood through the circulatory system, which includes the heart, blood vessels and blood itself. Those who chose C, *Convection* failed to realise that convection is the transfer of heat through liquid substances such as water. Those who chose distractor D, *Conduction* did not know that conduction is the transfer of heat through solid objects. Likewise, those who chose E, *Vaporisation* did not know that vaporization is a process which occurs when a liquid is heated to its boiling point to form vapor (the process that involves the change of liquid to gas).

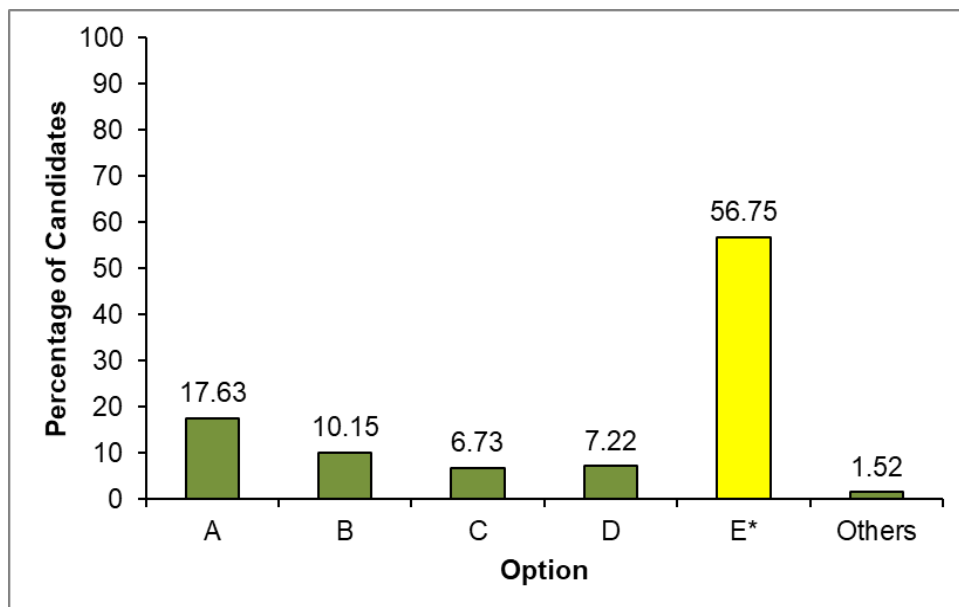
On the other hand, 43.47 percent of the candidates answered the question correctly by choosing B, *Radiation*. These candidates understood that radiation is a method of transfer of heat through the air.

**Question 12:** Suppose you are given an opportunity to advise the government on the kind of energy which will help to conserve the environment, what kind of energy would you advise to be used?

- A Fuel                      B Coal                      C Diesel  
D Firewood                E Solar energy

The question assessed candidates' ability to identify various types of energy, uses and their environmental effect. The performance of the candidates in this question was average since 769,774 (56.75%) candidates responded correctly and 586,539 (43.25%) gave wrong

responses. Figure 6 shows the percentage of candidates who selected each option.



**Figure 6:** *The percentage of candidates in each option*

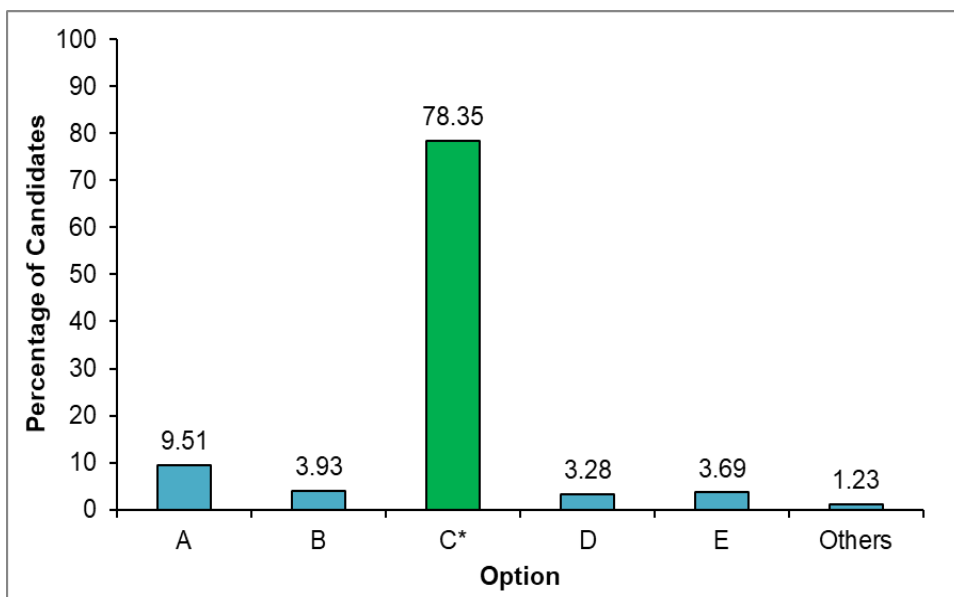
Figure 6 shows that, 56.75 percent of the candidates attempted the question correctly by choosing *E, solar energy*. These candidates understood that solar energy is an alternative energy source which comes from the sun's radiation that is used to produce electricity or heat. This source of energy has no harmful effect to living things and the environment during production and consumption.

Nonetheless, 43.25 percent of the candidates selected incorrect responses. These candidates lacked knowledge on the effects of various sources of energy to the environment. Those who chose alternative *A, Fuel* for instance failed to understand that fuel is any substance that when burnt produces energy accompanied with carbon monoxide. Candidates who chose alternative *B, Coal*; *C, Diesel* and *D, Firewood* failed to understand that, (coal, firewood and diesel) are non-renewable sources of energy which when burnt produce carbon dioxide gas and other pollutants which contribute to air pollution and climate change.

**Question 13:** A telephone technician dropped the phone screws in the sand when blowing out to clean the dirty materials accumulated on the phone. What instrument would you advise the technician to use in order to get back the screws easily?

- A Telescope      B Needle      C Magnet  
D Broom          C Torch

The question assessed candidates' competence in identifying various types of energy and their uses particularly the uses of a magnet. The performance of the candidates in this question was good since 1,062,702 (78.35%) candidates responded correctly and 293,611 (21.65%) chose wrong responses. Figure 7 shows the percentage of candidates who responded to each option.



**Figure 7:** Percentage of candidates in each option

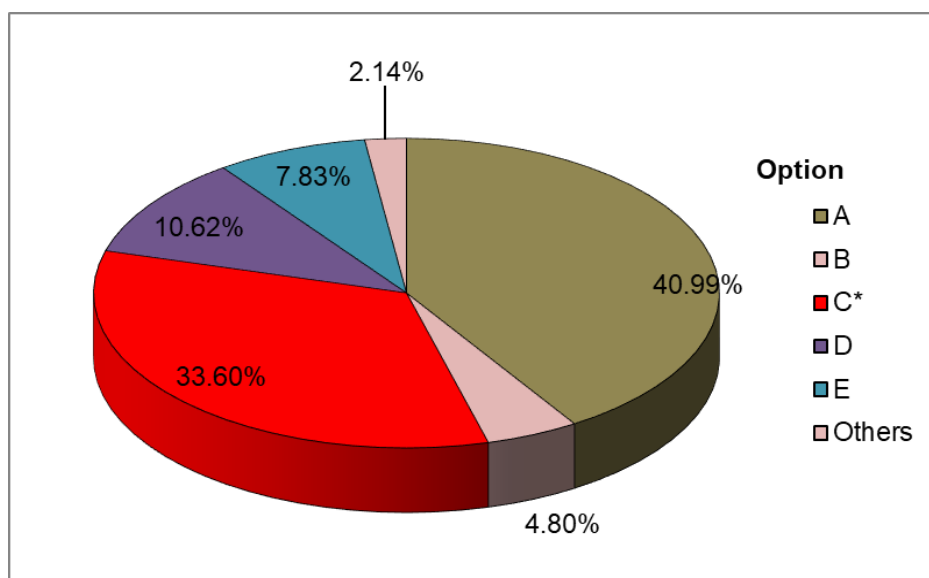
Figure 7 shows that 78.35 percent of the candidates answered the question correctly by choosing C, *Magnet*. These candidates were aware that magnets attract iron materials. Therefore, for the telephone technician to get the phone screws easily, he/she had to use a magnet.

However, 21.65 percent of the candidates who chose incorrect responses, lacked knowledge about the uses of magnets in daily life. Those who selected A, *Telescope* for instance were not aware that, a telescope is used to observe distant objects in space. Those who opted for B, *Needle* did not know that needles are used for sewing fabric and clothes. Moreover, those who selected distractor D, *Broom* were not aware that, a broom is used to sweep garbage from the floor and surfaces but in order to see the screws the technician had to use a magnet. Meanwhile, candidates who chose C, *Torch* they did not know that a torch is just an artificial source of light.

**Question 14:** What type of change occurs when making “Ugali” using maize flour?

- A Physical            B Environmental    C Chemical  
 D Matter            E Solid

The question assessed candidates’ competence about Scientific and Technological Theories specifically on differentiating physical and chemical changes of matter. The performance of the candidates in this question was weak since 900,526 (66.40%) candidates responded incorrectly while 455,787 (33.60%) responded correctly. Figure 8 shows the percentage of candidates who responded to each option.



**Figure 8:** Percentage of candidates in each option



Figure 8 shows that, 33.60 percent of the candidates responded correctly by choosing alternative C, *Chemical*.

Figure 8 shows that, 66.40 percent of the candidates failed to identify the correct answer. These candidates lacked adequate competence about physical and chemical changes of matter. Those who chose alternative A, *Physical* for example failed to understand that during cooking ugali heat is used which leads to chemical reactions that produces a new substances characterised by odour and brownish colour. Those who chose alternative B, *Environmental* failed to understand that environmental change is the alteration of the surroundings or conditions in which an organism exists due to human activities or natural calamities. Those who opted for D, *Matter*, failed to understand that matter can change either physically or chemically. The candidates who chose alternative E, *Solid* failed to understand that, solid is a state of matter with a strong force of attraction between its molecules. These wrong choices candidates provided, show that they lacked adequate competence about the changes of matter.

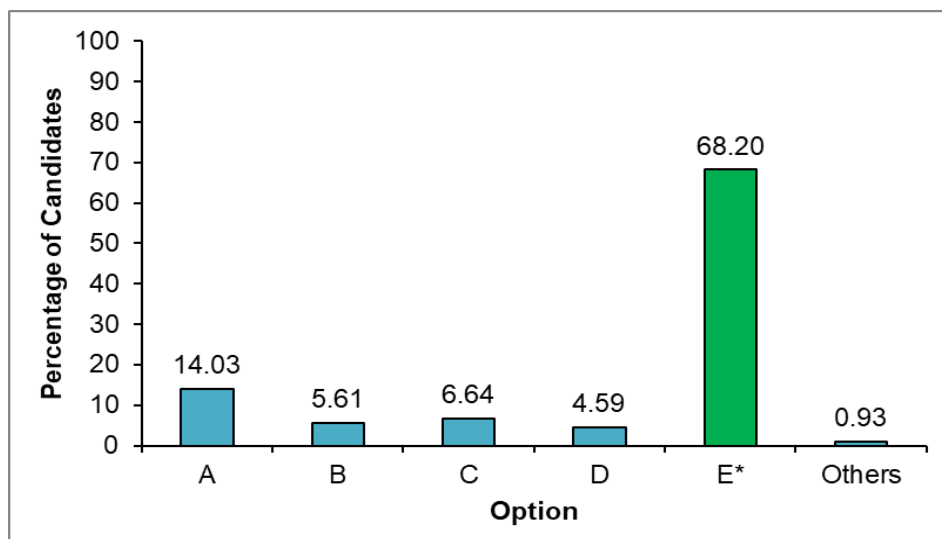
Conversely 33.60 percent of the candidates attempted the question correctly by choosing C, *Chemical*. These candidates understood that cooking ugali leads to the formation of a new substance which is characterized by formation of a brown substance and odour.

**Question 15:** In which way does the smell travel from inside to outside of the house?

- A Osmosis
- B Photosynthesis
- C Respiration
- D Photo osmosis
- E Diffusion

The question assessed candidates' knowledge of scientific and technological theories specifically on the concepts of diffusion and osmosis. The analysis shows that 924,981 (68.20%) candidates responded correctly and 431,332 (31.80%) responded incorrectly. Hence, the performance of candidates in this question was good

Figure 9 shows the percentage of candidates who responded to each option.



**Figure 9:** *The percentage of candidates in each option*

Figure 9 shows that, 68.20 percent of the candidates attempted the question correctly by choosing *E, Diffusion*. These candidates understood that diffusion is the movement of particles of matter from an area of high concentration to the area with low concentration. If the smell has spread inside the house, it means there is a high concentration of smell particles inside compared to outside. Thus the smell will diffuse outside the house.

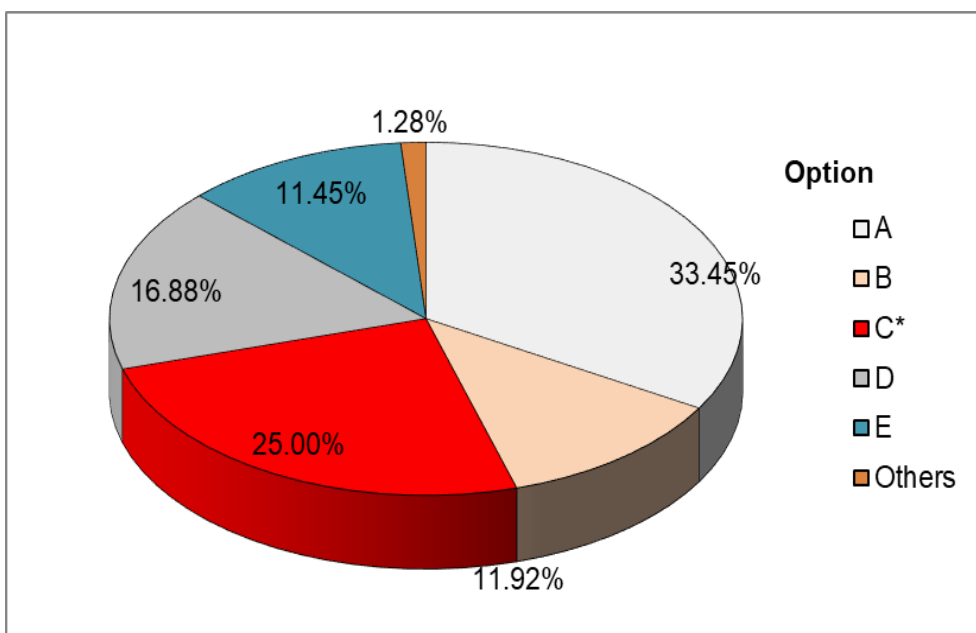
However, 31.80 percent of the candidates chose incorrect responses to the question. These candidates did not have knowledge of understanding different scientific concepts. They failed to identify the differences between the two scientific concepts. Those who chose alternative *A, Osmosis* for example failed to understand that osmosis is the process through which water molecules move from a solution of low solute concentration to a solution of high solute concentration through a semi-permeable membrane. Those who chose alternative *B, Photosynthesis*, failed to understand that photosynthesis is the process whereby green plants make their own food using carbon dioxide, water in the presence of chlorophyll and sunlight. Candidates who opted for *C, Respiration* failed to

understand that respiration is the process which takes place in all living organisms whereby food is broken down by oxygen to produce energy. Similarly, those who chose *D*, *Photo osmosis* did not realise that photo osmosis is a phenomenon which has been shown to be a consequence of light-induced electrical potential differences which develop across the liquid membrane bilayer due to the light-driven proton pumping action of bacteriorhodopsin.

