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) 2021

SCIENCE AND TECHNOLOGY

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FOREWORD

The Primary School Leaving Examination (PSLE) 2021 in the Science and Technology subject assessed candidates' competencies in Science and Technology and the effectiveness of implementation of the new 2016 Science and Technology syllabus for Basic Education Standard III –VII. The aim of this analysis is to give feedback to teachers, policy makers, curriculum developers and other stakeholders on how the candidates responded to the examination questions they have attempted. This is because the qualities of the candidates' responses to the questions are among of the indicators of whether the candidates were able or not able to learn effectively in Science and Technology subject.

In general, the analysis shows that candidates who had good performance had adequate knowledge on the competences tested. Some candidates failed to respond correctly, because they lacked competence on the assessed concepts/content, misunderstood the demand of the questions, failure to follow examination instructions and lack of 3R skills hence, giving responses not related to the asked questions.

The Examinations Council of Tanzania expects that the feedback provided through this report will enable education stakeholders on the trend of education in the primary education in Tanzania. Moreover, it is expected that this feedback will enable education stakeholders to identify proper measures that ought to be taken in order to improve performance in future examinations.

Finally, the National Examinations Council of Tanzania would like to express sincere gratitude to Examination Officers and all others who participated in the preparation of this report in different capacities.

Dr. Charles E. Msonde
EXECUTIVE SECRETARY

1.0 INTRODUCTION

The Primary School Leaving Examination (PSLE) 2021 in the Science and Technology subject intended to measure candidates' competences stipulated in the 2016 Science and Technology syllabus for Basic Education Standard III - IV and were set as per 2020 assessment format. The number of candidates registered were 1,132,084 out of whom 1,107,800 (97.85%) sat for the examination. Analysis of the candidates' performance in the Science subject examination indicates that 922,168 (83.28%) candidates passed the examination.

The report presents the data and descriptions concerning the performance of candidates per question and by competences. The questions analysed are divided into sections A and B. The analysis of candidates' responses in section A was done according to their choices: A, B, C, D and E. Possible reasons for candidates' choices are given for each question. The letter of the correct answer is marked with a star (*) in tables and charts to make it stand out. Furthermore, the percentage of candidates who failed to follow instructions on how to answer the questions and those who could not write anything signifying lack of Reading, Writing and Arithmetic (3R) skills, has been included in the analysis under the heading "others" as indicated in the respective tables and charts of this report.

The analysis of the candidates' responses in section B was based on the qualities of responses and performance in particular questions. Extracts of poor and good responses of the candidates have been used to show the ability of candidates in responding to different questions. The statistics which show performance of the candidates in each question are presented using charts.

In the overall, the report has five sections, namely; introduction, analysis of the candidates' responses to each question, analysis of the candidates' performance in each topic, and finally the conclusion and recommendations are given. The summary of performance per competence is shown in the Appendix at the end of the report. The grouping of candidates' performance is categorised as *good*,

average and *poor* based on the following percentage ranges: 60 – 100 = Good, 40 – 59 = Average and 0 – 39 = Poor.

2.0 ANALYSIS OF THE CANDIDATES' RESPONSES FOR EACH QUESTION

This part of the report analyses the performance of candidates in sections A and B. Furthermore, it explains in detail the reasons why some candidates' weak or good performance in each question.

2.1 Section A: Multiple Choice Items

This section consisted of 40 questions. The candidate was required to choose the correct answer and shade its corresponding letter in the special answer sheet (OMR) provided. The analysis of the performance of candidates in this section is as follows:

Question 1: The human excretory system is composed of four major organs. Which organ is responsible for the excretion of carbon dioxide and water in form of vapour?

A Lungs B Kidney C Liver
D Nose E Skin

This question was set from the competency of health and environment maintenance and assessed the candidates' ability to identify the function of lungs in the human excretory system. The question was attempted by 1,091,915 (98.57%) candidates out of which 428,075 (38.64%) responded correctly and 663,840 (59.92%) failed to identify the correct response. Table 1 shows candidates' percentage for each option.

Table 1: Number and Percentage of Candidates in each Option

Option	A*	B	C	D	E	Others
No. of Candidates	428,075	140,046	57,999	162,872	302,923	15,885
% of Candidates	38.64	12.64	5.24	14.70	27.34	1.43

The analysis of the candidates' responses shows that the candidates who opted for the correct answer A, *Lungs* had adequate knowledge about the concept of lungs to remove carbon dioxide, air and excess water in form of vapour as waste products.

On the contrary, 663,840 (59.92%) candidates failed to understand the function of lungs in the excretion of waste products. For example, the candidates who chose distractor B, *Kidney* failed to understand that the function of kidney is to filter blood containing waste products such as urea, salt, and chemicals resulting from medicinal by-products and excess water in the form of urine. The candidates who opted for incorrect choice C, *Liver* were not aware that the function of liver is to remove toxins and to digest food rich in protein and fats. Those who opted for distractor D*, Nose* failed to understand that the nose is used in the respiration process. Those who opted for distractor E*, Skin* failed to understand that the function of the skin is to remove waste products such as water, salt and small amount of urea in form of sweat. This is an indication that those candidates were not competent in the human excretory system.

Question 2: An old man was seen staggering along the road after drinking a lot of alcohol. Which part of the ear was affected by alcohol?

A Stapes B Oval window C Semicircular canals
D Cochlea E Auditory nerve

The question was set from the competence of health and environmental maintenance. It assessed the candidates about the function of the parts of the ear. The question was attempted by 1,090,075 (98.40%) candidates. The performance in this question was poor since 852,774 (76.98%) candidates failed to respond correctly to the question. The candidates' performance in this question is shown in Figure 1.

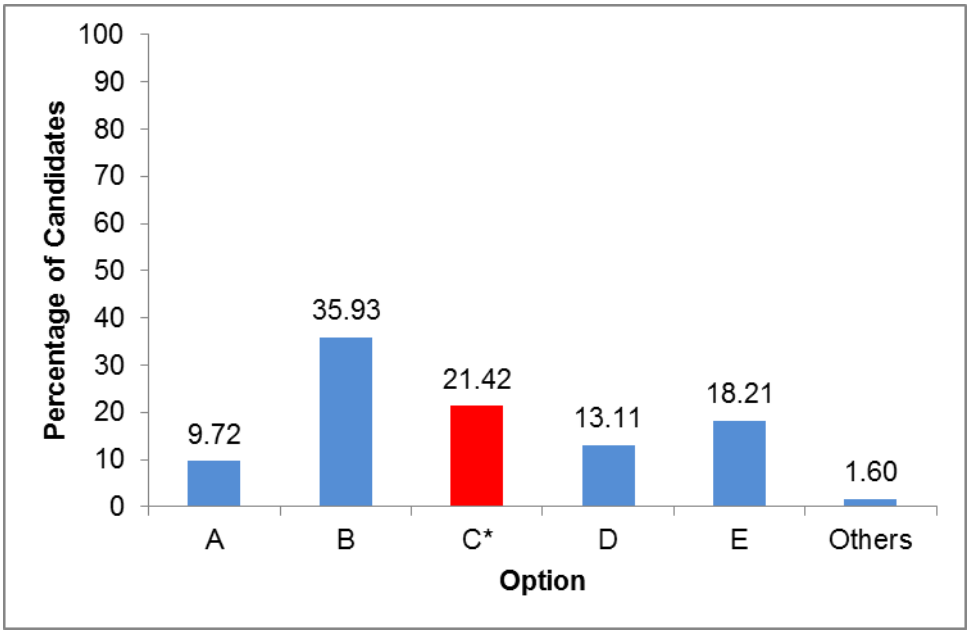


Figure 1: Candidates' Performance on Question 2

Figure 1 shows that, 76.98 per cent of candidates failed chose the correct answer. This made the question to be among the poor performed question.

The candidates who failed to answer the question correctly chose among the distractors A, B, D and E. Those who chose distractor A, *Stapes* failed to understand that the function of stapes is to receive vibration of sound waves from the eardrum and direct them to the inner ear. Those who opted for distractor B, *Oval window* lacked competence in the function of the oval window which amplifies the vibrations of sound waves. Also, those who opted for distractor D, *Cochlea* were not aware that the function of cochlea is to receive the sound waves through auditory nerves. However, those who chose E, *Auditory nerves* failed to understand that the function of the auditory nerves is to transmit sound waves to the brain for interpretation. Those answer shows that the candidates lacked knowledge about the function of the ear parts and its associate disorders.

On the contrary, 237,301 (21.42%) candidates answered the question correctly by choosing option C*, Semicircular canal.* Those

candidates understood that the semicircular canal balances the human body.

Question 3: Some people have poor vision at night. Which vitamin does the person with this problem lack?

A *A* B *B1* C *B2* D *D* E *C*

The question tested the candidate's competence about the importance of vitamins in human body. This question was attempted by 1,089,066 (98.31%) candidates, out of which 424,519 (38.32%) responded correctly and 664,547 (59.99%) failed to identify the correct answer. The overall performance on this question was poor as shown in Table 2.

Table 2: Number and Percentage of Candidates in each Option

Option	A*	B	C	D	E	Others
No. of Candidates	424,519	145,532	180,527	154,814	183674	18,734
% of Candidates	38.32	13.14	16.30	13.97	16.58	1.69

Table 2 shows that 38.32 per cent of the candidates identified the correct option A*, Vitamin*. The candidates understood that lack of vitamin A is the causative agent of night blindness.

More than a half (59.99%) of candidates failed to answer this question correctly because they lacked enough knowledge about the importance of vitamin in the human body. For example, those who chose among distractors B*, Vitamin B1* and C*, Vitamin B2* failed to understand that vitamin B1 helps to protect human skin and vitamin B2 strengthens gums. The candidates who chose distractor D*, Vitamin D* failed to understand that vitamin D strengthens the bones, teeth and the brain. Also, those who chose distractor E*, Vitamin C* failed to recognize that lack of vitamin C leads to scurvy. This signifies lack of candidates' knowledge about the concept of vitamins, and the functions they perform in the body.

Question 4: A mother felt dizzy and her body became weak. After medical examination, the doctor found out that she had

blood deficiency. What type of food would you advise her to eat?

A Food with enough sugar.
B Food containing iron.
C Food with enough oil.
D Carbohydrate food only.
E Food without salt.

The question tested competence in the importance of iron in the human body. A total of 1,090,421 (98.43%) candidates attempted this question. The overall performance was average as 57.93 per cent of the candidates responded to the question correctly. However, 40.51 per cent of the candidates failed. Figure 2 shows the statistics performance in this question.