**Question 16:** Properties of chemical changes are different from those of physical changes. Which property shows a chemical change?

- A No new substance is formed after the change
- B No difference between mass of the substance before and after the change
- C A lot of energy is used or produced during the change
- D The properties of the new substance are the same as the properties before the change
- E The original substance can be easily regenerated

The question tested candidates' competence in understanding scientific and technological theories specifically how to differentiate the concept of physical and chemical changes. Analysis shows that the performance in this question was weak because 1,017,169 (75.00%) candidates gave wrong responses and 339,144 (25.00%) responded correctly. Figure 10 shows the percentage of candidates who responded to each option.



**Figure 10:** *Percentage of candidates in each option*

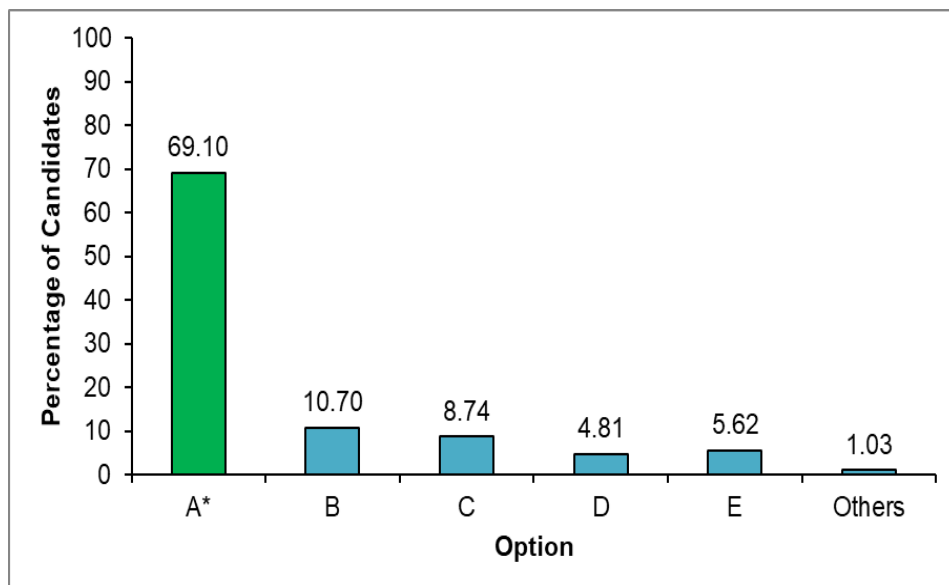
Figure 10 shows that 75.00 percent of the candidates chose wrong answers. These candidates lacked knowledge on the differences between physical change and chemical changes. For instance, those who chose distractor *A, No new substance is formed after the change; B, No difference between mass of the substance before and after the change; D, The properties of the new substance are the same as the properties before the change and E, The original substance can be easily regenerated* failed to understand that these are properties of physical change.

Nonetheless, 25.00 percent of the candidates attempted the question correctly by choosing *C, A lot of energy is used or produced during the change*. Those candidates understood the properties of chemical changes.

**Question 17:** Kapira poured water and kerosene in one vessel. Kerosene floated on water. What was the reason for the kerosene to float on the water?

- A Density of kerosene is less than the density of water
- B Upthrust of kerosene is greater than the upthrust of water
- C Gravitational force for kerosene is greater than the gravitational force for water
- D Mass of water is less than the mass of kerosene
- E Mass of water is greater than the mass of kerosene

The question assessed candidates' ability to understand scientific and technological theories particularly on the concept of density. The performance of the candidates in this question was good since 937,258 (69.10%) candidates responded correctly and 419,055 (30.90%) failed. Figure 11 shows the percentage of candidates who responded to each option.



**Figure 11:** *Percentage of candidates in each option*

Figure 11 shows that 69.10 percent of the candidates attempted the question correctly by choosing A, *Density of kerosene is less than*

*density of water*. These candidates knew that the less the density of a substance the more the ability to float on a denser substance.

Conversely, 30.90 percent of the candidates failed to identify the correct response. These candidates lacked knowledge on the effect of density of a substance to floating and sinking. Candidates who selected *B, upthrust of kerosene is greater than the upthrust of water* for instance did not know that upthrust is an upward force which is compared to the gravitational force to enhance floatation. Those who selected distractor *C, Gravitational force for kerosene is greater than gravitational force for water*, and *D, mass of water is less than mass of kerosene* did not know that any floating object has less density and so less gravitational force, hence gravitational force for kerosene should be less than that for water. Likewise, as kerosene floats on water, its density is less than that of water, thus the mass of kerosene is less than the mass of water. Those who opted for *E, Mass of water is greater than the mass of kerosene* failed to understand that mass without volume relativity is not the only condition for a body to float.

**Question 18:** Which matter has the strongest force of attraction between the molecules?

- A Iron            B Wood            C Air  
D Vapour        E Milk

The question examined candidates' competence in understanding scientific and technological theories specifically in identifying the strength of intermolecular forces that exist between molecules that form a matter. Analysis shows that 773,632(57.04%) candidates gave wrong responses and 582,681 (42.96%) responded correctly. Table 7 shows the number and percentage of candidates who responded to each option.

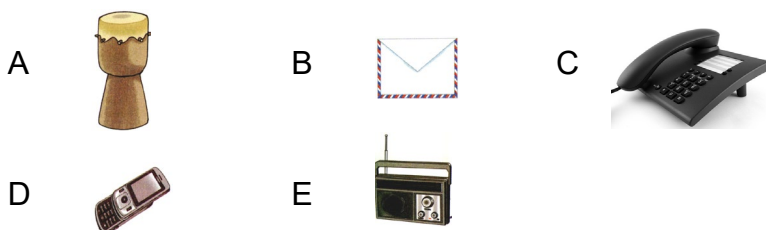
**Table 7: Number and percentage of candidates in each option**

Option	A*	B	C	D	E	Others
No. of Candidates	582681	91243	415002	177936	73235	16216
% of candidates	42.96	6.73	30.60	13.12	5.40	1.20

Table 7 shows that, 57.04 percent of the candidates failed to answer this question. These candidates lacked knowledge on the strength of intermolecular forces which exist between molecules. The candidates who chose alternative *B, Wood*, failed to understand that wood molecules are held strongly but its force is weaker than those found in iron. Those who chose *C, Air and D, Vapour* failed to understand that gas molecules are far apart from each other because their molecule are held together by weak intermolecular forces. Likewise, those who opted for *E, Milk* failed to understand that the attraction forces between the molecules in liquids are weaker than those found in solids although they are enough to keep the molecules of liquids together.

However, 42.96 percent of the candidates answered the question correctly by choosing *A, Iron*. These candidates were aware that iron molecules are more closely and tightly packed together. This shows that intermolecular forces which holds them are very strong. This force is between the nucleus of the molecules.

**Question 19:** Communication is important in the society for sharing information. Which device is used as the traditional way of communication?



The question assessed candidates' competence in applying information and communication technology especially in identifying various communication devices. The analysis shows that the performance in this question was average since 718,242 (52.99%) candidates responded incorrectly and 638,071 (47.01%) responded correctly. Table 8 shows the number and percentage of candidates who selected each option.

**Table 8: Number and percentage of candidates in each option**

<b>Option</b>	<b>A*</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>Others</b>
<b>No. of candidates</b>	638071	151441	37097	427416	84854	17434
<b>% of Candidates</b>	47.04	11.17	2.74	31.51	6.26	1.29

Table 8 shows that, 47.04 percent of the candidates chose the correct answer A, picture of a drum. Hence, the general performance of the question was average.

Table 8 shows that 52.99 percent of the candidates chose wrong answers. These candidates lacked knowledge of differentiating traditional and modern means of communication. The pictures in distractors B, C, D and E which is a letter, telephone, mobile phone and radio respectively are all modern means of communication

However, 47.01 percent of the candidates chose the correct response A which shows a picture of a drum. These candidates were aware of traditional and modern communication devices. Thus, they identified that the picture in alternative A shows a drum which is a traditional means of communication.

**Question 20:** The ICT teacher assigned Standard Seven pupils to type a letter using a computer. Which program would the students use to type the letter?

- A Microsoft excel      B Application      C Typing  
D System      E Microsoft word

The question assessed candidates' competence in applying information and communication technology especially in understanding computer programs. The analysis shows that 774,312 (57.09%) failed the question and 582,001 (42.91%) candidates responded correctly. Table 9 shows the number and percentage of candidates that selected each option.



**Table 9: Number and percentage of candidates in each option**

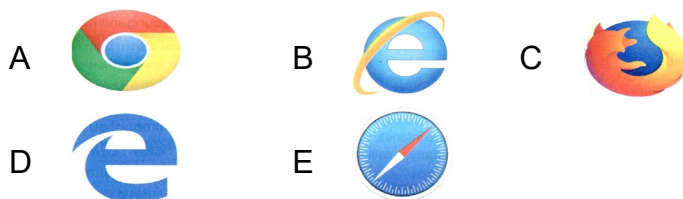
Option	A	B	C	D	E*	Others
No. of the Candidates	408173	87422	182375	79839	582001	16503
% of the Candidates	30.09	6.45	13.45	5.89	42.91	1.22

Table 9 shows that 42.91 percent of the candidates chose the correct response *E, Microsoft word*. Hence, the general performance in the question was average

Table shows that, 57.09 percent of the candidates failed to identify the correct answer. These candidates were unaware of the uses of different computer software systems. Those candidates who opted for *A, Microsoft excel* for example did not know that excel is used to calculate basic and complex mathematical data. Those who chose *B, Application* did not know that it is any software designed to perform a specific computer program. Candidates who opted for *C, typing* failed to understand that it is an activity of writing on a Microsoft word program. Whereas, those who selected distractor *D, system* failed to understand that a system is a general term that comprises of computer software and hardware applications.

Further analysis shows that 42.91 percent of the candidates chose the correct response. These candidates had knowledge that that Microsoft word is a software designed specifically for creating texts like letters, reports, magazines and journals.

**Question 21:** Which icon represents the Safari web browser?



The question assessed candidates' competence in applying information and communication technology especially in identifying the types of web browsers and their uses. The analysis shows that 613,569 (45.24%) of the candidates responded correctly and

742,744 (54.76%) responded incorrectly. Table 10 shows the number and percentage of candidates who selected each option.

**Table 10: Number and percentage of candidates in each option**

<b>Option</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E*</b>	<b>Others</b>
<b>No. of Candidates</b>	160512	251558	200778	108692	613569	21204
<b>% of Candidates</b>	11.83	18.55	14.80	8.01	45.24	1.56

Table 10 shows that 45.24 percent of the candidates chose the correct response *E*, hence the performance in the question was average.

The analysis shows that, 54.76 percent of the candidates who chose wrong responses; A, B, C, and D were unaware of different types of browsers. They failed to identify the web browsers presented in the pictures. For example, those who opted for *A*, did not know that the picture represents google chrome, *B* represents Internet explorer, *C* represents Mozilla Firefox and *D* represents Microsoft edge.

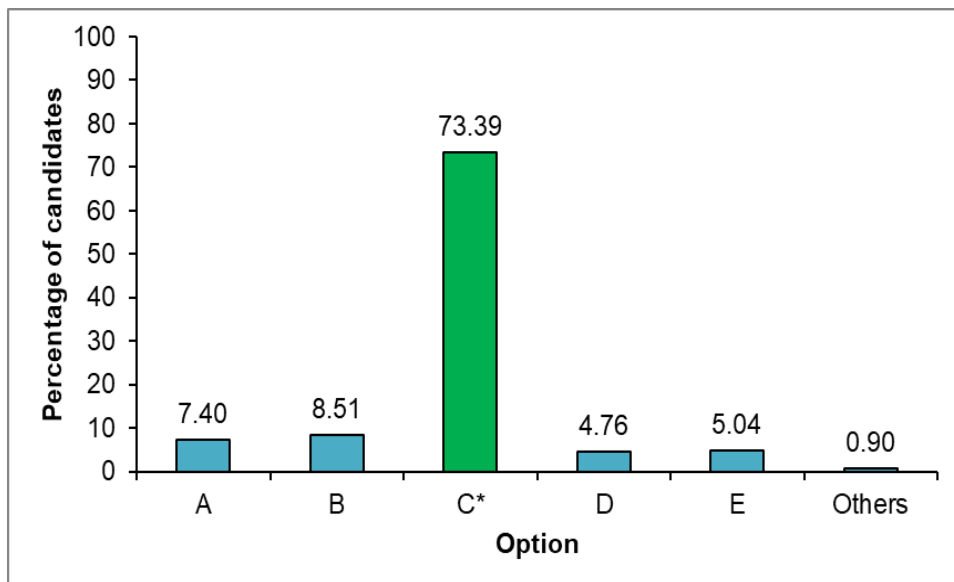
On the other hand, table 10 shows that 45.24 percent of the candidates chose the correct response. These candidates were aware of the different types of web browsers thus, they managed to identify the pictorial representation of the Safari web browser.

**Question 22:** Your parents have bought a mobile phone for family communication. Which steps would you follow to inform them about the emergency that may occur at home?

- A Communicate → write the mobile number → press the dial button
- B Write the mobile number → communicate → press the dial button
- C Write the mobile number → press the dial button → communicate
- D Make a call → write the mobile number → press an off button
- E Write the mobile number → press an off button → communicate

The question assessed candidates' competence in applying information and communication technology on how to use a mobile

phone for communication. The analysis shows that 995,363 (73.39%) candidates responded correctly and 360,950 (26.61%) gave wrong responses. Figure 12 shows the percentage of candidates who selected each option.