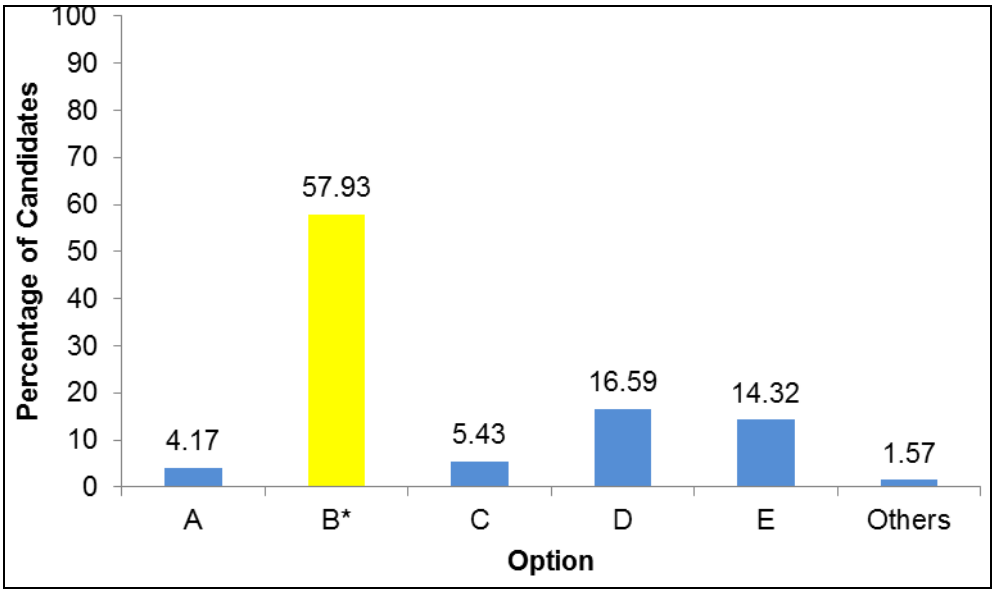


Figure 2: Candidates' Performance on Question 4

Figure 2 shows that more than half of the candidates (57.93%) who chose the correct answer B, *Food containing iron*, had clear understanding of the importance of iron, which produce red blood cell in human body.

A total of 448,715 (40.51%) candidates failed to respond correctly to this question because they lacked knowledge about the importance of iron in the human body. For example, those who chose distractors A, *Food with enough sugar* and C, *Food with enough oil*

failed to understand that those food stuffs give heat and energy to the body. The candidates who chose distractor D*, Carbohydrate food only* failed to understand that carbohydrates give the body energy and do not produce red blood cells. The candidates who chose distractor E*, Food without salt* were not aware that, only a small amount of salt is needed in the human body and not food without salt. This signifies that, the candidates lacked knowledge about the type of foods which can facilitate increase of blood in the human body.

Question 5: Your friend fails to see well a ball which is placed close to him. Which type of glasses would you recommend for him?

A Convex lens B Concave lens
C Double lens D Large lens
E Small lens

This question tested candidates' competence in identifying the types of lenses and their uses in correcting eye defects. The overall performance on this question was average as 609,696 (55.04%) candidates chose the correct response. The rest, 482.643 (43.57%) failed to answer it correctly. The performance on this question is summarized in Table 3.

Table 3: Number and Percentage of Candidates in each Option

Option	A*	B	C	D	E	Others
No. of Candidates	609,696	403,299	30,074	24,831	24,439	15,461
% of Candidates	55.04	36.41	2.71	2.24	2.21	1.40

The statistics in Table 3 shows that 55.04 per cent of the candidates managed to choose the correct response A, *Convex lens*. Those candidates understood that a convex lens converges the scattered rays and lands them on the retina, hence enabling the person to see nearby objects correctly.

Meanwhile, 43.57 per cent of the candidates who chose distractors B, C, D and E lacked knowledge about the uses of lens in correcting eye defects specifically convex lens. For example, the candidates

who chose distractor B*, Concave lens* failed to understand that a concave lens diverges light rays and brings them on the retina and therefore enables a person who does not see distant objects to see. Also, those who chose distractors C*, Double lens*; D*, Large lens* and C*, Small lens* lacked enough knowledge about the types of lens and their uses. This signifies that those candidates lacked competence in identifying the types of lens and their functions/properties.

Question 6: My brother cut his finger while pilling sweet potatoes. He tied the wound with a bandage but he continued to bleed for a long time. What did the blood of my brother lack?

A White blood cells
B Platelets
C Plasma
D Minerals
E Red blood cells

This question tested the candidates' competence in the disorders that may occur in the human circulatory system. A total of 1,090,588 (98.45%) candidates attempted this question out of whom 458,290 (41.37%) responded correctly while 632,298 (57.08%) failed. Generally, the performance of the candidates on this question was average as summarized in Table 4.

Table 4: Number and Percentage of Candidates in each Option

Option	A	B*	C	D	E	Others
No. of Candidates	173,176	458,290	179,349	92,723	187,050	17,212
% of Candidates	15.63	41.37	16.19	8.37	16.88	1.55

Table 4 shows that 41.3 per cent of the candidates who chose the correct response B*, Platelets* had enough knowledge about the function of platelets which is to prevent bleeding when blood vessels are damaged.

On the other hand, 632,298 (57.08%) candidates chose incorrect answers because they lacked knowledge about disorders that may occur in the human circulatory system. For example, the candidates who opted for distractor A, *White blood cells*, they were not aware that the function of white blood cells is to protect the body against

diseases. The candidates who chose distractor C, *Plasma* failed to understand that the function of plasma which is to transport nutrients, hormones and proteins to other parts of the body. Not only that but also plasma regulates the body temperature. The candidates who chose distractor D*, Minerals* failed to understand that the function of minerals in the human body to strengthen tissues and help in the process of digestion. Those who opted for distractor E, *Red blood cells* were unable to realize that the function of red blood cells is to transport oxygen and carbon dioxide in the body.

Question 7: Farmers were educated by an expert in agriculture to stop using agriculture methods that cause soil erosion. Which method are the farmers **not** allowed to use?

A To plant trees in the farm.
B Terrace farming.
C Contour farming.
D Applying steps farming.
E Clearing the farm using fire.

The question assessed the candidates' competence in identifying measures which conserve the soil and activities which affect the soil. The question was attempted by 1,091,813 (98.56%) candidates out of whom 604,775 (54.59%) gave a correct response while 487,038 (43.96%) failed. The number and percentage of the candidates in each option is summarized in Table 5.

Table 5: Number and Percentage of Candidates in each Option

Option	A	B	C	D	E*	Others
No. of Candidates	90,168	140,531	137,695	118,644	604,775	159,87
% of Candidates	8.14	12.69	12.43	10.71	54.59	1.44

The analysis shows that the candidates who were able to choose the correct answer E, *Cleaning the farm using fire* had clear understanding of the activities which affect the soil.

On the other hand, 487,038 (43.96%) candidates who opted for the distractors A, *To plant trees in the farm*; B, *Terrace farming*; *C,*

Contour farming and D, *Applying steps farming* failed to understand the activities which affects the soil. Those activities include cleaning the farm by using fire. Also, they failed to recognize that planting trees in the farm, terrace farming, contour farming and applying steps farming are the proper ways of farming used in protecting the land against soil erosion.

Question 8: Which group represents animals with a spinal cord?

A Snake, Zebra, Snail and Hyena.
B Lizard, Butterfly, Zebra and Lion.
C Crocodile, Antelope, Elephant and Grasshopper.
D Antelope, Crocodile, Hippopotamus and Giraffe.
E Snail, Crab, Elephant and Zebra.

The question assessed the candidates' competence in the concept of vertebrate and invertebrate animals. The overall performance on this question was good as out of 1,093,281 (98.69%) candidates who attempted the question 793,163 (71.60%) candidates chose the correct response D. The rest, 300,118 (27.09%) failed to answer it correctly. The performance on this question is summarised in Figure 3.

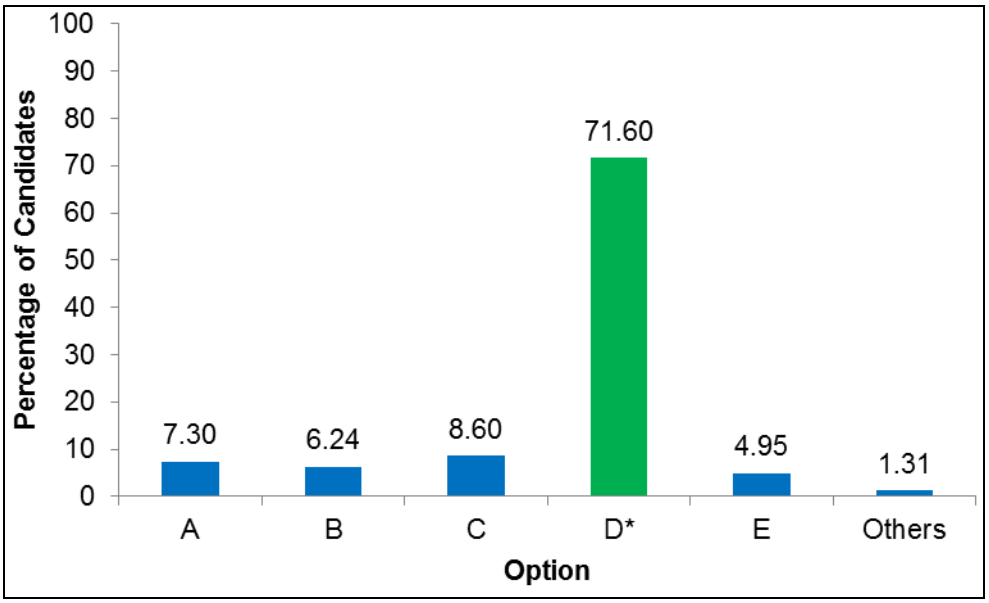


Figure 3: Candidates' Performance on Question 8

The data presented in Figure 3 show that 71.60 per cent of the candidates managed to choose the correct option D, *Antelope, crocodile, hippopotamus and giraffe*. Those candidates had clear understanding about the concept of vertebrate and invertebrate animals.

Despite good performance, 27.09 per cent of the candidates failed to respond correctly to the question as they chose the distractors A, *Snake, zebra, snail, and hyena;* B, *Lizard, butterfly, zebra and lion*; C, *Crocodile, antelope, elephant and grasshopper* and E, *Snail, crabs, elephant and zebra.* Those candidates failed to understand that butterfly, grasshopper and snail belong to a group of invertebrate animals which is a group of animal without the spinal cord. These signify that those candidates lacked competence of identify the groups of living things with spinal cord among those without spinal cord.

Question 9: Your younger brother was surprised to see the symbol of a skull on electric poles and on the gallons of toilet detergents. What does this sign indicate in those areas?

A Poison or danger B Flammable C Corrosive
D Explosive E Irritant

The question assessed the candidates' competence in the uses of safety signs in the environment. The performance on this question was good as 902,633 (81.48%) candidates responded correctly to the question. However, 191,488 (17.29%) candidates did not choose the correct response. The candidates' performance on the question is shown in Figure 4.

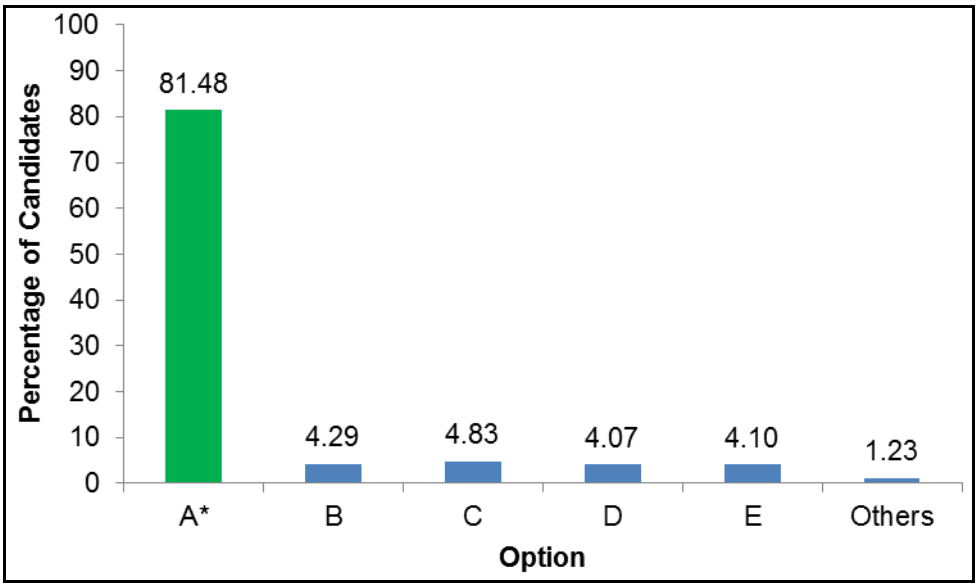


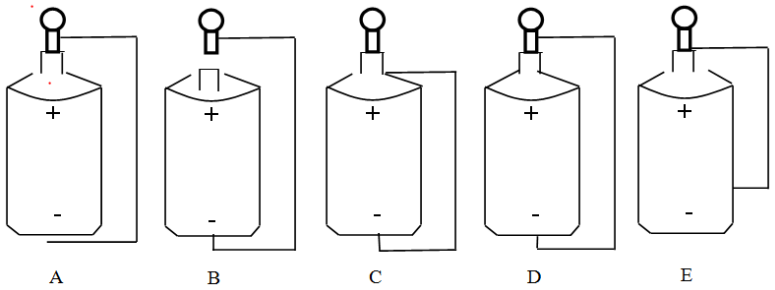
Figure 4*:* Candidates' Performance on Question 9

Statistics in Figure 4 show that 81.48 per cent of the candidates chose the correct answer A*, poison or danger*. Those candidates understood the proper uses of safety signs, especially the skull sign which is placed on the transformers, electric poles and items containing toxic chemicals such as toilet cleaning detergents, chemicals for livestock dipping trough and pesticides. This indicates that the candidates had enough competence about warning signs.

On the other hand, 17.29 per cent of the candidates failed to answer this question correctly. Those candidates lacked knowledge about the skull sign. For example, the candidates who opted for distractor B, *Flammable* failed to understand that, the sign which represent chemicals that catch fire are used on substances like sprit, pesticides, color removing agent, polishes, petrol and diesel. Those who opted for distractor C, *Corrosive* failed to understand that the sign that represents corrosive substances are used on chemicals like concentrated acids and car batteries. The candidates who opted for distractor D, *Explosive* failed to understand that the explosive sign is used on items that can explode or cause explosion such as herbicides, paints, solvents and chemicals used in the laboratory. Similarly those who opted for the option E, *Irritant* failed to understand that the sign for irritant objects is used on chemical or

drugs that cause irritation or itching such as toxic toilet cleaning detergents and pesticides. This indicates that those candidates lacked knowledge about the use of various safety signs in the environment.

Question 10: Standard five pupils did an assignment of making a simple electric circuit using a dry cell, wire and bulb. Which group succeeded to light the bulb?



The question assessed the candidates' competence in identifying a complete circuit. The overall performance on this question was average as 639,922 (57.77%) candidates chose the correct response. The rest, 450,845 (40.70%) of the candidates failed to answer it correctly. The performance on this question is summarised in Table 6.

Table 6: Number and Percentage of Candidates in each Option

Option	A	B	C	D*	E	Others
No. of Candidates	47,779	109,101	238,455	639,922	55,510	17,033
% of Candidates	4.31	9.85	21.53	57.77	5.01	1.54

The statistics in Table 6 show that 639,922 (57.77%) of the candidates who chose the correct answer D had enough understanding about of circuit.

On the other hand, 40.70 per cent of the candidates failed to identify the complete circuit thus, they chose distractors A, B, C and E. For example, those who chose among distractors A and E failed to realize that in these options, the given wire was not connected to the

negative terminal. Also, the candidates who opted for distractor B failed to discover that the bulb was not connected to the positive terminal. Others who opted for distractor C failed to recognize that the wire was not connected to the bulb, hence the bulb could not light up. Those candidates failed to recognize that the bulb will light up if there is a closed path of complete circuit consisting of battery, wire and bulb. This shows that those candidates lacked competence in the way of connecting the complete circuit.

Question 11: A pupil witnessed the school building collapsing after being hit by lightning. What do you recommend to be done to buildings so that such incidences do not occur in other buildings?

A They should be constructed using stones.
B They should be constructed using thick wals.
C They must have walls to protect lightning.
D They must be installed with earth wire.
E They must be installed with the lightning rod.

This question was based on the competency of *performing investigations and discoveries in science and technology* and tested the candidates' ability to protect buildings from lightning. A total of 1,099,987 (99.29%) candidates attempted this question out of whom, 608,167 (54.90%) responded correctly and 482,780 (43.60%) failed. The general performance of the candidates on this question was average as shown by the statistics presented in Table 7.

Table 7: Number and Percentage of Candidates in each Option

Option	A	B	C	D	E*	Others
No. of Candidates	67,786	48,890	73,324	292,780	608,167	16,853
% of Candidates	6.12	4.41	6.62	26.43	54.90	1.52

Table 7 shows that, 54.90 percent of candidates managed to choose the correct answer E*, They must be installed with the lightning rod*. Those candidates had knowledge about the function of lightning rod.

On the other hand, the candidates who failed to answer this question correctly lacked knowledge about the importance of the installation

of lightning devices. For example, the candidates who chose distractors A, *they should be constructed using stone*; *B, They should be constructed using thick walls* and C, *They must have walls to protect lightning* failed to realize that buildings constructed using stones or thick walls cannot protect lightning but can help the building to be strong and resist to fall apart once hit by lightning. The candidates who opted for distractor D, *They must be installed with earth wire* did not realize that the earth wire protects electric appliances against electric shock and not the buildings against lightning. This signifies that those candidates lacked competence on the importance of protecting building against lightning.

Question 12: Small particles of iron have entered into the eyes of a steel rod factory worker and he needs help. What would you do in order to help him?

A Wash his face using clean water and soap.
B Use a magnet that will attract those particles.
C Use cotton buds to remove the particles.
D Use a clean cloth to wipe inside the eye.
E Make the person bend for the particles to fall down.

This question was set based on the competence in *performing investigations and discoveries in science and technology* and tested the candidates' ability to explain the uses of magnet in the environment. The question was attempted by 1,090,646 (98.45%) candidates, out of whom 598,983 (54.07%) responded to it correctly and 491,663 (44.38%) failed. The overall performance in this question was average as shown in Table 8.

Table 8: Number and Percentage of Candidates in each Option

Option	A	B*	C	D	E	Others
No. of Candidates	88,391	598,983	87,134	273,691	42,447	17,154
% of Candidates	7.98	54.07	7.87	24.71	3.83	1.55

Table 8 shows that 54.07 per cent of the candidates chose the correct response B, *Use a magnet that will attract those particles*.

Those candidates realized that among the uses of a magnet is to separate iron materials from non-iron materials.

Nevertheless, 44.38 per cent of the candidates who chose distractors A, C, D and E lacked knowledge about the different uses of magnet. For example, the candidates who chose distractor A, *Wash the face using clean water and soap* failed to realize that a magnet is used to separate iron materials from non-iron materials. Thus, they had a wrong perception that use of *clean water and soap* could help to remove the iron materials from the eyes. Those who chose option C, *use cotton buds to remove particles* and D, *use a clean cloth to wipe inside the eyes* failed to realize that cotton buds and clean cloth do not attract magnetic materials. Also, the candidates who chose distractor E, *make a person bend for the particles to fall down* failed to realize that bending the person does not make the iron particles fall down. This signifies that those candidates lacked enough competence in the principle of magnet and its uses.

Question 13: John looked at the surface of stagnant water and saw his image. Which characteristic of light is displayed by this action?

A Travelling B Bending C Passing
D Reflection E Absorption

The question assessed the candidates' competence in recognizing the properties of light in the environment. The overall performance in this question was average because out of 1,089,986 (98.39%) candidates who attempted the question, 609,243 (55.00%) candidates answered it correctly. The rest, 480,743 (43.40%) failed. Table 9 shows the number and percentage of the candidates in each option.

Table 9: Number and Percentage of Candidates in each Option

Option	A	B	C	D*	E	Others
No. of Candidates	75,389	113,776	120,210	609,243	171,368	17,814
% of Candidates	6.81	10.27	10.85	55.00	15.47	1.61

Table 9 shows that 55.00 per cent of the candidates managed to answer this question correctly by choosing letter D, *reflection*. Those candidates understood that light is normally reflected once falls on stagnant water and produces an image.

On the contrary, the candidates who failed to answer this question correctly lacked knowledge about the properties of light. For example, those who opted for distractor A, *travelling* failed to realize that, light always travels in a straight line in one medium but this does not make John see his image. The candidates who chose distractor B, *bending* failed to understand that, light rays bend when they pass from different media. The candidates who chose distractor C, *passing* failed to understand that, images are formed when light rays meet a smooth media like water. Likewise, those who chose distractor E, *absorption* failed to differentiate the concept of reflection and that absorption thus absorption of light occurs when light rays meets a black body and not water. This signifies that, those candidates lacked knowledge about the properties of light.

Question 14: Which reason makes biogas to be better than fire wood as a source of energy?

A It does not produce smoke when used.
B It gives out oxygen gas.
C It gives out carbon dioxide gas.
D It is costless in production.
E It is used in small quantity.

The question assessed the candidates' competence in the uses of biogas. Out of 1,088,752 (98.28%) candidates who attempted the question, 423,650 (38.24%) responded to it correctly and 665,102 (60.04%) failed. Generally, the performance of candidates on this question was weak as summarized in Table 10.

Table 10: Number and Percentage of Candidates in each Option

Option	A*	B	C	D	E	Others
No. of Candidates	423650	144962	101682	315668	102790	19048
% of Candidates	38.24	13.09	9.18	28.50	9.28	1.72

Statistics represented in Table 10 shows that, 38.24 per cent of the candidates chose the correct answer A, *it does not produce smoke when used*. Those candidates understood that biogas does not produce smoke when compared to other source of energy like firewood.

Further analysis shows that, 60.04 per cent of the candidates failed to answer the question correctly. Those candidates lacked enough knowledge about the uses of biogas energy. For example, those who chose distractor B, *it gives out oxygen gas* failed to understand that biogas does not produce oxygen gas; instead it gives out a small amount carbon dioxide. The candidates who chose distractor C, *it gives out carbon dioxide* failed to understand that firewood is the one which produces large amount of carbon dioxide. The candidates who opted for distractor D, *it is costless in production* failed to understand that the initial costs of biogas investment are higher compared to firewood which has a low cost. The candidate who opted for distractor E, *it is used in small quantity* lacked knowledge about the uses of biogas.

Question 15: A plant absorbs water molecules from the soil through roots to different parts. Which way does the plant use to absorb water?

A Osmosis B Diffusion C Distribution
D Propagation E Sucking

This question assessed the candidates' competence about the concept of absorption of water molecules in plants. A total of 1,096,882 (99.01%) candidates attempted this question of whom 681,843 (61.55%) responded correctly and 415,039 (37.47%) failed. Generally, the performance of the candidates on this question was poor as it is shown in Figure 5.