**Figure 12:** *Percentage of candidates in each option*

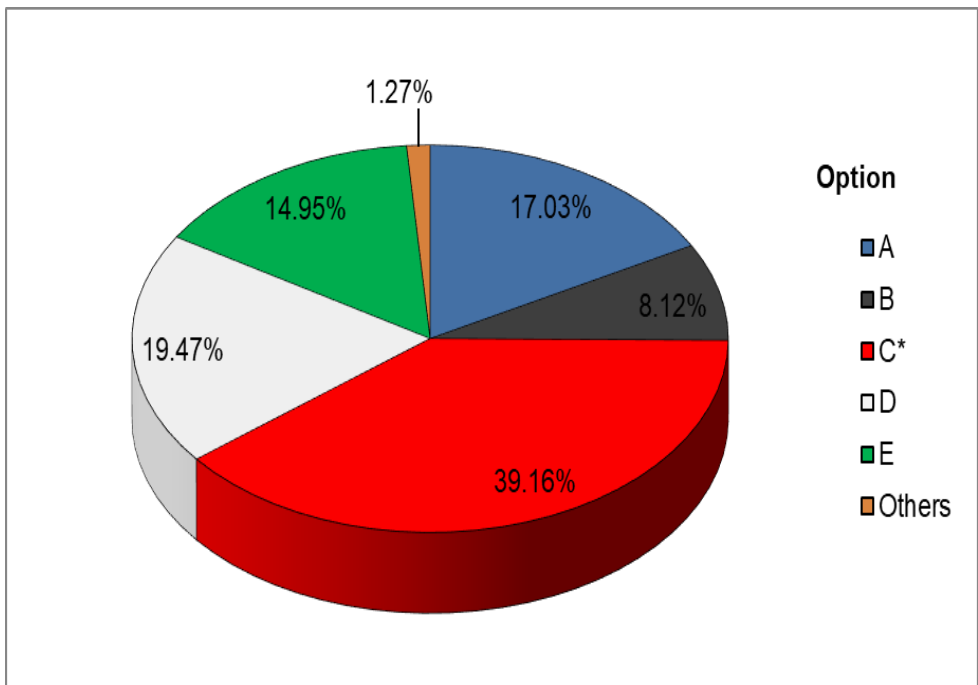
Figure 12 shows that 73.39 percent of the candidates selected the correct response *C, Write the mobile number → press the dial button → communicate*. These candidates understood that before calling, one has to start by writing the number on the phone screen, then dial it and finally communicate when the call is received.

Further analysis shows that, 26.61 percent of the candidates chose wrong responses, because they were unaware of the orderly procedures of using a phone for communication processes. Those who chose *A, communicate → write the mobile number → press the dial button* and *B, Write the mobile number → communicate → press the dial button* for example did not know that the dial button is pressed after writing the mobile number. Likewise, those who chose *D, make a call → write the mobile number → press an off button* and *E, Write the mobile number → press an off button → communicate* did not know that when the off button of a phone is pressed, the phone turns off hence there is no communication.

**Question 23:** Why is it important to switch off the computer soon after using it?

- A To keep information for a long time
- B To make it operate at the maximum speed
- C To make it last long and work properly
- D To ensure that no virus can attack it
- E To avoid unauthorized user.

The question assessed the candidates' competence in applying information and communication technology on the uses of a computer. The analysis shows that 825,135 (60.84%) candidates chose wrong responses and 531,178 (39.16%) responded correctly. Figure 13 shows the percentage of candidates that selected each option.



**Figure 13:** Percentage of candidates in each option.

Figure 13 shows that 39.16 percent of the candidates selected the right response *C*, to make it last long and work properly. Hence the general performance of the question was weak.

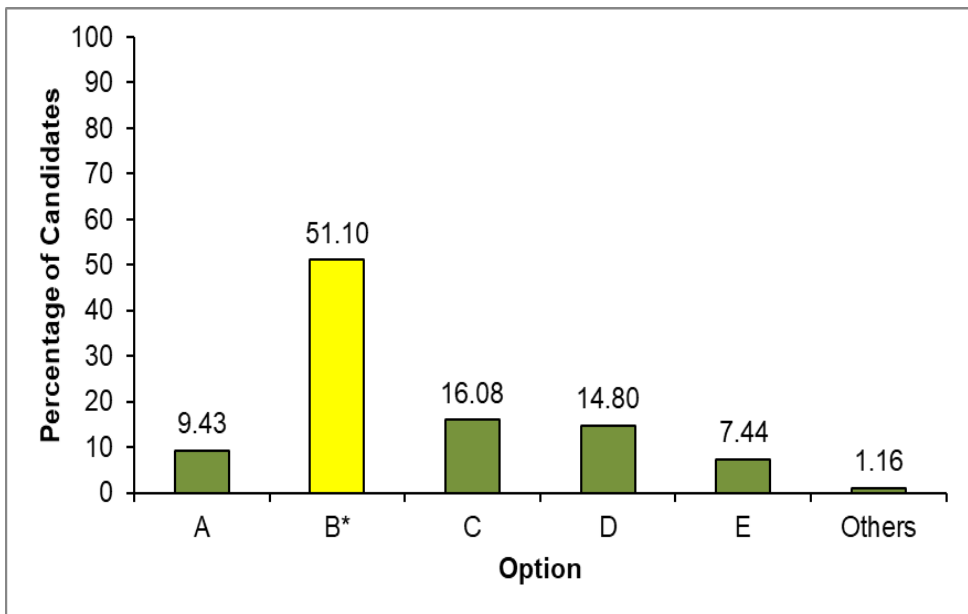
60.84 percent of the candidates who chose wrong responses, were unaware of computer uses and storage tips. Those who chose *A, to keep information for long time* for example did not know that to keep information for a longtime is one of the core characteristics of a computer whether “on” or “off”. Those who chose *B, to make it operate at a maximum time*, did not know that this is done by the refresh option. Candidates who opted for *D, to ensure that no virus can attack it*, did not know that computer viruses are prevented by anti-viruses. Finally, candidates who selected *E, to avoid unauthorized users* did not know that, this is possible if the computer has a strong pass word.

However, 39.16 percent of the candidates selected the right response *C, to make it last long and work properly*. They understood that the computer extends its life span in off mode because, it limits continuous tear and friction of the system components of the computer.

**Question 24:** Wheelbarrow is a simple machine used to carry luggage from one place to another. Which one is the correct arrangement of the lever parts of a wheelbarrow?

- A Effort is between fulcrum and wheel
- B Load is between effort and fulcrum
- C Effort is between fulcrum and load
- D Fulcrum is between effort and load
- E Fulcrum is between load and wheel

The question assessed the candidates’ competence in mastering scientific skills particularly of identifying the parts of a second class lever. The analysis shows that 693,036 (51.10%) candidates gave correct responses and 663,277 (48.90%) chose wrong responses. This indicates that the performance of this question was good. Figure 14 shows the percentage of candidates in each option.



**Figure 14:** *Percentage of candidates in each option*

Figure 14 shows that 51.10 percent of the candidates answered the question correctly by choosing *B, Load is between effort and fulcrum*

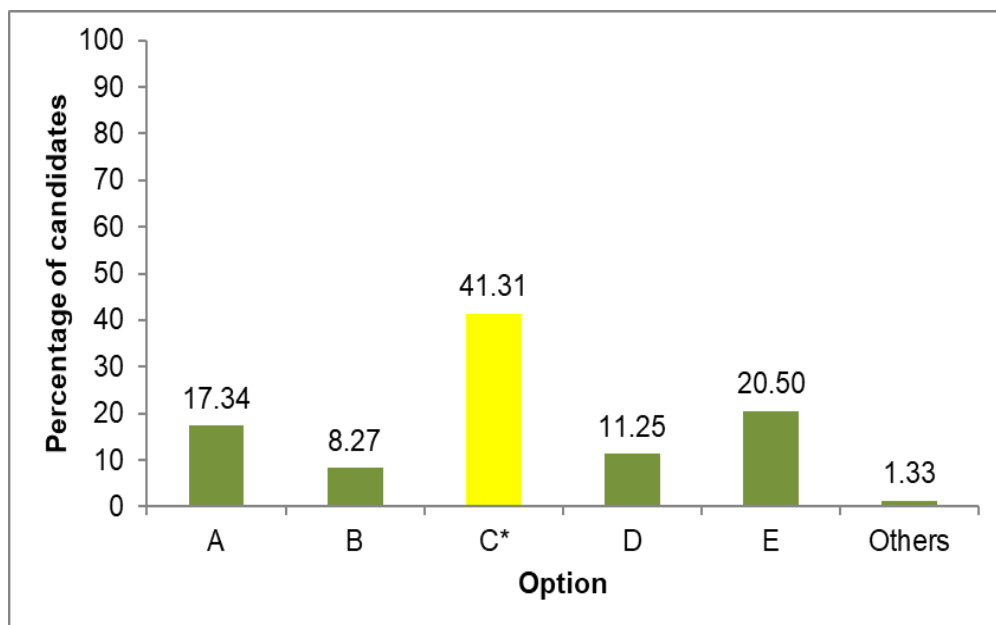
These candidates understood about the classes of levers and that a wheelbarrow is an example of the second class lever as the load is between effort and fulcrum.

Further analysis reveals that, 48.90 percent of the candidates chose wrong responses. These candidates lacked adequate knowledge about the classes of the levers and their parts. Those candidates who selected *A, Effort is between fulcrum and wheel* and *E, Fulcrum is between load and wheel* for example did not know that the wheel is mounted on a wheelbarrow at the fulcrum thus it is part of a fulcrum and not the wheel. Those who selected *C, Effort is between fulcrum and load* and *D, Fulcrum is between effort and load* did not know that these are the parts of a third class lever and first class lever respectively.

**Question 25:** A teacher instructed Standard Seven pupils to use a measuring cylinder of 1000 cm<sup>3</sup> instead of a cup to measure the volume of water. Why did he instruct them to use that apparatus?

- A For easily water filling
- B For preventing water loss
- C For giving accurate results
- D For saving time
- E For showing the measured water

The question assessed candidates' knowledge of scientific skills particularly on identifying the importance of using standard measuring devices. The analysis shows that 560,268 (41.31%) candidates responded correctly and 796,045 (58.69%) failed, thus the performance in the question was average. Figure 15 shows the percentage of candidates that selected each option.



**Figure 15:** Percentage of candidates in each option

Figure 15 shows that 41.31 percent of the candidates chose the correct response C, for giving accurate results.

The analysis from the chart shows that, 58.69 percent of the candidates failed to identify the correct response. These candidates

lacked knowledge on the importance of using standard measurements. They chose one of the following distractors: *A, for easy water filling; B, for preventing water loss; D, for saving time and E, for showing the measured water.* These candidates did not know that all these were not correct since a measuring cylinder is a standard volume measuring apparatus which measures accurate volume of liquids.

On the other hand, 41.31 percent of the candidates understood that a measuring cylinder is a standard apparatus used to measure the volume of a substance and it gives accurate measurement.

**Question 26:** A pair of scissors has the velocity ratio of 16 and its mechanical advantage is 8. Find the efficiency of that pair of scissors.

- A 200%                      B 50%                      C 128%  
 D 100%                      E 150%

The question assessed candidates' knowledge of scientific skills specifically in computing the efficiency of the machine. The performance of the candidates in this question was weak since 1,051,720 (77.54%) candidates gave wrong responses while 304,593 (22.46%) responded correctly. Table 11 shows of the number and percentage of candidates that selected each option.

**Table 11: Number and percentage of candidates in each option**

Option	A	B*	C	D	E	Others
No. of Candidates	240811	304593	589652	119792	83336	18129
% of Candidates	17.75	22.46	43.47	8.83	6.14	1.34

Figure 11 shows that 22.46 percent of the candidates chose the correct response *B*, 50%.

Data analysis reveals that, 77.54 percent of the candidates failed to identify the correct response. These candidates lacked knowledge of calculating and failed to identify the correct formula to calculate the efficiency of the machine. Those who selected *A,200%, C,128%,*



*D*, 100% and *E*, 150%. For instance, used a wrong formula by inverting the right one such as;

$$\text{Efficiency} = \frac{\text{Velocityratio}}{\text{Mechanicaladvantage}} \times 100\%$$

$$= \frac{16}{8} \times 100\%$$

$$= 200\%$$

OR

$$\text{Efficiency} = (\text{Mechanical advantage} \times \text{Velocityratio})\%$$

$$\text{Efficiency} = (8 \times 16)\%$$

$$= 128\%$$

OR

$$\text{Efficiency} = \frac{\text{Velocityratio} - \text{Mechanicaladvantage}}{\text{Mechanicaladvantage}} \times 100\%$$

$$\text{Efficiency} = \frac{16 - 8}{8} \times 100\%$$

$$\text{Efficiency} = 100\%$$

OR

$$\text{Efficiency} = \frac{1}{2} \frac{\text{Velocityratio} + \text{Mechanicaladvantage}}{\text{Mechanicaladvantage}} \times 100\%$$

$$= \frac{1}{2} \frac{16 + 8}{8} \times 100\%$$

$$= 150\%$$

Further analysis shows that 22.46 percent of the candidates got the correct formula to calculate the efficiency of a pair of scissors and also mastered computing skills as shown below:

$$\text{Efficiency} = \frac{\text{Mechanical advantage}}{\text{Velocity Ratio}} \times 100\%$$

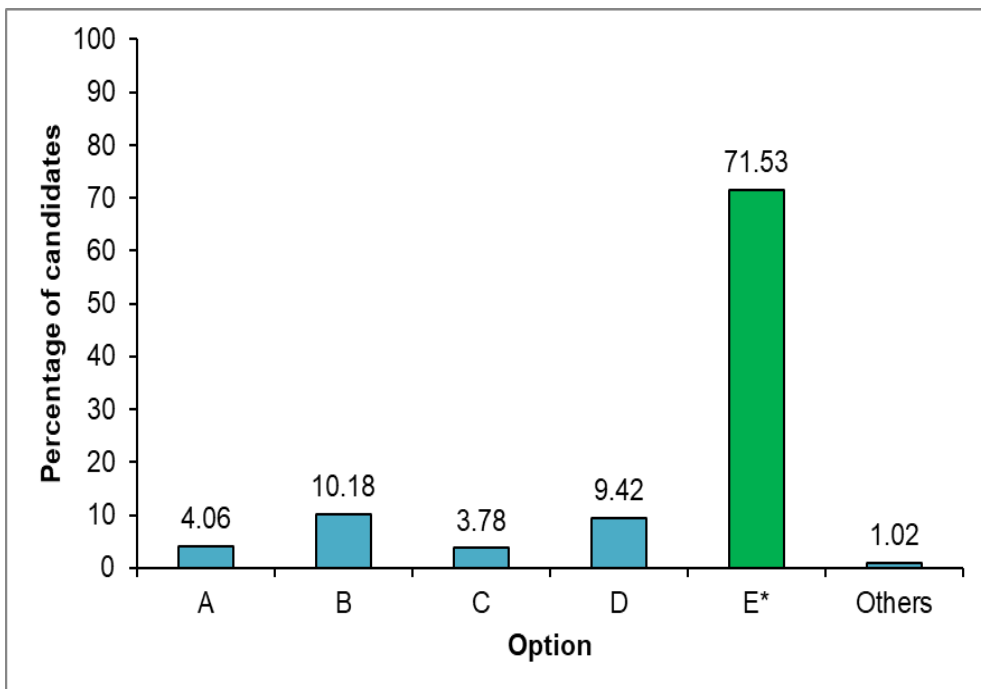
$$= \frac{8}{16} \times 100\%$$

$$= 50\%$$

**Question 27:** A businessman kept fishes in a basket but after five days they all decayed. If you were given a chance to advise on the best way of keeping fish for a long time, where would you advise him to keep them?