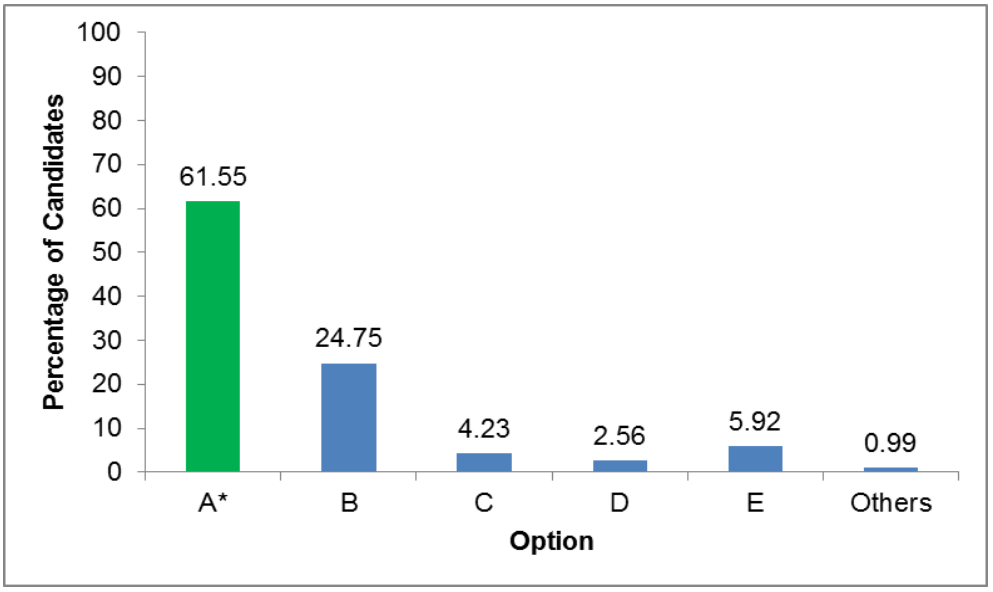


Figure 5: Candidates' Performance on Question 15

As Figure 5 shows, 61.55 per cent of the candidates chose the correct response A, *osmosis*. Those candidates understood that, plants get water from the soil by using roots which have cell membrane that absorb water by osmosis.

A total of 415,039 (37.47%) candidates failed to respond correctly to this question since they had inadequate knowledge about the concept of osmosis. Those candidates failed to understand that plants absorb water slowly from one part to the other through plant cells. For example, those who chose distractor B, *diffusion* failed to understand that diffusion is the movement of atoms or molecules from an area of higher concentration to an area of lower concentration. The candidates who chose distractor C, *distribution*; E, *sucking* and D, *propagation* lacked knowledge about how water travels from the soil to the roots and other parts of the plant.

Question 16: Which action results into the formation of a new matter?

A Dissolving sugar in water.
B Souring of milk.
C The change of water to vapour.
D Adding salt in food.
E Boiling a mixture of wax and water.

The question was based on the competency in performing investigation and discoveries in science and technology and the question assessed the candidates' understanding of chemical changes. The performance of the candidates on this question was poor since out of 1,095,514 (98.89%) candidates who attempted this question, 369,601 (33.36%) responded correctly and 725,913 (65.53%) failed to answer it correctly. Table 11 summarizes the performance of the candidates on this question.

Table 11: Number and Percentage of Candidates in each Option

Option	A	B*	C	D	E	Others
No. of Candidates	154,337	369,601	396,064	65,403	110,109	12,286
% of Candidates	13.93	33.36	35.75	5.90	9.94	1.11

As Table 11 shows, 65.53 per cent of the candidates who failed to answer the question correctly lacked the knowledge about chemical changes. For example, those who choose distractors A, *dissolving sugar;* C, *the change of water to vapour;* D, *adding salt in food* and E, *boiling a mixture of wax and water* these failed to understand that, those distractors represent examples of physical changes and not chemical changes; those changes may return to their original forms.

However, 33.36 per cent of the candidates who chose the correct answer B, *souring of milk* had the competence on the concept of chemical changes. They understood that, fermented milk has different characteristics from fresh milk as it cannot return to its normal condition, hence making the change to be chemical.

Question 17: You friend asked you for assistance to open Microsoft excel. Which steps would you follow?

A Click start menu → Microsoft office → Microsoft excel.

B Click start menu → Microsoft word → Microsoft excel.

C Click start menu → Microsoft excel → Microsoft office.

D Click start menu → Microsoft excel → Microsoft word.

E Click start menu → Microsoft office → Microsoft word.

The question was set based on the competence in *applying fundamentals of science and technology* and it assessed candidates' ability to talk about how to open Microsoft excel. Statistics show that, the candidates' performance on this question was poor as 438,087 (39.55%) candidates chose the correct answer. However, 651695 (58.83%) candidates opted for incorrect answers. Figure 6 provides the summary of the candidates' performance on this question.

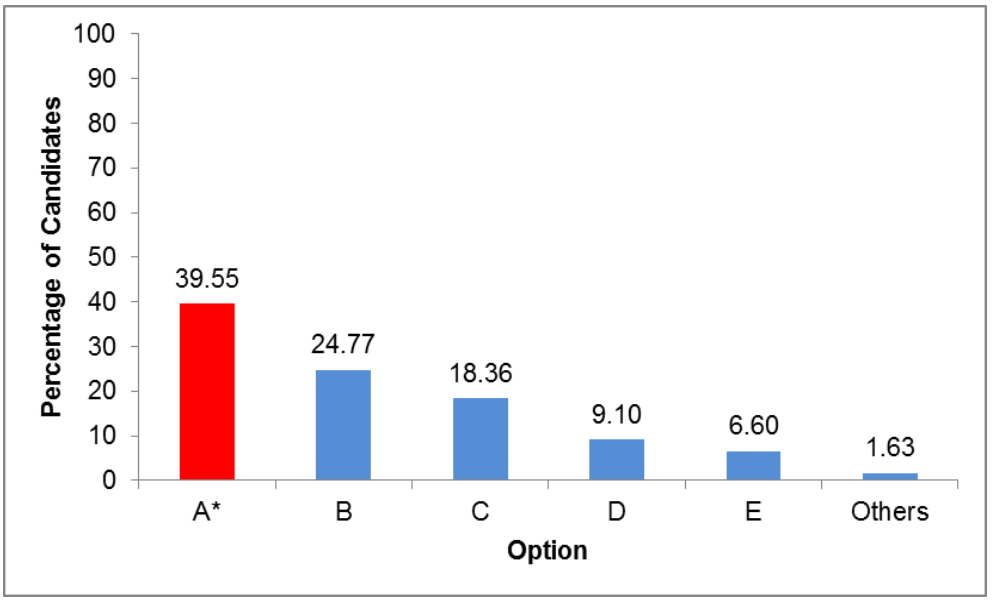


Figure 6: Candidates' Performance on Question 17

The Statistics in Figure 6 show that, 58.83 per cent chose among distractors B, *click start menu→microsoft word→microsoft excel*; C, *click start menu→microsoft excel→microsoft office* and D, *click start menu→microsoft excel→microsoft word*. Those candidates lacked knowledge and skills in the procedures that should be followed in order for one to open Microsoft excel. The steps which were presented in those distractors were not correct for opening microsoft excel. On the other hand, 39.55 per cent of the candidates chose the correct answer A, *click start menu→microsoft office → microsoft excel.* Those candidates had the competence in the correct steps for opening Microsoft excel which are click the start menu,then Microsoft office followed by Microsoft excel.

Question 18: The head teacher at Makuti Primary School wants to change the system of keeping pupils attendance records from the manual attendance book to the electronic system. Which electronic machine would you advise to be used?

A Television B Computer C Decoder
D System Unit E Router

This question assessed the candidates' ability to identify the electronic device used to store data. The overall performance of the candidates on this question was good because out of 1,096,278 (98.96%) candidates who attempted this question, 731,642 (66.04%) opted for the correct response. On the other hand, 364,636 (32.92%) of the candidates chose incorrect options. The candidates' performance in this question is summarized in Figure 7.

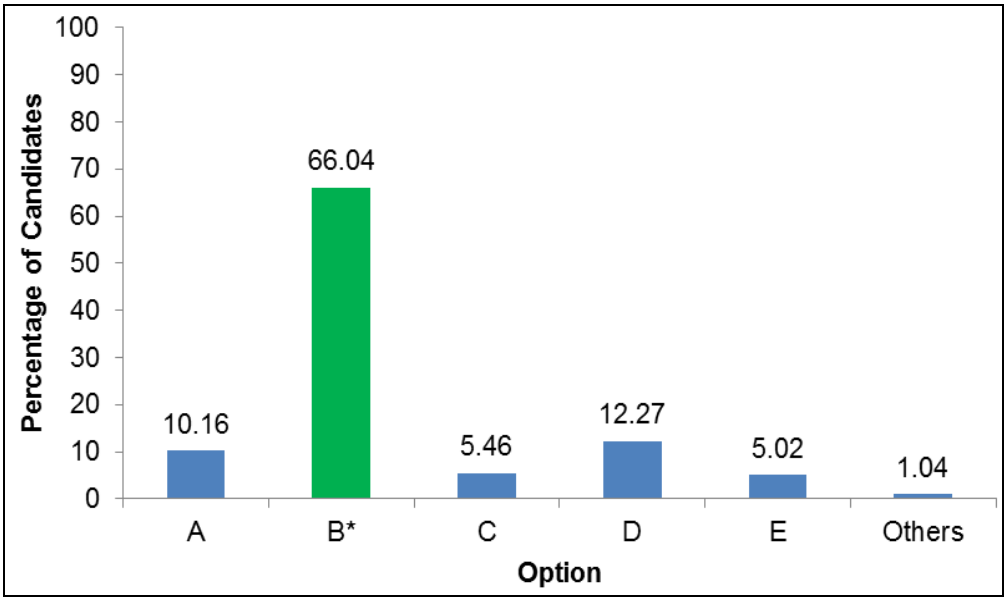


Figure 7: Candidates' Performance on Question 18

Statistics in Figure 7 shows that, most of the candidates (66.06%) managed to choose the correct answer B, *computer*. Those candidates understood the function of a computer as it is used to receive, process and store data as well as to give output.

However, the candidates who chose A, *television* failed to understand that the function of a television is to broadcast information, display images on the screen and sound on the speaker which are not the functions of a computer. Those who opted for distractor C, *decoder* failed to understand that a decoder is used to receive sound and picture waves but not to store data or information. The candidates who opted for distractor D, *system unit*, failed to understand that a system unit is among the devices found in the computer which stores and protects all electronic devices including processor and the motherboard. The candidates who opted for distractor E, *router*, failed to understand that, a router is a device which is used to connect network from one data center to another. This indicates that, those candidates lacked competence about the uses of a computer.

Question 19: The Science and Technology teacher has asked you to open a gmail account. Which first step would you follow to get the account?

A To visit the www.gmail.com website.
B To fill all information needed in the gmail form.
C To fill the phone number and birthdate in the gmail form.
D To choose the type of address you want in the gmail form.
E To visit the website “www.yahoo.com” and write the password correctly.

The question assessed the candidates’ competence about the required steps to get a gmail account. The performance on this question was average since 350,049 (31.60%) candidates managed to respond correctly to the question. A total of 742,190 (67.00%) candidates failed to select the correct answer. The candidates’ performance on this question is shown in Figure 8.

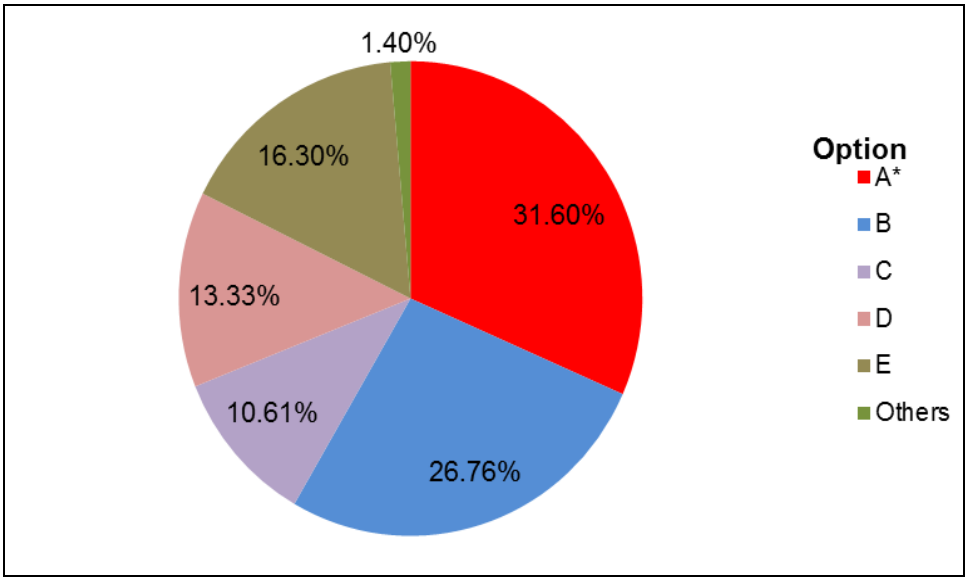


Figure 8: Candidates’ Performance on Question 19

Statistics in Figure 8 show that most of the candidates (67.00%) failed to answer the question correctly. Those candidates failed to understand the first step that should be followed in order to get the gmail account. For example, the candidates who chose distractor C,

to fill the phone number and birth date in the gmail form failed to understand that this is a third steps which allow one to get a gmail account. The candidates who chose distractor D, *to choose the type of gmail address you want in the gmail form*, lacked competence in getting a gmail account. The candidates who chose distractor E, *to visit the website www.yahoo.com*, failed to understand that the website to be used is gmail and not yahoo. This indicates that those candidates lacked competence about the steps to be followed to get a gmail account.

In contrast, 31.60 per cent of the candidates who chose the correct answer A, *to visit the www.gmail.com website* had enough competence in the steps that should be followed to get an email from gmail account.

Question 20: The news broadcast reported that most of the radios in Magunga village use the small loop type antenna. What disadvantage do they experience due to the use of that type of antenna?

A They cause defect of radio.
B They cause loss of electrical energy.
C They destract speakers.
D They have high maintenance coast.
E They have electromagnetic interference.

The question assessed the candidates' competence in explaining the uses of small loop type antenna. A total of 171,513 (15.48%) candidates were able to choose the correct response while 921,553 (83.19%) candidates failed to answer it correctly. The candidates' performance in this question was poor. Table 12 shows the candidates' performance on this question.

Table 12: Number and Percentage of Candidates in each Option

Option	A	B*	C	D	E	Others
No. of Candidates	101,697	171,513	116,459	207,269	496,128	14,734
% of Candidates	9.18	15.48	10.51	18.71	44.78	1.33

Statistics in Table 12 shows that 83.19 per cent of the candidates failed to answer the question correctly. Those candidates failed to identify the disadvantages of the small loop type antenna For example, those who chose distractors A, *they cause defects of radio* and C, *they destruct speakers*, failed to understand that a small loop type of antenna cannot cause any defect of those devices; Instead, those devices can be affected by abrupt increase in electric current. Also, the candidates who chose distractor D, *they have high maintenance,* failed to understand that a small loop type of antenna does not need high cost of maintenance. In other cases, those who chose distractor E, *they have electromagnetic interference* failed to understand that a small loop type of antenna does not have electromagnetic interference are mostly used in short range transmission. This indicates that those candidates lacked knowledge about the way a small loop type of antenna works.

On the contrary, 15.48 per cent of the candidates managed to answer the question correctly. Those candidates managed to choose option B*, they cause loos of electrical energy* as the correct answer. This signifies that those candidates had enough knowledge of the way a small loop type of antenna works.

Question 21: Why is it advised to shut down the computer by following the correct procedure?

A To protect it against unexpected power failure.
B To protect it from falling down.
C To reduce the heat generated within the computer.
D To protect it against the computer virus.
E To avoid losing unsaved information.

This question assessed the candidates' competence to recognize the steps to be followed when shutting down a computer. A total of 1,092,421 (98%) candidates attempted this question. The overall performance on this question was poor since 696,571 (62.27%) candidates failed to recognize the correct answer as they chose among the distractors A, B, C and D instead of the correct response E. A few candidates 395,850 (35.73%) responded to the question

correctly. Figure 9 shows the statistics of candidates' performance on each option.

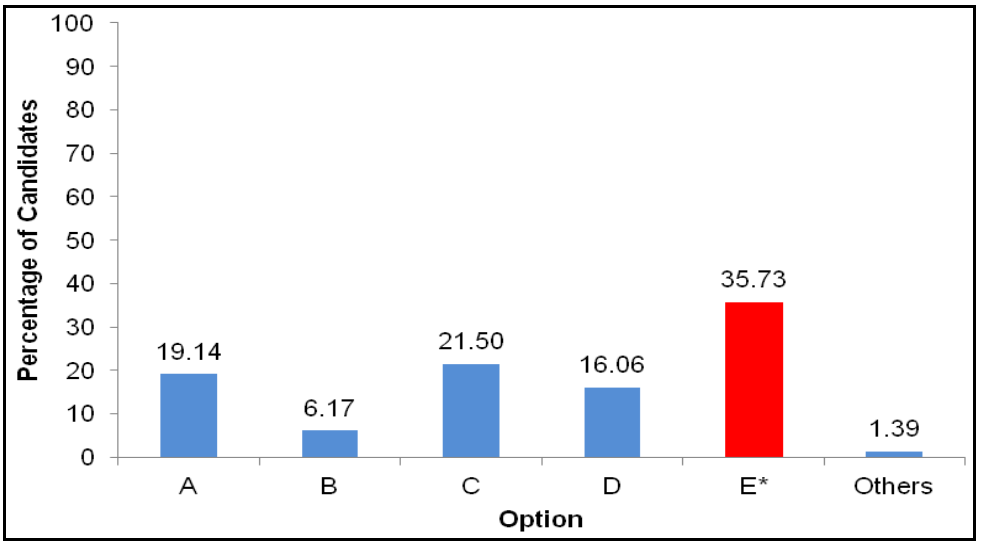


Figure 9: Candidates' Performance on Question 21

Statistics in Figure 9 reveal that 64.27 per cent of the candidates lacked knowledge about the correct procedures to follow when shutting down a computer. For example, the candidates who opted for distractor A, *to protect it against unexpected power failure* failed to understand that the computer is protected from unexpected power failure by using Uninterruptible Power Supply (UPS) and not by following correct procedure when shutting down the computer. However, the candidates who opted for distracter B, *to protect it from falling down* failed to understand that this is the precaution to be taken when using the computer but is not a step to follow when shutting down the computer. Also, the candidates who opted for distracter C, *to reduce heat generated within the computer* were unable to know that a computer has a special device that is used to reduce the amount of heat. Likewise, those who chose distractor D, *to protect it against computer virus* lacked the knowledge that a computer is protected by anti-virus.

On the other hand, 395,850 (35.73%) candidates who selected the correct option E, *to avoid losing unsaved information.* These candidates had enough knowledge that in order to avoid the

wastage of unsaved data or information when shutting down a computer, it is very crucial to follow the correct procedure.

Question 22: The Kiswahili subject teacher sent the pupils' parents results by using an electronic mail (e-mail) but the parents did not receive them. Which important thing did the teacher fail to consider when sending the e-mail?

A Writing the receivers' e-mail address correctly.
B Writing the heading of the message.
C Writing the sender e-mail address correctly.
D Signing out his e-mail account after using.
E Allowing the web browser to remember the password.

This question assessed the candidates' competence in applying fundamentals of science and technology especially in understanding the process used when sending and receiving an e-mail. The question was attempted by 1,093,235 (98.68%) candidates. The performance of the candidates on this question was average as 544,740 (49.17%) candidates responded correctly to the question. The rest, 548,495 (49.51%) failed to answer it correctly as they chose among the distractors A, B, D and E as shown in Table 13.

Table 13: Number and Percentage of Candidates in each Option

Option	A*	B	C	D	E	Others
No. of Candidates	544,740	192,704	176,396	100,174	79,221	14,565
% of Candidates	49.17	17.40	15.92	9.04	7.15	1.31

Data in Table 13 shows that 49.17 per cent of the candidates who chose the correct response A, *writing the receivers' e-mail address correctly* understood that in order to receive the e-mail, it is important for the sender to write the recipient's e-mail address correctly.

Further analysis indicates that 49.51 per cent of the candidates who failed to answer this question correctly lacked enough understanding

of the steps to be taken when sending and receiving an e-mail. For example, those who chose distractor B, *writing the heading of the message* did not recognize that this step follows after the sender of the e-mail has written the receiver's e-mail address correctly. The candidates who chose distractor C, *writing the sender's e-mail address correctly* lacked knowledge that this step comes before the sender writes the e-mail address and message. However, those who chose distractor D, *signing out his e-mail account after using* were incompetent to recognize that this is the last step to consider when sending an e-mail after which the sender is supposed to sign out. The candidates who chose distractor E, *allow the web browser to remember the password* had inadequate knowledge that this step cannot make the e-mail to reach the receiver but it is one of the crucial things to consider when sending the e-mail by restricting the browser from remembering your password. This indicates that those candidates failed to understand that the important thing to consider when sending the e-mail is to make sure that the receivers' e-mail address is written correctly.

Question 23: Complex machines are made up of two or more simple machines. What is the importance of that make up?

A To increase efficiency.
B To increase attraction.
C To increase friction.
D To increase velocity.
E To reduce friction.

This question measured the candidates' competence to identify the structure of a complex machine. The performance on this question was average since more than half of the candidates (55.15%) responded correctly and 482,560 (43.57%) failed to respond correctly. Figure 10 summarizes the performance of the candidates on this question.

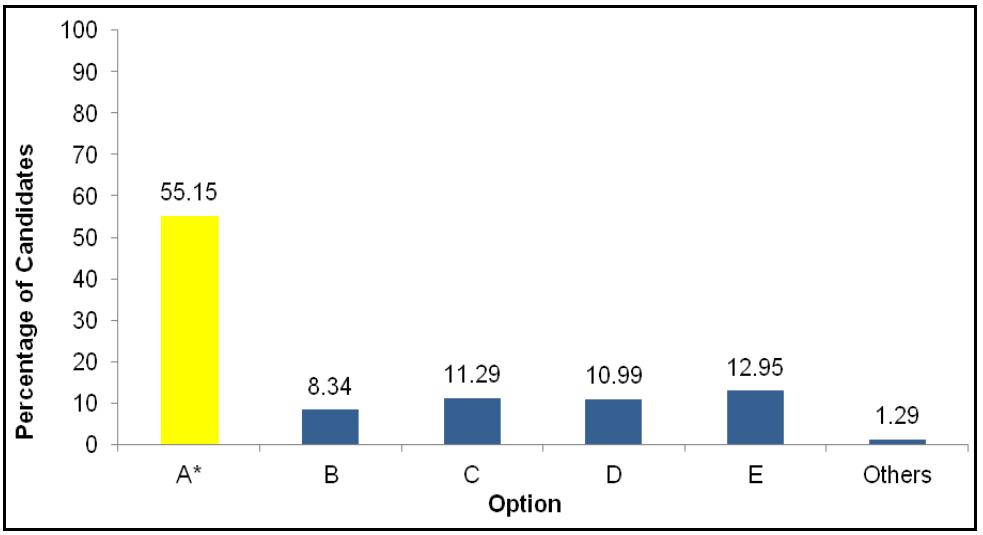


Figure 10: Candidates' Performance on Question 23

Statistics in Figure 10 shows that 610,939 candidates equivalent to 55.15 per cent were able to identify that option A, *to increase efficiency* is a correct answer. These candidates understood the structure and the importance of a complex machine, that is, to simplify and increase the efficiency of doing work.