- A In a nylon
- B In water
- C In a bucket
- D In an open space
- E In a refrigerator

The question assessed candidates' competence in mastering scientific skills especially in the use of electrical equipment in the preservation of food. The performance of the candidates in this question was good since 970,151 (71.53%) candidates responded correctly and 386,162 (28.47%) failed to respond correctly. Figure 16 shows the percentage of candidates that selected each option.



**Figure 16:** *The percentage of candidates in each option*

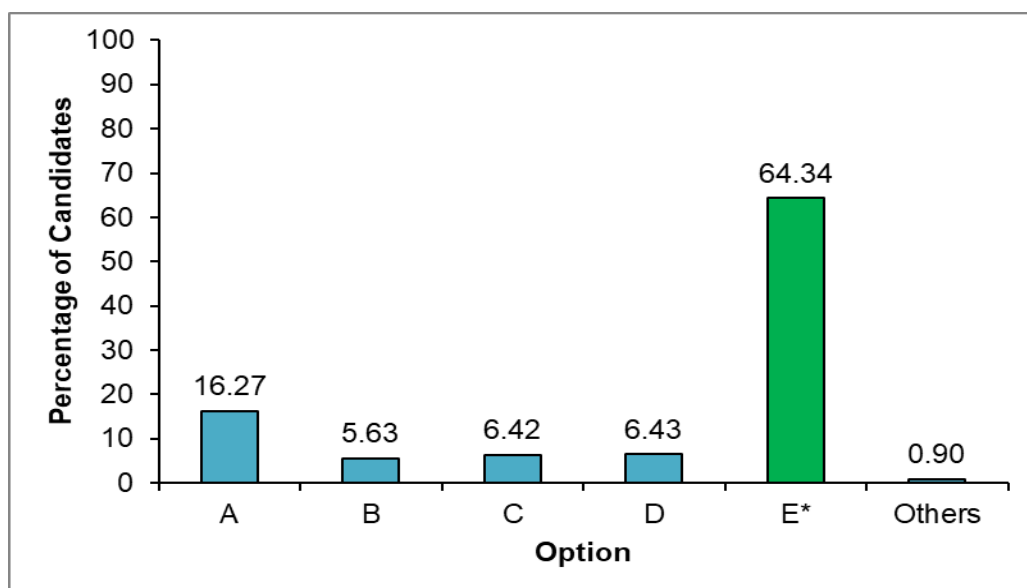
Figure 16 shows that, 71.53 percent of the candidates attempted the question correctly by choosing *E, Refrigerator*. These candidates were aware that a refrigerator is an appliance which preserves different stuff like food by cooling.

However, 28.47 percent of the candidates chose wrong answers. These candidates lacked competence on the uses of electrical and non-electrical equipment for food preservation. Candidates who chose *alternative A, In a nylon; B, In water; C, In a bucket and D, In an open space* were not aware that these places and non-electrical appliances allow air and moisture to pass through the food which creates a conducive environment for the growth of bacteria and other microorganisms. Likewise, they provide optimal temperature which speeds up the rate of microorganism growth hence, spoiling the food.

**Question 28:** Which set represents the standard unit used in the measurement of things?

- A Ruler, tape measure and bucket
- B Ruler, bucket and jug
- C Ruler, tape measure and jug
- D Tape measure, bucket and beam balance
- E Ruler, tape measure and beam balance

The question assessed candidates' competence to master scientific skills particularly in identifying standard measuring devices. The analysis shows that 872,651 (64.34%) candidates responded correctly and 483,662 (35.66%) failed. The performance in the question was good. Figure 17 shows the dispersion of percentage of candidates that selected each option.



**Figure 17:** Percentage of candidates in each option

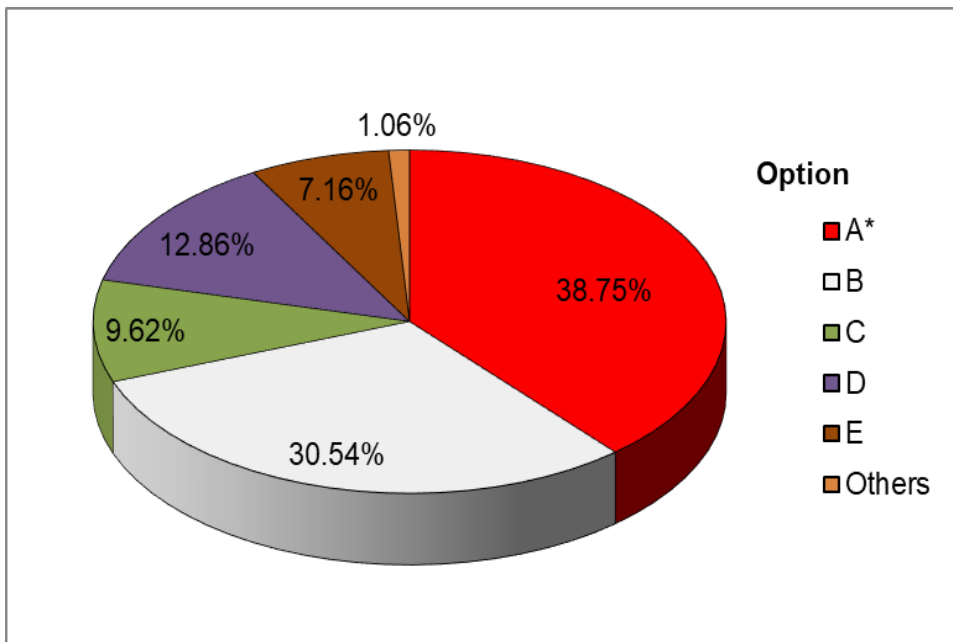
Figure 17 shows that 64.34 percent of the candidates responded correctly by choosing set *E*, *Ruler, tape measure and beam balance*. These candidates were competent in identifying standard measurements.

On contrary, 35.66 percent of the candidates selected the wrong choices: *A*, *Ruler, tape measure and bucket* *B*, *Ruler, bucket and*

jug, C, Ruler, tape measure and jug and D, Tape measure, bucket and beam balance. These candidates were unaware of standard measurements. The bucket in responses A, B and D and a jug in B and C are non-standard measurements devices.

**Question 29:** Which electric component made of a thin wire can melt if too much current flows in the circuit?  
 A Fuse      B Earth wire      C Circuit breaker  
 D Switch      E Plug

The question assessed candidates' competence to perform scientific experiments correctly specifically in identifying electric circuit component which consist of a thin wire that melts easily when exposed to high current. The general performance in this question was weak as 830,716 (61.25%) candidates chose wrong responses and 525,597(38.75%) responded correctly. Figure 18 shows dispersion percentage of candidates that selected each option.



**Figure 18:** Percentage of candidates in each option

Figure 18 shows that, 61.25 percent of the candidates who chose the distractors lacked knowledge of the functions of different electric circuit devices particularly the component which consists of a thin

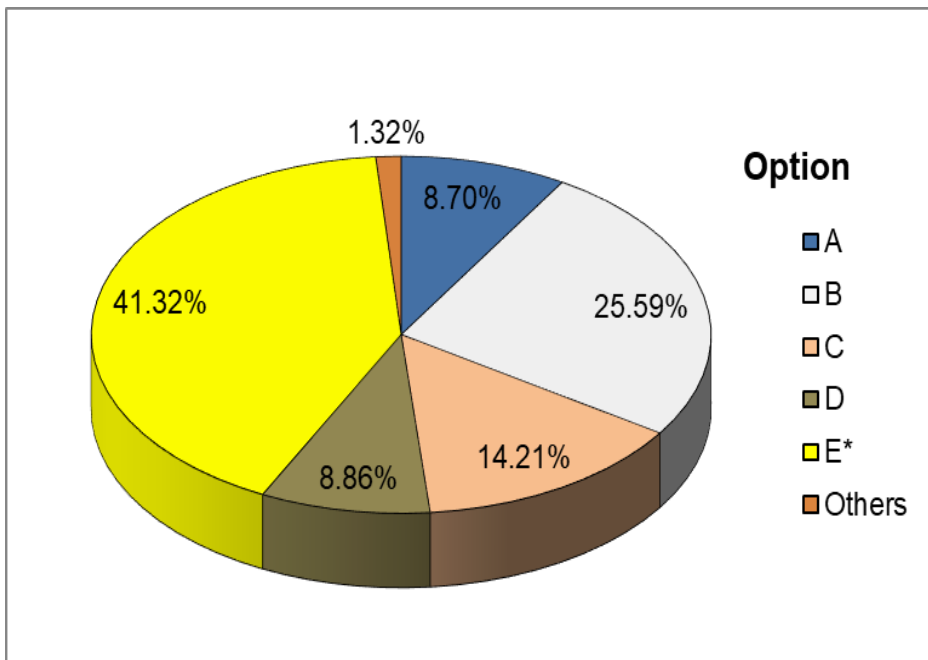
wire that melts easily when exposed to high electric current. Candidates who selected *B, Earth wire* for example, did not know that its function is to prevent users from getting an electric shock when an electric fault occurs for instance in buildings. Those who chose *C, Circuit breaker* did not know that the function of a circuit breaker is to cut off the circuit preventing it from being damaged in case of immediate increase of the current. The candidates who chose *D, Switch* did not know that the function of a switch is to put the circuit on or off. Those who chose *E, Plug* did not know that, a plug is an electrical device used to connect current from the source to the user.

Figure 18 shows that 38.75 percent of the candidates answered correctly as they chose *A, Fuse*. These candidates were aware of the functions of different components of electric circuit devices. They understood that a fuse is a thin wire that allows a specific amount of current to pass through the circuit. If the power rating of the electrical appliance is exceeded, the fuse blows off but the appliance remains secure.

**Question 30:** A Standard Seven pupil had a wound. Although the wound was tied with a bandage, the blood continued to flow for some time. Why the blood did not clot?

- A His blood had an excess of plasma
- B His blood had a shortage of white cells
- C His blood had a shortage of plasma
- D His blood had an excess of platelets
- E His blood had a shortage of platelets

The question assessed candidates' competence in understanding various systems in the human body especially the components of the blood circulatory system. The analysis shows that 795,930 (58.68%) candidates failed and 560,383 (41.32%) responded correctly. Figure 19 shows percentage of candidates who selected each option in question 30.



**Figure 19:** *The percentage of candidates in each option*

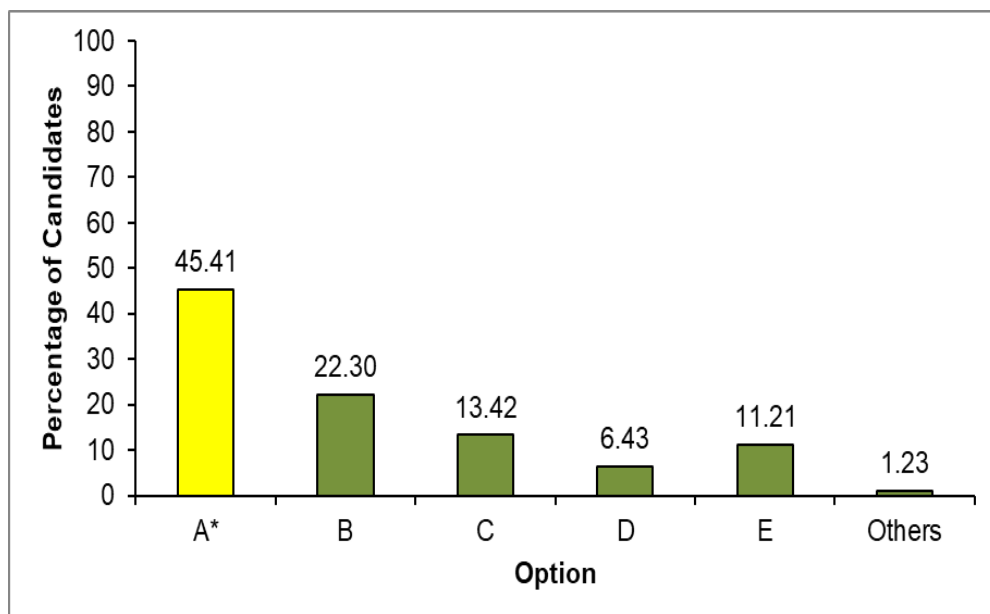
Figure 19 indicates that, 58.68 percent of the candidates chose incorrect responses. These candidates lacked adequate knowledge on the functions of blood components. Candidates that chose distractor *A, His blood had an excess of plasma* and *C, His blood had a shortage of plasma* for example failed to recognize that the role of blood plasma is to transport nutrients, regulate antibodies and dissolve salts. It is also used to collect waste products from the cells and to maintain body temperature. Those who opted for *B, His blood had a shortage of white cells* failed to understand that the function of white blood cells is to protect the body against disease causing organism. Furthermore, those who chose distractor *D, His blood had an excess of platelets* failed to understand that presence of enough blood platelets helps to prevent bleeding in new injury.

However, 41.32 percent of the candidates attempted the question correctly by choosing *E, His blood had a shortage of platelets*. These candidates were aware that the function of blood platelets is to stop bleeding from a new wound. They also understood that insufficient amount of blood platelets reduces its effectiveness to stop bleeding in a new wound.

**Question 31:** Which one of the following is an inheritable disease?

- A Haemophilia    B Asthma    C Cancer  
D Diphtheria    E Tetanus

The question assessed candidates' knowledge of how to maintain health and the environment particularly the concept of hereditary diseases. The analysis reveals that the performance in this question was average since 740,471 (54.59%) candidates responded incorrectly and 615,842 (45.41%) failed. Figure 20 shows percentage of candidates that selected each option.



**Figure 20:** The percentage of candidates in each option

Figure 20 reveals that, 45.41 percent of the candidates answered the question correctly by choosing A, *Haemophilia*.

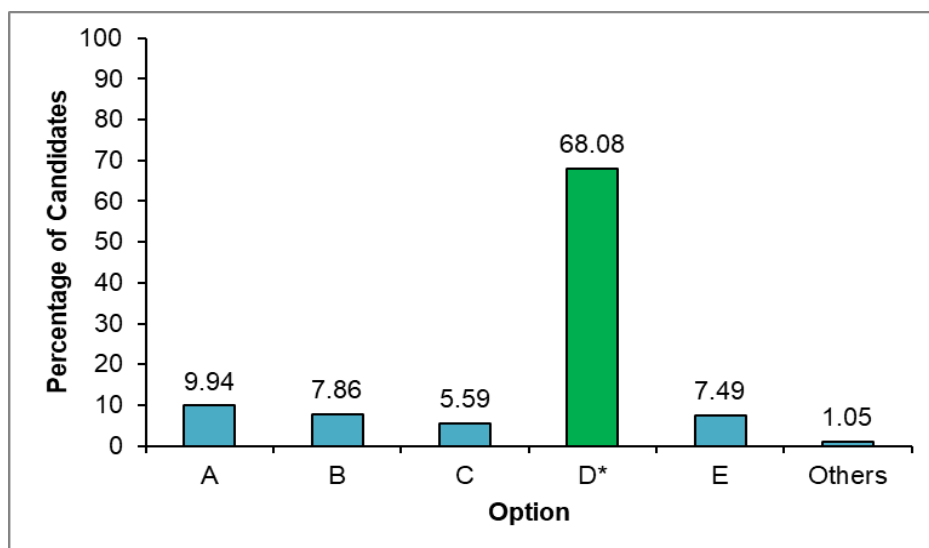
Figure 20 shows that, 54.59 percent of the candidates gave wrong answers. These candidates lacked adequate knowledge of heritable diseases. Candidates who chose distractor B, *Asthma* and C, *cancer* failed to understand those are non-communicable diseases. Those who chose D, *Diphtheria* E, *Tetanus* for example, failed to understand that these are communicable diseases spread by disease causing microorganisms and not through heredity.



However, 45.41 percent of the candidates answered the question correctly by choosing A, *Haemophilia*. These candidates understood that haemophilia is a genetic disorder whereby blood does not clot when a person is injured. This abnormality occurs in genes which are carried in hereditary materials thus the disorder is passed from one generation to the next.

**Question 32:** In which group are foods like butter, groundnuts, cashew nuts and sunflower found?  
A Protein            B Vitamins            C Minerals  
D Fats and oils    E Carbohydrates

The question measured the candidates' ability to apply health principles for good health especially in identifying the groups of food that make a balanced diet. The performance of the candidates in this question was good as 923,400 (68.08%) candidates answered correctly and 432,913 (31.92%) candidates failed. Figure 21 shows the percentage of candidates that selected each option.



**Figure 21:** The percentage of candidates in each option

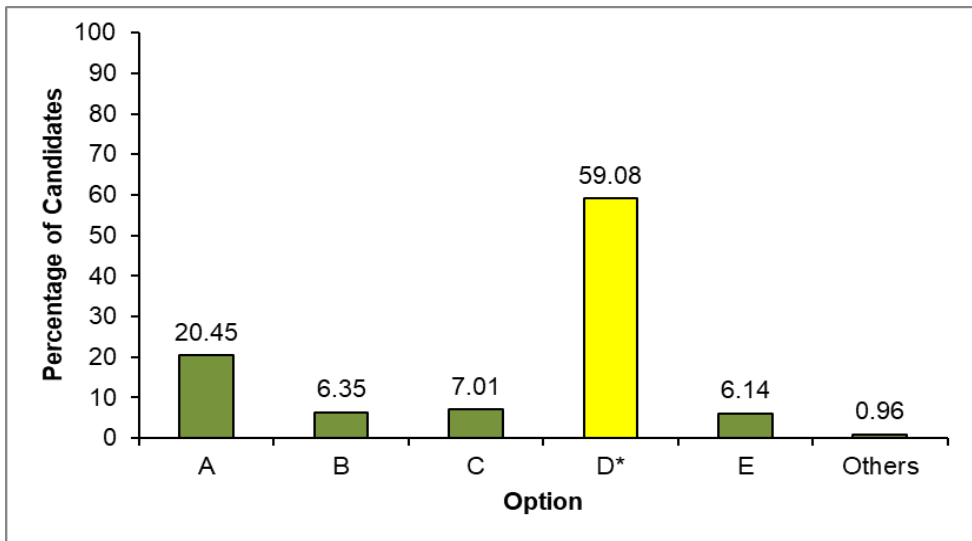
Figure 21 shows that 68.08 percent of the candidates answered the question correctly by selecting D, *Fats and oils*. These candidates understood that butter, groundnuts, cashew nuts and sunflower belong to a group of foods rich in fats and oils.

On the other hand, 31.92 percent of the candidates chose incorrect responses. These candidates had inadequate knowledge of the nutrients found in different groups of food that make a balanced diet. The candidates who chose distractor A, *Protein* for example did not know protein is found in food substances such as fish, meat, eggs, beans and milk. Those who chose distractor B, *Vitamins* were not aware that vitamins are found in fruits and vegetables. Those who chose C, *Minerals* failed to understand that minerals are obtained from foods like cabbage, carrot and green vegetables. Moreover, those who chose option E, *Carbohydrates* did not know that carbohydrates are found in foods such as *maize*, rice, sorghum, cassava, potatoes, wheat and bananas.

**Question 33** If you are given a task to advise on the proper way that can be used to remove plastic remains that are scattered on the environment, which way would you propose?

- A Collecting and burning
- B Burying in the soil
- C Dumping in a pit
- D Recycling
- E Sell them to those in need

The question assessed candidates' competence in applying principles of hygiene for good health and environment especially in methods of waste maintenance. The performance of the candidates in this question was average since 801,371 (59.08%) candidates responded correctly and 554,942 (40.92%) candidates failed. Figure 22 shows the percentage of candidates that selected each option.



**Figure 22:** *The percentage of candidates in each option*

Figure 22 shows that, 59.08 percent of the candidates answered correctly by choosing *D, Recycling*. These candidates understood that recycling is the proper method through which waste is processed into a new product that can be used again.

However, 40.92 percent of the candidates answered incorrectly. These candidates lacked adequate competence to understand proper methods of waste disposal and maintenance. Candidates who chose *distractor A, Collecting and burning* for example failed to understand that burning of wastes lead to air pollution. Those who chose alternative *B, Burying in the soil* failed to understand that plastic materials are non-decomposable thus, stay longer in the soil and cause land and eventually water pollution. Those who chose *distractor C, Dumping in a pit* failed to understand that accumulation of plastic materials in the pit acts as a breeding site for vectors such as mosquitoes and flies. The candidates who opted for alternative *D, Sell them to those in need* failed to recognize that selling of plastic materials do not remove them from the environment.

**Question 34:** A youth had unsafe sex and suffered from the diseases which attack male parts. Which diseases did he suffer from?

- A Gonorrhoea, cancer, trichomoniasis
- B Syphilis, trichomoniasis, dysentery
- C Diabetes, chlamydia, schistosomiasis
- D Gonorrhoea, fungal and chlamydia
- E Syphilis, trichomoniasis and schistosomiasis

The question assessed the candidates' competence in applying principles of hygiene for good health and environment in relation to sexually transmitted diseases. Generally, the performance of the candidates in this question was weak since 821,494 (60.57%) candidates responded incorrectly and 534,819 (39.43%) candidates answered correctly. Table 12 shows the number and percentage of candidates that selected each option.

**Table 12: The number and percentage of candidates in each option**

Option	A	B	C	D*	E	Others
No. of Candidates	341279	147038	93387	534819	223073	16717
% of Candidates	25.16	10.84	6.89	39.43	16.45	1.23

Table 12 shows that, 60.57 percent of the candidates chose wrong responses. These candidates lacked adequate knowledge on sexually transmitted diseases. Those who chose alternative A, *Gonorrhoea, cancer, trichomoniasis* for example, failed to understand that cancer is a disease affecting human cells caused by various things including chemicals and harmful radiations resulting to the formation of abnormal cells that divide to produce new abnormal cells which are not needed by the body. Those who chose alternative B, *Syphilis, trichomoniasis, dysentery* failed to realise that dysentery occurs when a person is infected by bacteria through contaminated food or water. Those who chose alternative C, *Diabetes, chlamydia, schistosomiasis* did not know that diabetes is a disease that occurs when normal blood sugar levels are too high or too low due to failure of the pancreas to produce enough chemicals to balance blood sugar. Those who chose option E, *Syphilis,*

*trichomoniasis and schistosomiasis* did not understand that schistosomiasis is a disease affecting the intestine and the urinary bladder and is spread when a person takes a bath or enters in stagnant water with micro-organisms causing the disease.

The statistics from the table also shows that, 39.43 percent of the candidates got the question correctly by choosing alternative D, *Gonorrhoea, fungal and chlamydia*. These candidates understood that such diseases are sexually transmitted. These diseases are transmitted from an infected person to another person through unprotected sexual intercourse.

**Question 35:** A child had diarrhoea and vomiting after acquiring cholera. Which substance was quickly lost from the body?

- A Water                      B Food                      C Salt  
D Blood                      E Nutrients

The question assessed the candidates' ability to apply principles of hygiene for good health and environment particularly in understanding the symptoms of various diseases analysis shows that 755,287 (55.69%) candidates responded correctly and 601,026 (44.31%) gave wrong answers. Table 13 shows the number and percentage of candidates that selected each option.

**Table 13: The percentage of candidates in each option**

Option	A*	B	C	D	E	Others
No. of Candidates	755287	90159	155205	107814	233326	14522
% of Candidates	55.69	6.65	11.44	7.95	17.20	1.07

Table 13 shows that, 55.69 percent of the candidates attempted the question correctly by choosing A, *Water*. These candidates were aware that vomiting and diarrhoea causes excessive water loss from the body.

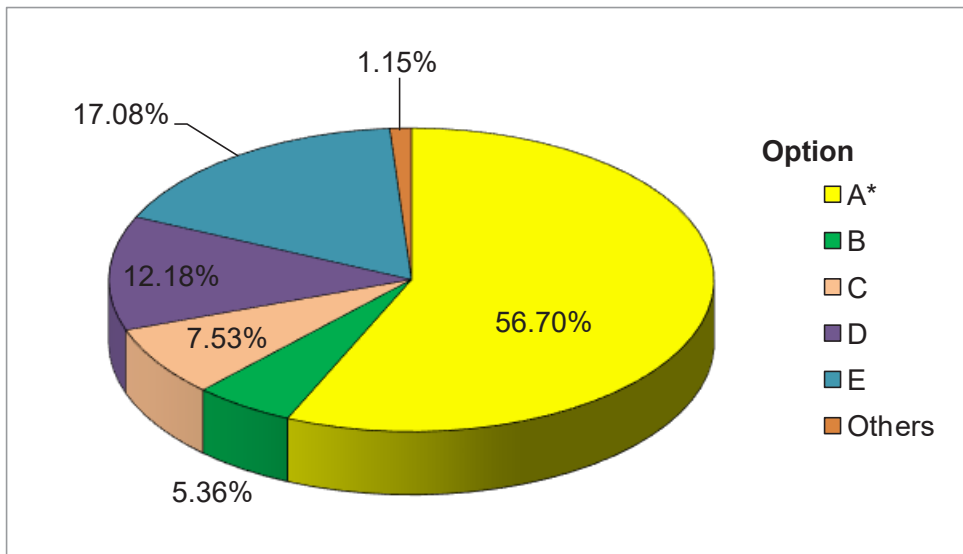
However, 44.31 percent of the candidates failed to respond correctly. These candidates failed to understand the symptoms of various diseases. The candidates who chose *alternative B, Food* for

instance, failed to understand that food is any substance consumed to provide nutrients for the body, it is lost during vomiting and diarrhea but in small quantity compared to water. Those who chose alternative *C*, *Salt* failed to understand that salt is lost from the body through sweating and urine. Those who chose alternative *D*, *Blood* failed to understand that blood is lost when there is a cut or wound in the body. Likewise, those who chose alternative *E*, *Nutrients* failed to understand that nutrients are substances obtained from food which the body needs for growth, maintenance and proper functioning. Nutrients are also lost during vomiting and diarrhoea but in small quantity compared to water.

**Question 36:** People who carry luggage in the market use a lot of energy in doing that work. Which type of food do they deserve to eat more in relation to the work they do?

- A Carbohydrates
- B Fat and Oils
- C Minerals
- D Vitamins
- E Proteins

The question assessed candidates' competence in applying health principles for good health especially on the importance of food groups that make a balanced diet. The performance of the candidates in this question was average as 769,036 (56.70%) candidates answered correctly and 587,277 (43.30%) failed. Figure 23 shows the percentage of candidates that selected each option.



**Figure 23:** *The percentage of candidates in each option*

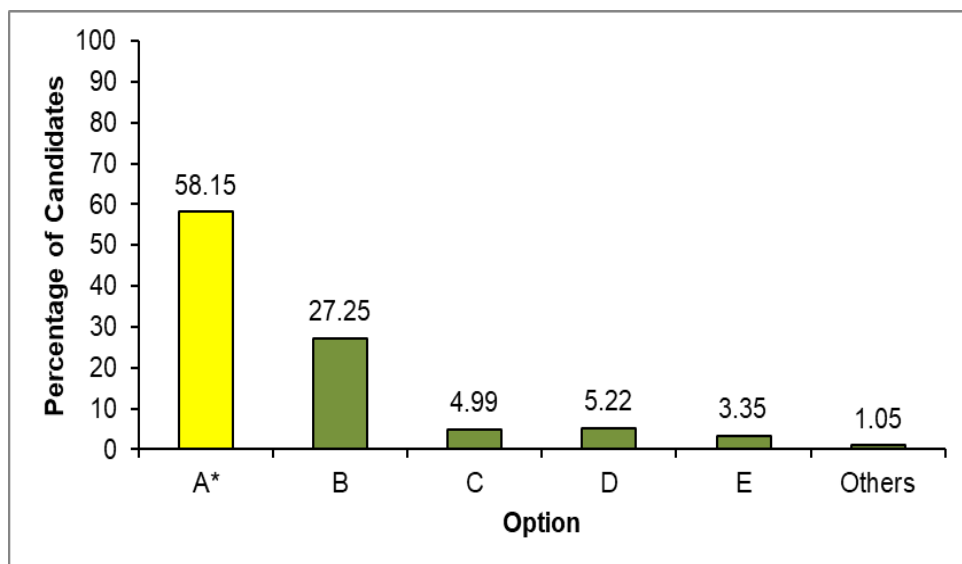
Figure 23 shows that 56.70 percent of the candidates answered the question correctly by selecting A, *Carbohydrates*. These candidates understood that carbohydrates are foods that provide our bodies with energy.