However, the candidates who failed to respond to this question correctly by choosing distractors B, C, D and E were not aware of the structure of a complex machine. For example, those who chose distracter B, *to increase attraction* and C, *to increase friction* lacked knowledge about the fact that the presence of friction and attraction forces makes a machine fail to perform well and hence reduces its efficiency. Moreover, the candidates who opted for distractor D, *to increase velocity* lacked knowledge about the importance of complex machine against simple machine. Likewise, those who chose distractor E, *reduce friction* were not aware that friction between machine parts is reduced by applying special lubricants like oil or grease and does not depend on the structure of the machine itself.

Question 24: A lever has three main parts which are arranged in a specific order. Which arrangement best represents the third class lever?

A Effort, load and fulcrum.
B Fulcrum, effort and load.
C Fulcrum, load and effort.
D Load, fulcrum and effort.
E Effort, fulcrum and load.

This question measured the candidates' competence in applying fundamentals of science and technology specifically the characteristics of the third class lever. A total of 1,091,282 (98.51%) candidates attempted this question. The overall performance of the candidates on this question was poor since 730,458 (65.94%) candidates failed to choose the correct answer. A few candidates (32.57%) were able to answer this question correctly. Table 14 provides a summary of the candidates' statistics performance in this question.

Table 14: Number and Percentage of Candidates in each Option

Option	A	B*	C	D	E	Others
No. of Candidates	187,832	360,824	188,906	176,149	177,571	16,518
% of Candidates	16.96	32.57	17.05	15.90	16.03	1.49

As observed in Table 14, most of the candidates (65.94%) opted for the incorrect responses A*, effort, load and fulcrum,* C*, fulcrum, load and effort,* D, *load, fulcrum and effort* and E*, effort, fulcrum and load.* These candidates lacked the competence of identifying the classes of lever and its main parts. They failed to understand that the three classes of lever are categorized according to the arrangement of load, fulcrum and load. For example, those who chose distractors A, *effort, load and fulcrum* lacked the competence that this is the second class lever and not the third class lever. Also, the candidates who chose distractor C, *fulcrum, load and effort* failed to understand that this is the second class lever. Furthermore, those who chose distractors D, *load, fulcrum and effort* and E, *effort, fulcrum and load* did not realize that the arrangement mentioned in these distractors

fall under the first class lever since the fulcrum is between the load and effort.

On the other hand, 32.57 per cent of the candidates who chose the correct response B, *fulcrum, effort and load*, had adequate knowledge about the characteristics and arrangement of lever in the third class, that is, the effort must be between the fulcrum and load.

Question 25: Which formula gives the relationship between mechanical advantage, load and effort in a pulley system?

A $\text{Mechanical advantage} = \frac{\text{load}}{\text{effort}}$

B $\text{Load} = \frac{\text{mechanical advantage}}{\text{effort}}$

C $\text{Load} = \frac{\text{effort}}{\text{mechanical advantage}}$

D $\text{Effort} = \frac{\text{mechanical advantage}}{\text{load}}$

E $\text{Effort} = \text{mechanical advantage} \times \text{load}$

The question assessed the candidates' competence in applying fundamentals of science and technology especially in mastering scientific skills. The candidates were required to show the ability to identify the correct relationship among mechanical advantage, load and effort. The question was attempted by 1,094,742 (98.82%) candidates out of whom 787,226 (71.06%) responded correctly and 307,516 (27.76%) candidates failed to choose the correct answer. Generally, the candidates' performance on this question was good as shown in Figure 11.

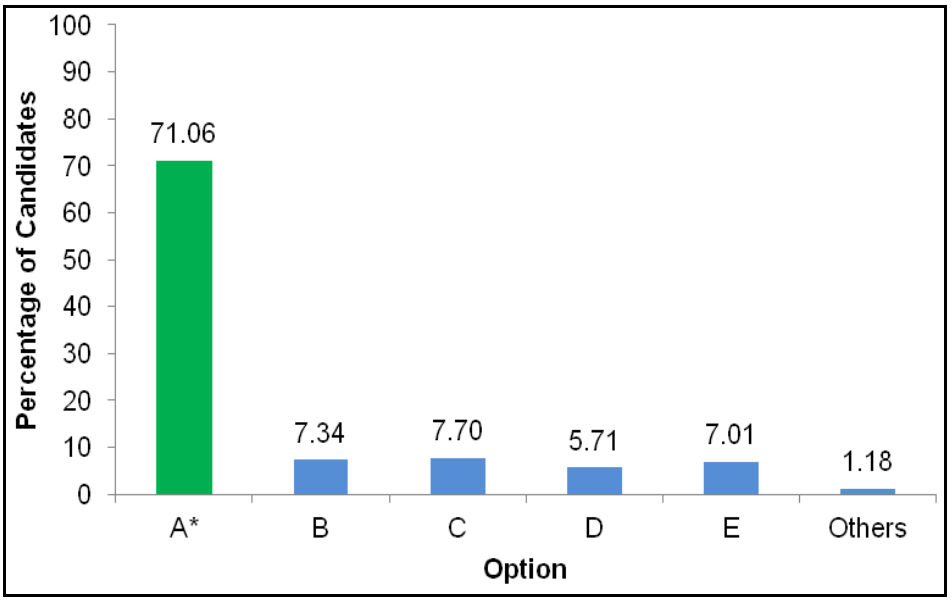


Figure 11: Candidates' Performance on Question 25

The data presented in Figure 11 show that 71.06 per cent of the candidates managed to choose the correct response *A*, Mechanical advantage=$\frac{\text{load}}{\text{effort}}$. These candidates had enough competence about scientific skills particularly on the calculation of mechanical advantage, since they were able to identify the relationship that exists between mechanical advantage, load and effort.

Nevertheless, 27.76 per cent of the candidates failed to respond correctly to the question as they chose among the distractors B, Load=$\frac{\text{mechanical advantage}}{\text{effort}}$, C, Load=$\frac{\text{effort}}{\text{mechanical advantage}}$, D, Effort=$\frac{\text{mechanical advantage}}{\text{load}}$ and E, effort = mechanical advantage x load. These candidates were not aware of the correct formula representing the relationship among mechanical advantage, load and effort in simple machines. Most of them lacked competence in mathematical skills in identifying that the correct answer

$\text{Effort}=\frac{\text{load}}{\text{mechanical advantage}}$ can be obtained from the formula $\text{Load}=\text{mechanical advantage}\times\text{effort}$.

Question 26: Standard four pupils were asked to bring complex machines to be used in learning their parts. Which tools did they bring?

A Bicycle, sewing machine and beam balance.
B Mortise lock, bicycle and claw hammer.
C Mortise lock, sewing machine and bicycle.
D Sewing machine, bicycle and bottle opener.
E Beam balance, mortise lock and bicycle.

This question assessed the candidates' competence in performing investigations and discoveries in science and technology in identifying complex machines and their parts. A total of 1,094,041(98.75%) candidates attempted this question. The overall performance on this question was average since 651,325 (58.79%) candidates answered correctly and 442,716 (39.96%) failed to respond correctly. Table 15 provides the statistics of candidates' performance on each option.

Table 15: Number and Percentage of Candidates in each Option

Option	A	B	C*	D	E	Others
No. of Candidates	200,624	107,473	651,325	72,712	61,907	13,759
% of Candidates	18.11	9.70	58.79	6.56	5.59	1.24

The candidates who opted for the correct answer C, *mortise lock, sewing machine and bicycle* had adequate knowledge that complex machines are made up of two or more simple machines for the purpose of simplifying work.

However, the candidates who opted for distractor A, *bicycle, sewing machine and beam balance* failed to recognize that beam balance is a simple machine in the group of levers. Also, the candidates who opted for distracter B, *mortise lock, bicycle and claw hammer* did not realize that among the machines mentioned in this group, claw

hammer is one of the simple machines belonging to wedges. The candidates who opted for distractor D, *sewing machine, bicycle and bottle opener* were not aware that in this group bottle opener is a simple machine in the group of levers. Nevertheless, those who opted for *distractor* E, *beam balance, mortise lock and bicycle* failed to realize that a beam balance is a simple machine which belongs to the group of levers. Generally, those candidates lacked knowledge on the types of machines and examples of complex machines.

Question 27: Which is the unit of resistance in electricity?

A Volt
B Ohm
C Voltmeter
D Ampere
E Ammeter

This question measured the candidates' competence in identifying the unit of resistance in electricity. Out of 1,092,450 (98.61%) candidates who attempted this question, 638,472 (57.63%) responded correctly implying average performance. A total of 453,978 (40.98%) candidates failed as they chose the distractors A, C, D and E instead of the correct option B. The candidates' performance in each option is shown in Table 16.

Table 16: Number and Percentage of Candidates in each Option

Option	A	B*	C	D	E	Others
No. of Candidates	124,178	638,472	91,009	171,726	67,065	15,350
% of Candidates	11.21	57.63	8.22	15.50	6.05	1.39

Statistics in Table 16 show that 57.63 per cent of the candidates who opted for the correct answer B, *Ohm* were aware of the unit of resistance in electricity. Those candidates understood that the resistance is measured in the circuit by using the resistor and has the unit of Ohm which is denoted by omega symbol "Ω".

On the other hand, the candidates who chose distractor A, *volt* failed to discover that volt is the unit of voltage which is denoted by the

capital letter V. Also, those who chose distractor C, *voltmeter* were not able to recognize that a voltmeter is a device used to measure voltage in an electric circuit and not the S.I unit of resistance. Furthermore, the candidates who opted for distractor D, *ampere* lacked the knowledge that ampere is the S.I unit of electric current. Nevertheless, those who opted for distractor E, *ammeter* were not aware that this is a device used to measure electric current in a complete circuit. Generally, those candidates lacked knowledge about the S.I unit of the quantities involved in current electricity specifically the resistance.

Question 28: Which set contains acidic substances?

A Orange and wood ash.
B Lemon and wood ash.
C Wood ash and soda ash.
D Orange and lemon.
E Orange and soda ash.

This question assessed candidates' competence in performing investigations and discovering in science and technology especially in performing scientific experiments to identify acidic substances. The performance in this question was average as out of 1,094,309 (98.78%) candidates who attempted this question, 451,214 (40.73%) responded to the question correctly. The rest of the candidates, 643,095 (58.05%), failed by choosing the distractors A, B, C and E. Figure 12 show the summary of the candidates' performance on this question.

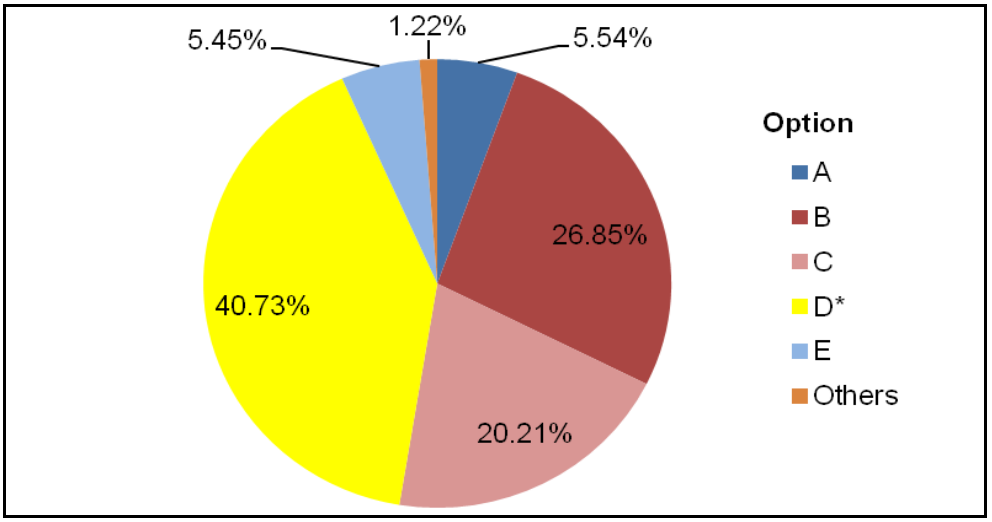


Figure 12: Candidates' Performance in Question 28

Figure 12 shows that 40.73 per cent of the candidates managed to recognize that option D, *Orange and lemon* is the correct answer. These candidates understood the concepts of acid and base such that acid has sour taste and can be obtained in foods such as lemon, sour milk and oranges.

Nevertheless, more than half of the candidates (58.05%) chose the incorrect responses A, B, C and E for various reasons. Most of them lacked competence to identify the characteristics of acidic substances. They failed to realize that, normally acidic substances have sour taste as prescribed in the correct option, D. For example, those who chose distractors A, *orange and wood ash,* B, *lemon and wood ash,* C, *wood ash and soda ash* and E, *orange and soda ash* failed to discover that wood ash belongs to a group of basic substances and not acidic substances.

Question 29: White, red, black, yellow and green clothes made of the same material were washed and kept in a place to dry from sunlight. Clothes of which colour will be the first to dry up?

A White
B Red
C Black
D Yellow
E Green

This question assessed the candidates' competence in performing investigations and discoveries in science and technology in identifying various types of energy and their uses. Basically, the question intended to measure the candidates' understanding of the concept of absorption of sunlight. A total of 1,095,510 (98.90%) candidates attempted this question. The overall performance was average since 518,779 (46.83%) candidates answered the question correctly and 576,731 (52.07%) failed. Table 17 provides the statistics of candidates' performance on this question.

Table 17: Number and Percentage of Candidates in each Option

Option	A	B	C*	D	E	Others
No. of Candidates	469,341	46,189	518,779	36,629	24,572	12,290
% of Candidates	42.37	4.17	46.83	3.31	2.22	1.11

The candidates who chose the correct response C, *black* had good understanding of the characteristics of light as it passes through different materials. Those candidates demonstrated their competence on identifying that black colour materials absorb sunlight in a larger amount than other colours. Also sunlight energy is accompanied by heat energy. So, due to this , black colour clothes will dry faster than any other clothes.

On the other hand, the candidates who opted for distractor A, *white* failed to realize that white colour clothes reflect sunlight; so it will dry slowly compared to black colour clothes. The candidates who opted for distractor B, *red*, lacked knowledge about absorption of sunlight.

They did not know that red colour clothes do not absorb much sunlight compared to black colour clothes. However, those who opted for distractor D, *yellow* failed to understand that yellow is the third colour in colour absorption capability after black and red colours. Those who opted for distractor E, *green* were not aware that green colour absorbs sunlight in smaller amount than black, red and yellow colours. Generally, the candidates lacked knowledge to recognize the colour that absorbs more sunlight.

Question 30: Your friend's clothes caught fire which was caused by petrol explosion. What are you supposed to do in order to put out the fire?

A Remove all the victim's clothes.
B Cover the victim with a cold piece of cloth.
C Splash the victim with water.
D Cover the victim with a heavy blanket.
E Take the victim to the hospital.

The question measured the candidates' competence and ability to provide First Aid to a victim whose clothes caught fire which caused by explosion of explosive oil like petrol, diesel and kerosene. The analysis shows that the performance was good as a total of 812,351 (73.33%) candidates chose the correct option while 284,190 (25.65%) failed. Figure 13 shows the statistics of candidates' performance on this question.

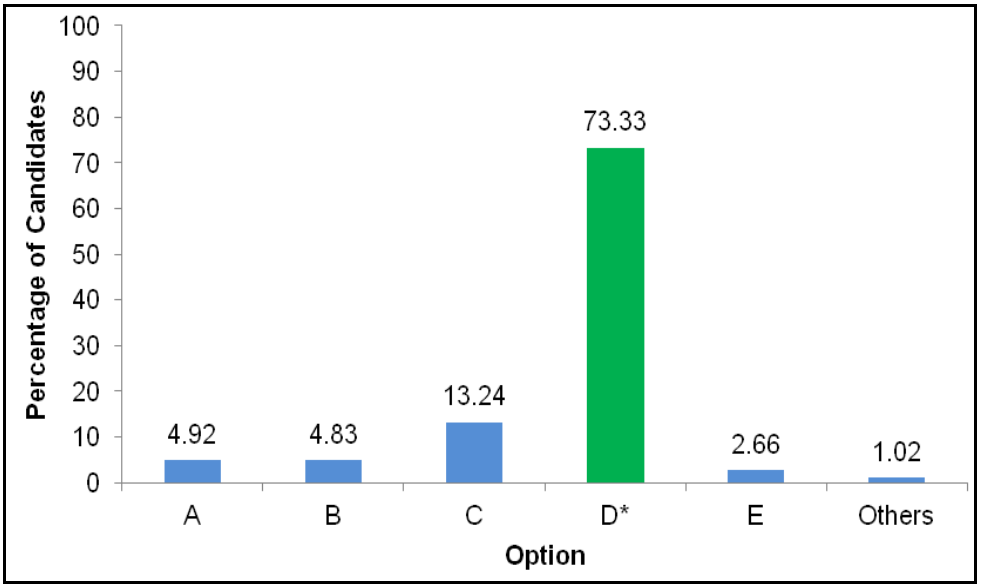


Figure 13: Candidates' Performance in Question 30

The data in Figure 13 show that, 73.33 per cent of the candidates managed to choose the correct response D, *cover the victim with a heavy blanket.* Those candidates understood the steps to be followed when giving first aid to a victim of fire accident caused by petrol explosion.

However, 25.65 per cent of the candidates chose incorrect responses A, B, C and E. Out of them, 4.92 per cent chose distractor A, *remove all the victim's clothes.* These candidates failed to understand that this is the first aid given to a person who has been burnt by hot liquids such as tea, steam, hot milk or water and not the fire caused by petrol explosion. The candidates who chose distracter B, *cover the victim with a cold piece of cloth* had insufficient knowledge that this is the first aid given to a victim with minor burn but not the one whose clothes caught fire. Those who opted for distractor C, *splash the victim with water* were not aware that water increases the rate of fire caused by petrol explosion; hence it is not a safe option. They were supposed to understand that water is used to put out fires caused by substances such as paper, clothes and plastic but not petrol. Likewise, those who opted for distractor E, *take the victim to the hospital* failed to understand that this is the last step when giving first aid to a patient.

Question 31: A hunter was bitten by a snake on his leg. What kind of first aid is he supposed to be given?

A Lay the victim down with the legs raised up.
B Take the victim to hospital.
C Scrub with ashes and salt.
D Tighten the top part of the bitten leg.
E Wash him/her by using clean water and soap.

This question assessed the candidates' competence of maintaining health and the environment especially on applying health principles for good health. The question intended to measure the candidates' ability to understand the procedures to be followed when providing First Aid to a person bitten by snake. The performance was good since 919,866 (83.04%) candidates responded correctly to the question. However, 177,926 (16.07%) candidates failed to choose the correct response. Statistics of the candidates' performance in each option is presented in Figure 14.

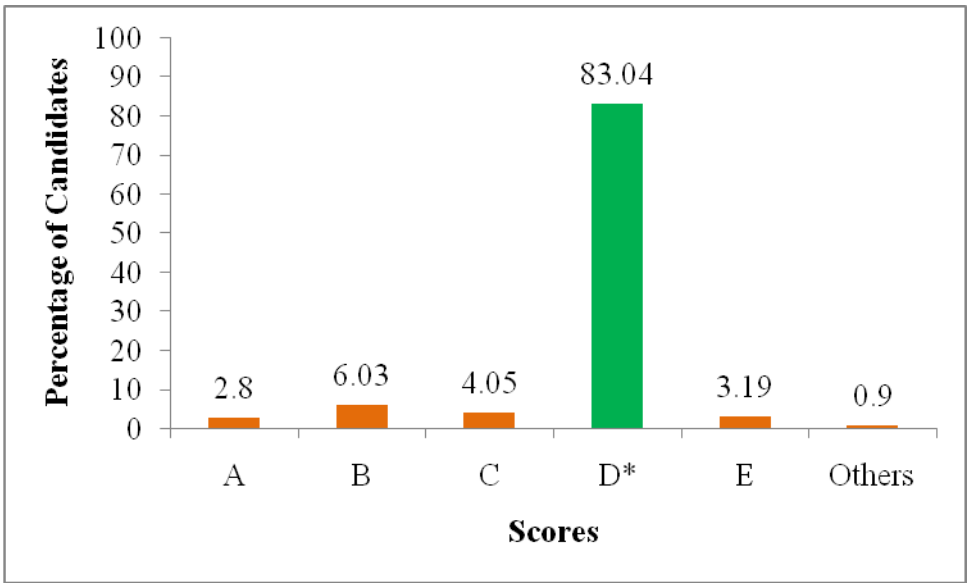


Figure 14: Candidates' Performance on Question 31

Statistics in Figure 14 show that the candidates who opted for the correct response D, *Tighten the top of the bitten leg*, had enough competence about the correct steps to be followed when providing First Aid to a victim of a snake bite.

On the other hand, the candidates who opted for distractor A, *Lay the victim down with the legs raised up* were not aware that by doing so cause the snake poison to spread rapidly in different parts of the victim's body. Likewise, those who opted for distractor *B, Take the victim to hospital*, lacked the knowledge that taking the victim to the hospital for further treatment is the final stage. Nevertheless, the candidates who opted for distractors C, *Scrub with ashes and salt* and E, *Wash him/her by using clean water and soap* were not aware that scrubbing the victim with ashes and salt does not help to stop the spread of the snake poison to the body. Generally, those candidates lacked competence on how to provide first aid to a victim of snake bite.

Question 32: Your grandfather is a short sighted person. Which food would you recommend him to use so as to solve the problem?

A Bananas, oranges and groundnuts.
B Rice, pineapple and meat.
C Mango, carrots and green vegetables.
D Carrots, cassava and beans.
E Bread, bananas and cassava.

This question assessed the candidates' competence of maintaining health and the environment especially on applying health principles for good health to identifying foods required for helping a shortsighted person. The analysis shows that the performance was good as a total of 803,581 (72.54%) candidates chose the correct option and 292,032(26.36%) failed. The summary of the candidates' performance in this question is presented in Table 18.

Table 18: Number and Percentage of Candidates in each Option

Option	A	B	C*	D	E	Others
No. of Candidates	79,446	57,285	803,581	110,087	45,214	12,187
% of Candidates	7.17	5.17	72.54	9.94	4.08	1.10

The data presented in Table 18 show that, 72.54 per cent of the candidates chose the correct response C, *Mango, carrots and green*

vegetables. These candidates had competency to understand foods rich in vitamin A whose function is to strengthen the human body against various problems of the eyes including shortsightedness.