On the contrary, 43.30 percent of the candidates chose incorrect responses. These candidates had inadequate knowledge about the importance of different groups of food that make a balanced diet. The candidates who chose distractor B, *Fats and Oil* for example, did not know that food rich in fats and oil give our bodies heat and energy. However, their energy production process is not immediate compared to carbohydrates. Those who chose distractor C, *Minerals* failed to understand that minerals make our body tissues strong and help in the digestion of food. Those who chose D, *Vitamins* failed to realise that vitamins are foods that protect our bodies against diseases and make our bones and teeth strong. Furthermore, those who chose E, *Proteins* did not know that proteins build up the body and repair worn out cells.

**Question 37:** You are given a chance to provide professional advice to youths living with HIV/AIDS to strengthen their health. Which advice would you give them?

- A To eat balanced diet and observe health regulations
- B To exercise and use ARV
- C To have enough rest and eat well
- D To observe cleanness and do exercise
- E To worship and rest

The question assessed candidates' competence in applying health principles for good health particularly about for people living with HIV/AIDS. Generally, the performance of the candidates in this question was average as 788,633 (58.15%) candidates answered correctly and 567,680 (41.85%) candidates chose wrong answers. Figure 24 shows the percentage of candidates who selected each option.



**Figure 24:** *The percentage of candidates in each option*

Figure 24 shows that 58.15 percent of the candidates attempted the question correctly by selecting the correct response A, *To eat balanced diet and observe health regulations*. These candidates understood that HIV infection lowers the body immunity and therefore eating a well-balanced diet increases the immunity.



Observing health regulations helps to maintain a health body and reduce the infection of opportunistic diseases.

Whereas, 41.85 percent of the candidates chose wrong responses. These candidates had inadequate ability in applying to health principles for good health particularly about caring for and respecting people living with HIV/AIDS. Candidates who chose distractors B, *To exercise and use ARV*; C, *To have enough rest and eat well*; D, *To observe cleanness and do exercise* and E, *To worship and rest* failed to understand that doing exercise, having enough rest and observing cleanness are ways of observing health regulations. They also did not realize that eating well is not a guarantee that will strengthen the health of the people living with HIV/AIDS unless they eat a balanced diet. Furthermore, they did not know that worshiping is an act of showing reverence and devotion to God or a religious figure and it does not lead to strengthening the health status of a person living with HIV/AIDS.

- Question 38:** Why mothers are advised to breastfeed their babies for at least two years?
- A Milk makes the children eat
  - B Milk makes children sleep
  - C Milk has all the nutrients
  - D Milk makes children sleep
  - E If not breast fed children cry

The question assessed candidates' ability to apply health principles for good health in particular the importance of breastfeeding the baby after birth. The analysis shows that 1,109,099 (81.77%) candidates responded correctly and 247,214 (18.23%) chose wrong responses. Figure 25 shows the percentage of candidates who selected each option.

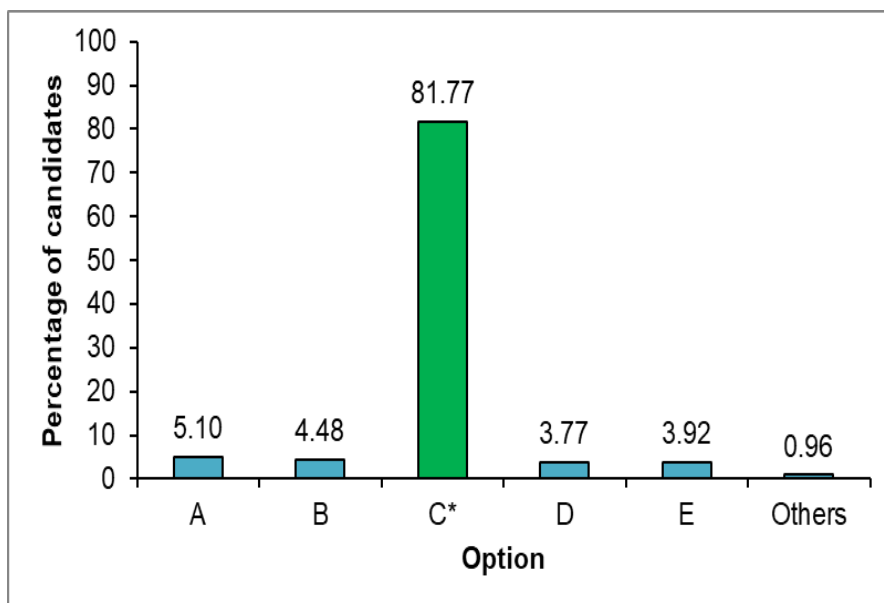


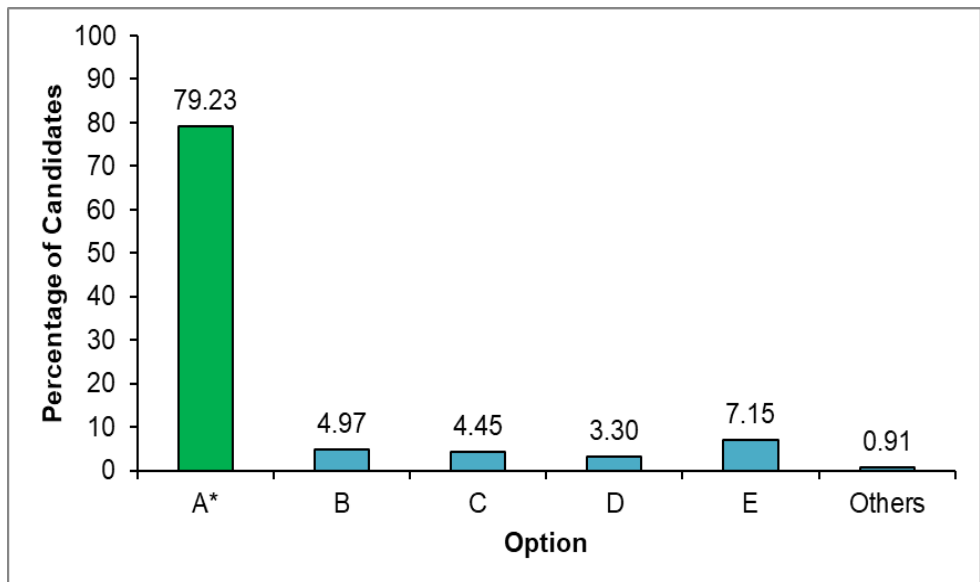
Figure 25 shows that, 81.77 percent of the candidates attempted the question correctly by choosing *C, Milk has all the nutrients*. These candidates understood that milk from a mother have all the vital nutrients for proper growth of a baby. Milk provide antibodies which defend the baby against pathogens. Thus, a baby should be breastfed for at least two years for good health.

However, 18.23 percent of the candidates chose wrong responses. These candidates lacked adequate knowledge about the importance of breastfeeding a baby after birth. For instance, Candidates who chose alternatives *A, Milk makes the children eat*; *B, Milk makes children sleep*; *D, Milk makes children sleep*; *E, If not breast fed children* failed to understand that milk has the vital nutrients such as protein, fats, vitamins, natural immunity components and minerals which perform important functions such as building the body and providing natural immunity to the baby. Therefore, breastfeeding must be done at least two years.

**Question 39:** In our society, there are different groups of people who need special health service categorised according to their condition. Which group needs special health service?

- A Children, the pregnant women, elder and patients
- B Children, youth, soldiers and teachers
- C Children, the pregnant women, teachers and doctors
- D Teachers, elders, patients and youth
- E Patients, youth, the pregnant women and elders

The question assessed candidates' ability to apply health principle for good health in particular about identifying different groups of people who need special health services. The analysis shows that that 1,074,645 (79.23%) gave correct responses and 281,668 (20.77%) did not identify the correct response. Figure 26 indicates the percentage of candidates who selected each option.



**Figure 26:** *The percentage of candidates in each option*

Figure 26 shows that, 79.23 percent of the candidates attempted the question correctly by choosing A, *Children, the pregnant women, elder and patients*. These candidates understood that this group of people need special health care. They understood that children need

special care so as to prevent a disability which a baby can acquire at early ages due to disease such as polio. Similarly, elders, need special health so as to enable them to live long to make a positive contribution to the society. Moreover, pregnant women need special care to give birth to health babies and patients need special care in order to become health like other people.

However, 20.77 percent of the candidates failed the question. These candidates lacked adequate knowledge about groups which need special health services. Candidates who chose *alternative B, Children, youth, soldiers and teachers; D, Children, the pregnant women, teachers and doctors* and *E, Patients, youth, the pregnant women and elders* failed to understand that youth have strong immunity to fight against diseases. Likewise, teachers, doctors and soldiers are just professions and not a criterion of being a special group. Criteria for being in a special group are age, immunity and health status.

**Question 40:** Asha was asked to prepare a balanced diet. Which group of food would she use to prepare the diet?

- A Maize, fish, pawpaw, groundnuts and water
- B Potatoes, eggs, mango, groundnuts and beans
- C Bananas, fish, beans, water and rice
- D Rice, meat, pawpaw, orange and water
- E Millet, milk, cucumber, mango and orange

The question assessed the candidates' ability to apply health principles for good health especially on groups of food that make a balanced diet. Generally, the performance of the candidates in this question was weak as 905,358 (66.75%) candidates answered incorrectly and 450,955 (33.25%) candidates chose wrong answers. Table 14 shows the number and percentage of that selected each option.

**Table 14: The percentage of candidates in each option**

Option	A*	B	C	D	E	Others
No. of Candidates	450933	279359	307986	179642	121382	17011
% of Candidates	33.25	20.60	22.71	13.24	8.95	1.25

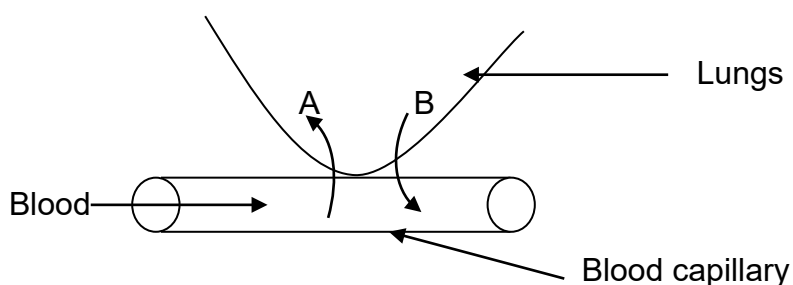
Table 14 shows that, 33.25 percent of the candidates chose the correct answer.

Table 14 shows that, 66.75 percent of the candidates failed as they chose wrong responses. These candidates had inadequate knowledge on how to apply health principles for good health specifically about in the groups of food that make a balanced diet. For example, candidates who chose distractor B, *Potatoes, eggs, mango, groundnuts and beans* for example did not know that eggs and beans are both foods rich in proteins so it was repeated in the group. Moreover, water as an essential substance for body functioning is missing. Those who chose distractor C, *Bananas, fish, beans, water and rice*. D, *Rice, meat, pawpaw, orange and water* and E, *Millet, milk, cucumber, mango and orange* did not know that all these groups do not contain fats and oils.

Table 14 reveals that, 33.25 percent of the candidates got the question correct by selecting A, *Maize, fish, pawpaw, groundnuts and water*. Those candidates understood that a balanced diet should contain all groups of food that include of carbohydrates, protein, fats and oils, vitamins, minerals and water. They knew that maize is a carbohydrate, fish is a protein, pawpaw provides vitamins and minerals, groundnuts provide fats and oils and water is important for many bodily functions.

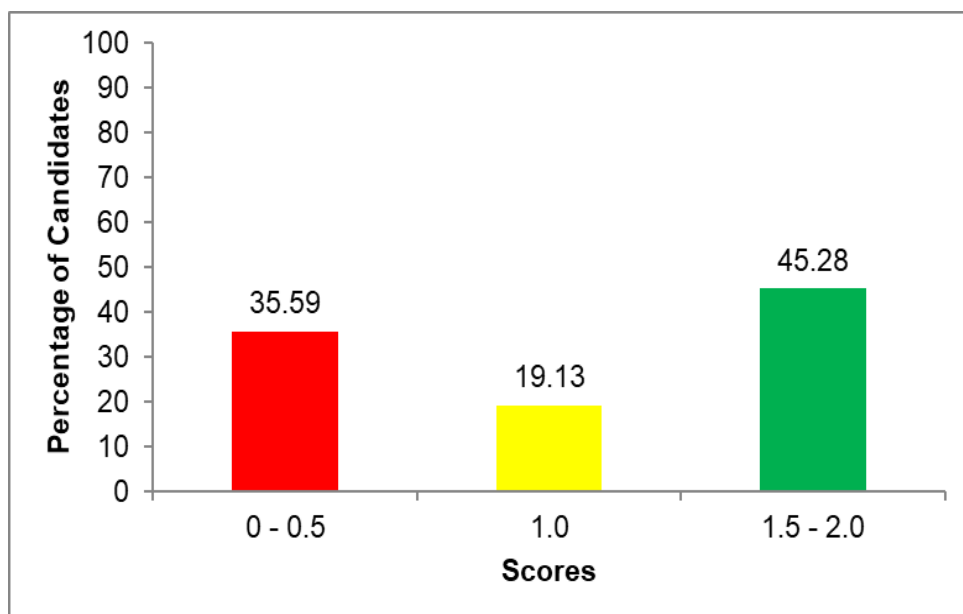
## 2.2 Section B: Short Answer Items

**Question 41:** Study Figure No.1, which shows gas exchange in the lungs. Which gas do letters A and B represent?



**Figure No.1**

The question measured candidates' competence in understanding various systems in the human body mainly respiratory system. The performance of the candidates in this question was average since 613,433 (45.23%) responded correctly and 742,888 (54.77%) gave wrong responses. Further analysis on candidates' performance shows that 35.30 percent of the candidates scored 00 and 45.23 percent scored 02 marks. A summary of candidates' performance in this question is shown in the Figure 27.



**Figure 27:** *Candidates' performance on question 41.*

Figure 27 shows that 35.30 percent of the candidates scored 0 mark and 45.23 percent scored 2 marks.

The analysis of candidates' responses shows that 64.41 percent of the candidates scored 01 to 02 marks because they understood that, gaseous exchange take place in alveoli that is found in the lungs. The alveoli are surrounded by blood capillaries and have thin membrane to enable oxygen gas to enter the blood by diffusion and carbon dioxide escapes from the blood to the lungs so as to be removed from the body. The candidates who scored 01 mark mentioned either of the gases correctly and those who scored 02

marks mentioned all the two gases correctly. Extract 1.1 is a sample of the correct response provided by one of the candidates.

QUESTION NO. 41
A = Carbondioxide gas .
B = Oxygen gas .

**Extract 1.1:** A sample of a correct response to question 41.

Further analysis shows that 35.30 percent of the candidates scored 00 mark. These candidates had inadequate knowledge about the respiratory system. They failed to realise that during breathing, gaseous exchange occurs in the alveoli found in the lungs. In this process oxygen gas enters the blood while carbon dioxide gas is removed from the blood to the lungs outside the body. Some candidates wrote gases exchanged in alveoli interchangeably, they wrote “A is oxygen gas and B is carbon dioxide gas.” This indicates that they knew the gases exchange occur in alveoli but failed to realise the gas which enter the alveoli is oxygen while the gas which moves out of the alveoli is carbon dioxide.

Other candidate also wrote the names of the gases which are not involved in breathing. One candidate for example wrote: “A is carbon monoxide and B is methane.” This candidate did not know that the gases exchanged in the alveoli are oxygen gas and carbon dioxide. Another candidate wrote A, gas that enter and B, gas that is removed. This candidate correctly interpreted the diagram that shows gas entering and leaving the blood capillary but he/she could not give the names of the gases exchanged. Some candidates interpreted letter A and B from the diagram as the parts of respiratory system hence, they wrote “A is alveoli and B, is diaphragm. This response shows that these candidates understood the question is from the respiratory system but they did not understand about the exchange of gases taking place in alveoli. *Extract 1.2* is a sample of an incorrect response on question number 41.

QUESTION NO. 41
A= AORTA
B= BLOOD CAPILARIES

**Extract 1.2:** *A sample of the wrong responses to question 41.*

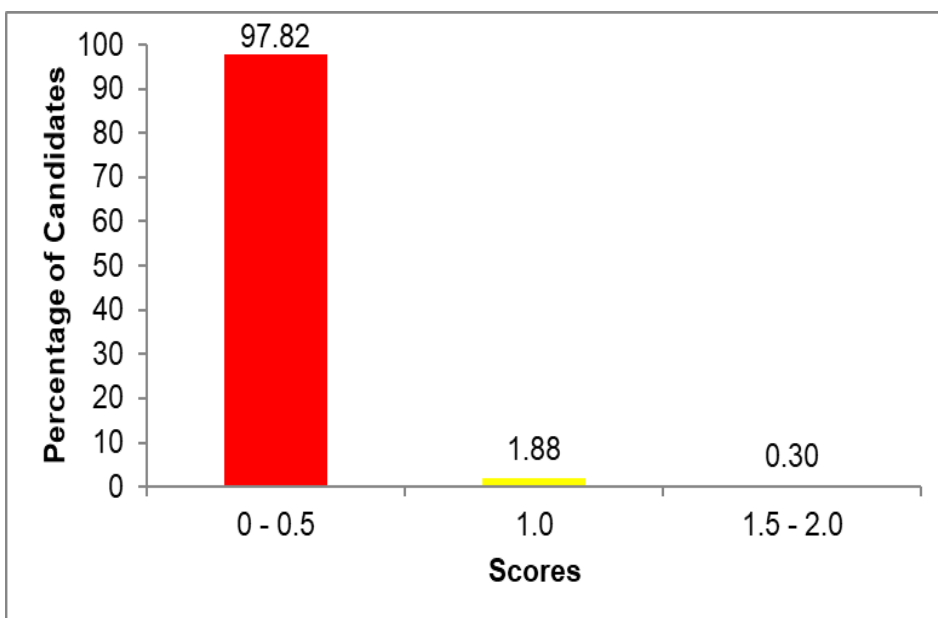
In extract 1.2, the candidate wrote parts of the blood circulatory system instead of gases exchanged in alveoli.

**Question 42:** The teacher did an experiment by tying a rod magnet at the middle using a thread and suspended it in the air until it settled. Which two things can be demonstrated from his experiment?

The question assessed candidates' competence in identifying various types of energy and their uses particularly in identification of magnetic principles. The performance of the candidates in this question was weak since 3,522 (0.26%) candidates responded correctly and 352,791 (99.74%) gave the wrong responses.

Further analysis on the candidates' performance shows that 97.78 percent of the candidates scored 00 while 0.26 of the candidates scored 02 marks as shown in Figure 28.

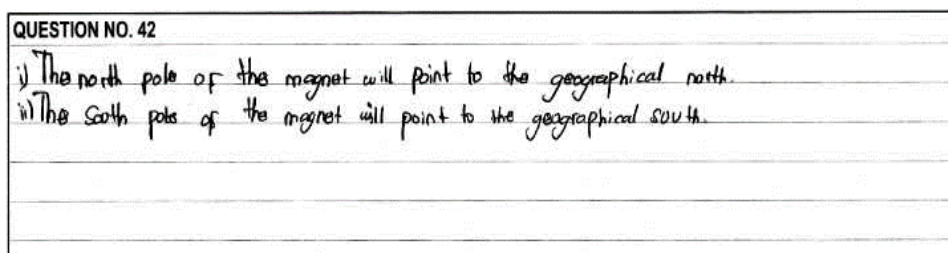




**Figure 28:** *Candidates' performance in question 42*

Figure 28 shows that 97.82 percent of the candidates scored 0 - 0.5 marks and 0.30 percent scored 1.5 - 02 marks.

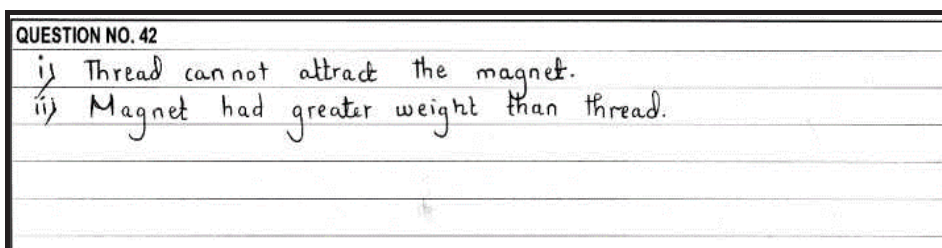
Furthermore, the analysis shows that, 2.18 percent of the candidates who scored 01 to 02 marks had knowledge about magnetic principles. They understood that when the rod magnet is freely suspended and left to rest, the north pole of the magnet directs to the geographical north while the south pole of the magnet directs to geographical south. Extract 2.1 is a sample of a correct response from a candidate.



**Extract 2.1:** *A sample of a correct response to question 42*

The candidates who got responded incorrectly lacked knowledge about the magnetic principles. They failed to identify the relationship between poles of a bar magnet and that of the earth. Some of the

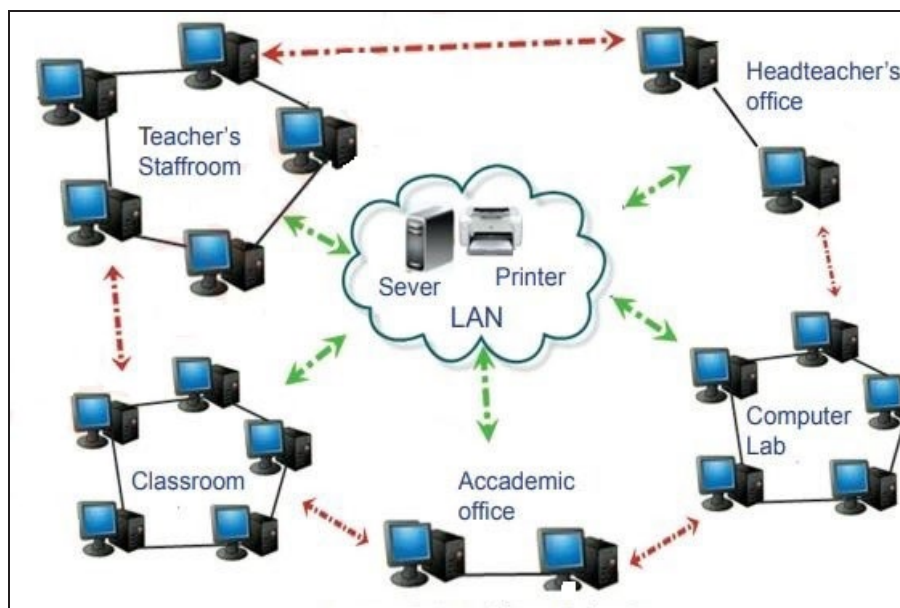
candidates for instance, associated the experimental outcome with the laws of magnetism. They stated that: *like poles of the magnet would repel while unlike poles attract*. Other candidates were attracted by color codes of the magnet as indicated in the textbooks where red color represents north pole while blue represents south pole, hence they responded by mentioning the colors Blue and Red. Extract 2.2 is a sample of incorrect response to this question.



**Extract 2.2:** A sample of a wrong response to question 42

In extract 2.2, the candidate related hanging of the bar magnet to the measurement of weight of objects since, objects are usually weighed by hanging.

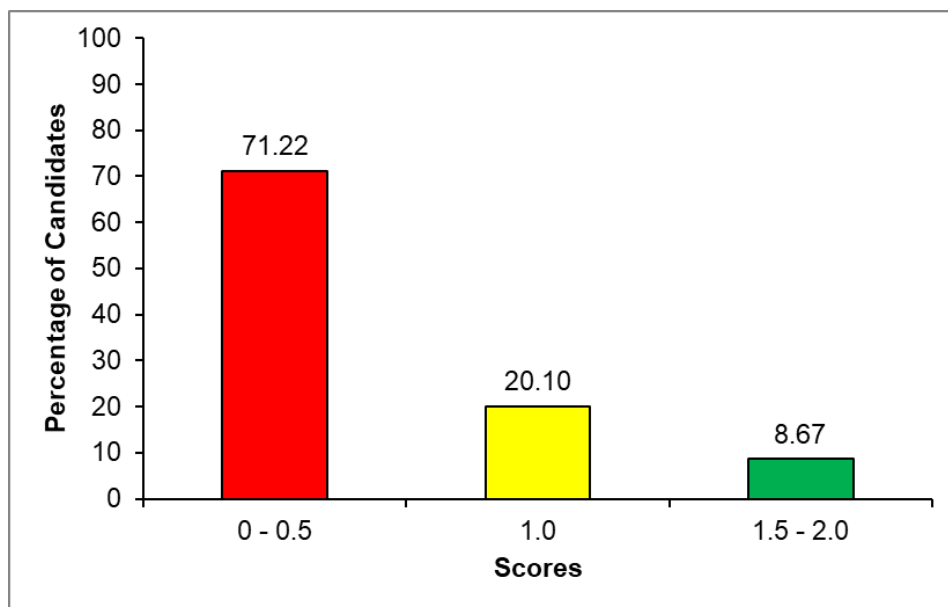
**Question 43:** Azimio Primary School decided to connect its computers as shown in Figure 2. Study the figure and answer the questions that follow:



**Figure. 2**

- (a) Which type of network was used to connect the computers shown in Figure 2?
- (b) Give an advantage of the type of network you mentioned in (a).

The question assessed the candidates' competence in applying information and communication technology (ICT) specifically on a computer network. The performance of the candidates in this question was weak as 117,297 (8.65%) candidates answered correctly and 1,239,016 (91.35%) gave wrong responses. Further analysis on the candidates' performance shows that 71.14 percent of the candidates scored 00 mark while 8.65 percent of the candidates scored 02 marks. Figure 29 shows the performance of the candidates in this question.



**Figure 29:** Candidates' performance in question 43.

Figure 29 shows that 71.22 percent of the candidates score 00 - 0.5 marks and 8.67 percent scored 1.5 - 02 marks.

The analysis of the candidates' responses revealed that 28.78 percent of the candidates scored 01 to 02 marks because they understood the type of network used to connect all the computers in the local area by writing Local Area Network (LAN) in part (a). They also, correctly listed the advantages of this type of network in part

(b). Some of the advantages of LAN are: *The cost to establish is cheap compared to other type of network, It is easy to maintain due to small geographical area, Its devices and cables are cheap to purchase and It is easy to maintain its security because of small geographical area.* Those who scored 01 mark were able to respond correctly to one part of the question by either writing the correct answer of the type of network used to connect computers in part (a) or writing one correct advantage of that network in part (b). Extract. 3.1 is a sample of a correct answer from one of the candidates.

QUESTION NO. 43
a. The Local Area Network (LAN).
b. It has a high security compared to WAN.

**Extract 3.1:** A sample of a correct response to question 43.

Further analysis reveals that 71.14 of the candidates scored 00 mark. These candidates lacked adequate knowledge about computer networks and their advantages. They did not realise that the network used to connect the computers of Azimio Primary School was Local Area Network (LAN) and this network has many advantages in use. In part (a), some of these candidates wrote; *Wide Area Network*. These candidates failed to understand that the Wide Area Network (WAN) is a network that connects computers over a large geographical area such as a country, continent or the world. Some candidates wrote *Facebook*. These candidates did not recognize that Facebook is a social network site. Other responses written by some candidates includes; *servers, printers and computers*. All these gadgets were shown in the network presented in the question. In part (b), some these candidates failed to write the advantages of using the Local Area Neatwork (LAN). They wrote wrong responses such as; *it shows information anywhere, the network is good because if you have a network on your phone you can get news or see what's happening on social networks, it helps*

*you learn better and it transmits sound signals.* These responses show that these candidates did not have enough knowledge on the advantages of using different types of computer networks. Thus, they wrote the advantages of a cellular network instead those of a computer network shown in the picture. Extract 3.2 is a sample of a wrong response from one of the candidates.

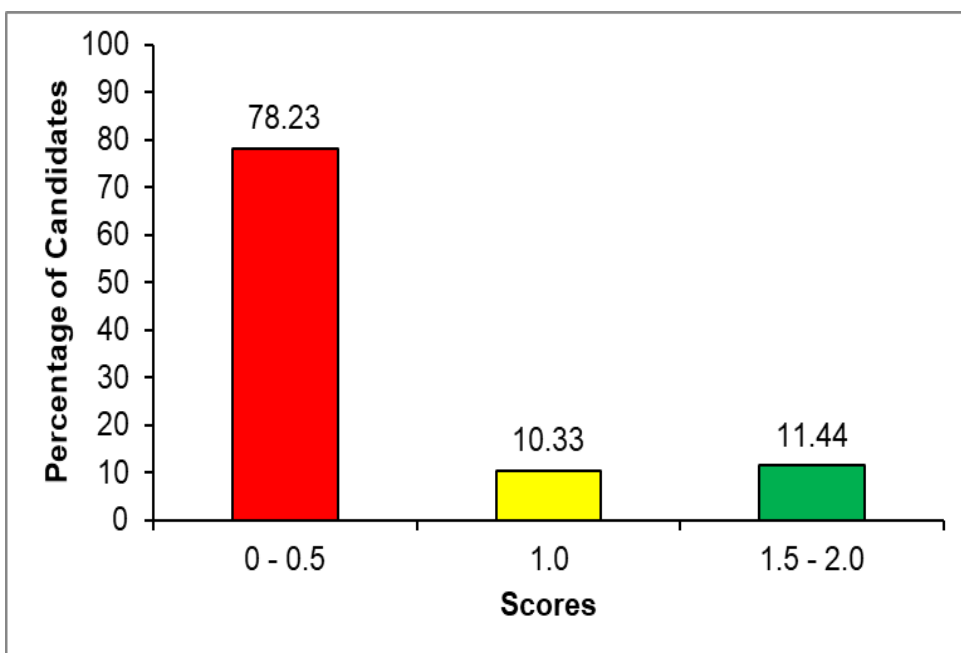
QUESTION NO. 43
as MICROSOFT WORD
BY IT HELP IN WRITE THE DOCUMENT

**Extract 3.2:** *A sample of an incorrect response to question 43*

Extract 3.2 shows that that the candidate lacked knowledge on types of computer networks. The candidate wrote Microsoft application program used for changing and modifying texts in part (a) and therefore responded wrongly in part (b).

**Question 44:** Calculate the density of a sphere with the volume of  $4000 \text{ cm}^3$  and a mass of 400 g.

The question assessed candidates' ability to understand scientific and technological theories based on properties of objects which float on or sink in water. The analysis shows that 121,469 (8.96%) candidates responded correctly and 1,234,844 (91.04%) failed. Further analysis of the candidates' performance reveals that 75.28 percent of the candidates scored 00 mark while 8.96 percent of the candidates scored 02 marks. Figure 30 shows the performance of the candidates in this question.



**Figure 30:** Candidates' performance in question 44.

Figure 30 shows that 11.44 percent of the candidates scored 1.5 - 02 marks while 78.22 percent scored 0 - 0.5 marks.

The analysis shows that 21.77 percent of the candidates answered the question correctly and scored 01 to 02 marks they were able to calculate the density of a sphere, calculated correctly and finally got the correct answer. The candidates who scored 01 mark wrote the correct formula but failed to calculate correctly and others calculated but did not show the formula used. A sample of a correct response is provided in Extract 4.1.

QUESTION NO. 44			
Data given $V = 1000 \text{ cm}^3$ $m = 400 \text{ g}$ $D = ?$	$D = \frac{\text{Mass}}{\text{Volume}}$ $D = \frac{400 \text{ g}}{1000 \text{ cm}^3}$	$\begin{array}{c} \triangle \\ m \\ \hline D \quad V \\ \hline \end{array}$	$\frac{10 \overline{) 400}}{0} = 0.4$ $\frac{10 \overline{) 400}}{40} = 10$ $\frac{10 \overline{) 400}}{40} = 10$ $\frac{10 \overline{) 400}}{40} = 10$
$\rightarrow \text{Density} = 0.4 \text{ g/cm}^3$			

**Extract 4.1:** Sample of a correct response on question 44

However, the candidates who gave wrong responses used inappropriate formula to calculate the density of a sphere thus scored 0 mark. Some candidates inverted the formula. For instance:

$$\begin{aligned} \text{Density} &= \frac{\text{Volume}}{\text{Mass}} \\ &= \frac{4000}{400} \\ &= 10 \text{ g/cm}^3 \end{aligned}$$

Other candidates were not able to calculate the correct answer. They used the correct formula but they failed to divide the two parameters and ended up with the wrong answer. Furthermore, some candidates ended with wrong answers as they employed incorrect formula like Multiplying, Adding and Subtracting the given parameters. That is,

$$\begin{aligned} \text{Density} &= \text{Mass} \times \text{Volume} \\ &= 40 \times 4000 \\ &= 160000 \text{ g/cm}^3 \end{aligned}$$

Or,

$$\begin{aligned} \text{Density} &= \text{Mass} + \text{Volume} \\ &= 40 + 4000 \\ &= 4040 \text{ g/cm}^3 \end{aligned}$$

Extract 4.2 is a sample of an incorrect response to this question.

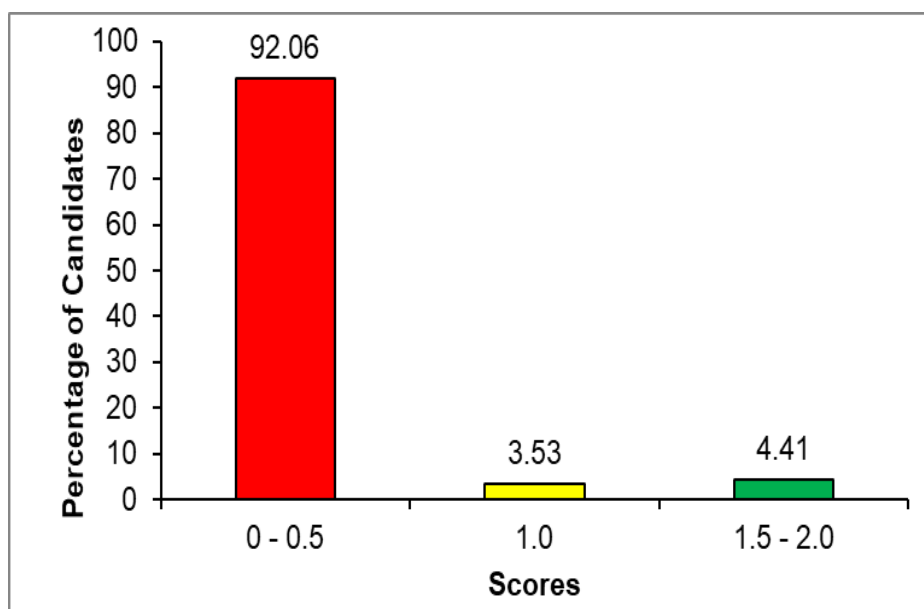
<b>QUESTION NO. 44</b>	
Density = $\frac{\text{Mass}}{\text{Volume}}$	$\begin{array}{r} 10 \\ 400 \overline{) 4000} \\ \underline{-400} \phantom{0} \\ 0 \phantom{0} \\ \underline{-0} \\ 0 \end{array}$
Density = $\frac{4000 \text{ cm}^3}{400 \text{ g}}$	= 10 cm <sup>3</sup> /g.

**Extract 4.2:** Sample of a wrong response to question 44

In Extract 4.2, the candidate wrote a correct formula but exchanged the data of mass and volume showing incompetence in understanding quantities.

**Question 45:** A teacher led the pupils to investigate the size of the image formed by a plain mirror and later on, he used a convex mirror from his motorcycle. What was the difference between the images formed by the two mirrors?

The question assessed candidates' knowledge of various forms of energy and their uses specifically on the properties of light when it falls on plain mirrors and convex mirrors. The analysis shows that 59,720 (4.40%) candidates responded correctly and 1,296,593 (95.6%) failed. Further analysis about the performance of the candidates shows that 91.98 percent of the candidates scored 00 mark while 4.40 percent of the candidates scored 02 marks Figure 31 shows the performance of the candidates in this question.



**Figure 31:** Candidates' performance in question 45

Figure 31 shows that 4.41 percent of the candidates scored 1.5 - 02 marks while 92.06. percent scored 0 - 0.5 marks.



Statistics show that 7.94 percent of the candidates answered the question correctly and scored 01 to 02 marks because they deduced the difference between plain and convex mirrors by identifying the distinct properties of the images formed. Their responses included: *A plain mirror produced the image of the same size as the object but the convex mirror produced the image smaller than the object.* Extract 5.1 Is a sample of a correct response in this question.

QUESTION NO. 45
→ The image formed by a plain mirror appears normal while the image formed by a convex mirror appear smaller than the real image.

**Extract 5.1:** A sample of a correct response to question 45.

The candidates who scored 00 mark, lacked knowledge about properties of images formed in plain mirrors and convex mirrors. Some of them did not abide to the instructional requirements of the question as they answered base on use of mirrors. One candidate for instance, responded that *plain mirrors are used in Saloons while convex mirrors are used in cars and motorcycles.* Another candidate defined convex mirrors and concave mirrors interchangeably as *convex mirrors converge light while concave mirrors diverge light.* Besides some of these candidates assumed concave mirrors as plain mirrors. Extract 5.2 provides a sample of wrong response to this question.

QUESTION NO. 45
Plain mirror its plane show when showing pictures while convex mirror can show <del>the image</del> you <del>is</del> back what is happening.

**Extract 5.2:** A sample of a wrong response to question 45

In Extract 5.2, the candidate wrote the structure of the plain mirror and the uses of the convex mirror instead of the properties of the images formed by the two mirrors.

### **3.0 EVALUATION OF THE CANDIDATES' PERFORMANCE IN EACH COMPETENCE**

The Science and Technology Examination in 2023 assessed: *Maintaining Health and Environment; Applying fundamentals of Science and Technology* and *Performing investigations and discoveries in Science and Technology* competences as stipulated in the syllabus of this subject for standard III to VII.

The analysis of performance of each competence shows that the competence of *Performing investigations and discoveries in Science and Technology; Maintaining Health and the Environment and Applying Fundamentals of Science and Technology* had an average performance of 41.51, 51.21, and 42.06 percent, respectively. The summary of the performance of the candidates has been shown in Appendix A for each competence. Furthermore, the candidates achieved the highest performance of 81.77 in question number 38 while question number 42 had the lowest performance of 2.18 percent.

Further analysis reveals that the performance of the candidates in this subject has been fluctuating in 3 consecutive years as follows: 83.27%, 71.63% and 74.08% in 2021, 2022 and 2023 respectively. This implies that teaching and learning in all three types of competences is in average.

## 4.0 CONCLUSION AND RECOMMENDATIONS

### 4.1 Conclusion

The overall performance of the candidates in the Science and Technology subject in 2023 Primary School Leaving Examination (PSLE) was good since 1,004,654 (74.08%) candidates passed the examination. This good performance in this examination was attributed by factors such as: good understanding the requirements of the question, sufficient computing skills, and good understanding on the competence assessed. Conversely, the weak performance to some candidates was due to failure to the understand demand of the question, insufficient or lack of enough competence in various concepts and lack of sufficient computation skills.

### 4.2 Recommendations

In order to improve the performance of the candidates in the Primary School Leaving Examination from average performance to good, the following are the measures recommended:

- (a) In conducting a lesson relating to the competence of *Performing Scientific Experiments Correctly especially in physical and chemical changes*, teachers are advised to use improvised and locally available materials such as ice, papers, candles, milk and iron to do simple experiments to distinguish between physical and chemical changes. This will enable them to have long-term memory of what they learned.
- (b) On the competence of *identifying various systems in the human body*, teachers are advised to use models, simulations and videos to reinforce learning process.
- (c) On the competence related to *identifying various types of energy and their uses* especially in performing activities about magnetic principles, teachers are advised to perform simple experiments of observing the properties of a magnet.
- (d) On the competencies which involve computation skills, pupils are advised to do many exercises so that they can be familiar with computation skills.

APPENDIX

**COMPARISON OF CANDIDATES PERFORMANCE ON EACH COMPETENCE BETWEEN PSLE 2022 AND PSLE 2023**

S/N	PSLE 2022				PSLE 2023								
	Specific competence	Performance on each question		Average performance (%)	Remarks	Performance on each question		Average performance (%)	Remarks				
		Question number	Performance (%)			Question number	Performance (%)						
1.	Investigation of Various Things in the Environment	6	22.4	56.50	Average	6	47.58	41.51	Average				
		7	8.10			7	59.43						
						8	21.53						
						9	55.73						
2.	Identifying various Types of Energies and Their Uses	10	72.27			56.50	Average			10	21.42	41.51	Average
		11	37.99							11	43.47		
		12	34.81							12	56.75		
		13	35.72							13	78.35		
		24	27.13							42	02.18		
		25	30.09							45	07.94		
		26	41.92										
42	11.71	3.	Identifying Scientific and Technological Theories			14	59.69			14	33.60		
15	63.60					15	68.20						
37	48.86			16	25.00								
38	24.48			17	69.10								
45	61.34			18	42.96								
				44	21.77								
4.	Applying Principles of Good Hygiene for Good Health and the Environment	28	63.39	46.08	Average	31	45.41	51.21	Average				
		29	42.92			32	68.08						
		30	29.32			33	59.08						
		31	25.43			34	39.43						

		32	21.27			35	55.69		
		33	67.35			36	56.70		
		34	50.79			37	58.15		
		35	71.84			38	81.77		
		36	61.50			39	79.23		
		37	48.08			40	33.25		
5.	Identifying Various Systems of Human Body	1	63.39			1	38.20		
		2	42.92			2	43.40		
		3	29.32			3	34.44		
		4	50.50			4	65.01		
		5	34.06	5	26.45				
		8	69.08	30	41.32				
		9	34.81	41	64.41				
		27	42.59						
		41	14.81						
6.	Performing Scientific Experiments Correctly	21	78.02	43.67	Average	29	38.75	42.06	Average
		39	55.33						
		40	54.82						
7.	Mastering Scientific Skills	22	22.64			24	7.44		
		23	43.57			25	41.31		
		44	44.84			26	22.46		
						27	71.53		
						28	64.34		
8.	Applying Information and Communication Technology	16	38.66			19	47.01		
		17	43.40			20	42.91		
		18	41.66	21	45.24				
		19	60.32	22	73.39				
		20	39.44	23	39.16				
		43	1.38	43	28.78				