However, 26.36 per cent of the candidates failed to respond correctly to the question as they chose among the distractors A, B, D and E. For example, the candidates who opted for a distractor *A, Banana, oranges and groundnuts,* lacked the knowledge that these foods are not rich in vitamin A. They were supposed to know that, bananas and oranges are foods rich in vitamin C while groundnuts provide fat/oil as well as protein.

The candidates who opted for distractor B, *Rice, pineapples and meat*, failed to recognize that rice provides carbohydrate nutrients whose function is to provide energy to the body, meat is a source of protein which helps to build the human body and pineapples is a good source of vitamin C that helps to protect the skin against various skin disorders. Those who chose distractor D, *Carrots, cassava and beans*, were not aware that cassava is a good source of carbohydrate nutrients which provides energy and beans are among the foods rich in protein. Also, the candidates who opted for distractor E, *Bread, bananas and cassava* lacked the knowledge that these are foods rich in carbohydrate and not in vitamin A which are essential for a short sighted person.

Question 33: The students were not allowed to throw the plastic bottles of water in the school fields after the use in order to prevent environmental pollution. Which way would you advice to be used to prevent bottles from continuing to pollute the environment?

A Burning them
B Returning them to the factory
C Breaking them into pieces and throw away
D Burying them in a pit
E Keeping them in the store

This question assessed the candidates' competence of maintaining health and the environment particularly in applying principles of hygiene for good health and the environment. The question required

the candidates to identify the best method to consider in controlling plastic bottles from polluting the environment. A total of 1,094,593 (98.80%) candidates attempted this question, out of whom 356,958 (32.22%) responded correctly while 737,635 (66.58%) failed. This suggests that there was weak performance in this question. Statistics of the candidates' performance in the question is shown in Figure 15.

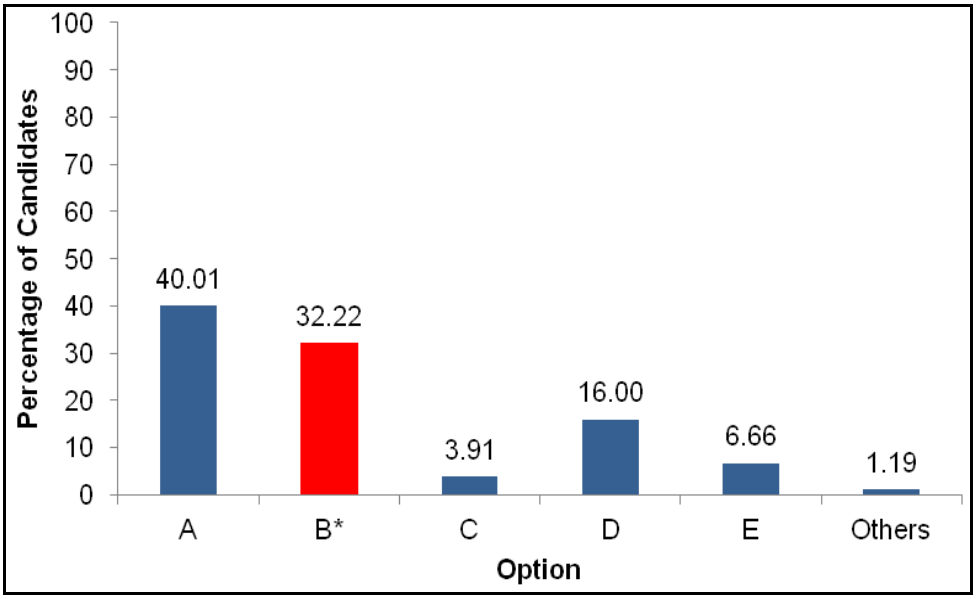


Figure 15: Candidates' Performance on Question 33

Data in Figure 15 indicate that, 32.22 per cent of the candidates opted for the correct response B, *Returning them to the factory.* These candidates had adequate knowledge that recycling of waste is among the best methods for waste management in which waste is processed into a new product that can be used again.

However, the candidate who opted for distractor A, *burn them* failed to understand that burning waste leads to air pollution. Those who opted for distractor C, *break them into pieces and throw away* lacked the knowledge that to throw small pieces of plastic bottles causes environmental pollution. Likewise, those who opted for distractor D, *burying them in a pit* were not aware that plastic bottles are among non-decomposable wastes even if they are buried in the pit they cannot be broken down into simple substances by bacteria or fungi,

so due to this, they cause land pollution. Moreover, the candidates who opted for distractor E, *keeping them in the store* did not understand that, store is not a proper place for keeping plastic bottles. Wastes are kept in the special bins depending on its nature. Generally, these candidates lacked knowledge on how to ensure waste is properly managed and destroyed to prevent its effects to the environment.

Question 34: The Head prefect led the Standard Three pupils to clean the school environment so as to destroy mosquito breeding sites. Which main activities did they do?

A Slashing and filling up water pools
B Sweeping and planting trees
C Planting flowers and slashing
D Removing cobwebs and mopping
E Covering full rubbish pits and digging new ones

This question assessed the candidates' competence in maintaining health and the environment especially in applying health principles for good health. The question required the candidates to identify the main activities that are used to destroy mosquito-breeding sites. A total of 1,096,541(98.98%) candidates attempted this question. The overall performance in this question is good since 806,255 (72.78%) candidates answered correctly and 290,286 (26.20%) failed. The summary of candidates' performance in each option is shown in Figure 16.

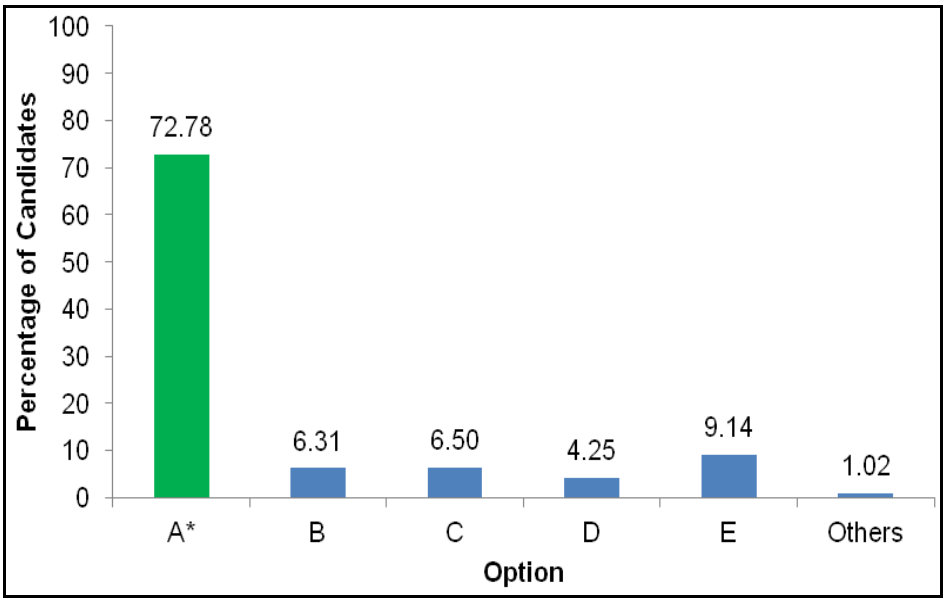


Figure 16: Candidates' Performance on Question 34

As observed in Figure 16, most of the candidates (72.78%) chose the correct response, A, *Slashing and filling up water pools.* These candidates understood that malaria can be controlled by destroying breeding sites of the anopheles mosquito like filling up water ponds and slashing grasses.

On the other hand, 26.20 per cent of the candidates who chose among the incorrect responses B, C, D and E were not competent in the proper ways of destroying mosquito breeding sites. For example, those who opted for the distractor B, *Sweeping and planting trees*, failed to understand that these are the methods used to protect the environment and to make them clean and safe but does not help in destruction of mosquito breeding sites breeding. The candidates who opted for the distractor C, *panting flowers and slashing* lacked the knowledge that planting flowers supports mosquito breeding sites although flowers make the environment attractive.

Moreover, the candidates who chose distractor D, *removing cobwebs and moping* failed to understand that these are the proper methods used in daily life to clean a house but not to destroying mosquito breeding sites. Likewise, those who opted for the distractor E, *covering full rubbish pits and digging new ones* lacked

competence in understanding the fact that mosquito breeding sites does not take place in rubbish pits which do not have stagnant water.

Question 35: Which of the following **does not** relate to the health principles which are required to be followed by each one in order to have good health?

A Eat balanced diet
B Environmental cleanliness
C Using clean and safe water
D Knowing different games
E Resting and sleeping

This question measured the candidate's competence in identifying unhealthy principles. The question was attempted by 1,093,469 (98.70%) candidates. The performance of the candidates on this question was average as 516,484 (46.62%) candidates responded correctly to the question. However, 576,985 (52.08%) failed to answer it correctly as they chose distractors A, B, C and E as shown in Table 19.

Table 19: Number and Percentage of Candidates in each Option

Option	A	B	C	D*	E	Others
No. of Candidates	151,260	142,637	57,175	516,484	225,913	14,331
% of Candidates	13.65	12.88	5.16	46.62	20.39	1.29

Table 19 shows that 46.62 per cent of the candidates were able to choose the correct response D, *Knowing different games.* These candidates had competence to understand that knowing different games does not make someone to have good health but if a person is engaged in performing them then it helps someone to be healthy.

The statistics also show that 52.08 per cent of the candidates failed to answer the question correctly, as they chose distractors A, B, C and E, indicating that they were not familiar with unhealthy principles. For example, the candidates who opted for distractor A, *Eating balanced diet* did not understand that eating a meal that contains the right proportion of different groups of food nutrients like

carbohydrates, proteins, vitamins, fats/oils and minerals is among the principles of good health. The candidates who opted for distractor B, *Environmental cleanliness* did not understand that cleaning the environment is among the health principles as it protects the environment from bacterial breeding and disease. Also, those who opted for distractor C, *Using clean and safe water* lacked the competence to understand that using clean and safe water strengthens body health and so it is among the health principles. Nevertheless, the candidates who opted for the distractor E, *Resting and sleeping* failed to understand that in order to have good health, you need to have enough time for resting or sleeping.

Question 36: Which diseases are caused by the inheritance of disorders in genes from one generation to another?

A Epilepsy and bilharzia
B Sickle cell and haemophilia
C Albinism and hepatic fever
D Asthma and tuberculosis
E Haemophilia and gonorrhea

The question measured the candidates' competence in identifying hereditary diseases that are caused by inheritance of genetic disorders from one generation to another. A total of 1,092,526 (98.62%) candidates attempted this question, out of whom 585,118 (52.82%) responded correctly and 507,408 (45.80%) failed. The general performance of the candidates on this question was average as shown in Table 20.

Table 20: Number and Percentage of Candidates in each Option

Option	A	B*	C	D	E	Others
No. of Candidates	78,676	585,118	154,235	177,654	96,843	15,274
% of Candidates	7.10	52.82	13.92	16.04	8.74	1.38

Data in Table 20 reveal that more than half of the candidates (52.82%) opted for the correct response *B, Sickle cell and hemophilia.* These candidates had enough competence about the types of hereditary diseases which are caused by genetic disorders.

Nevertheless, the candidates who opted for distractor A, *Epilepsy and bilharzia* failed to understand that both epilepsy and bilharzia are genetically non-hereditary diseases. Epilepsy is a disease which is caused by brain damage while bilharzia is transmitted by snail. The candidates who opted for distractor C, *Albinism and hepatic fever* lacked knowledge about the fact that albinism is not a disease although it is a genetic disorder and hepatic fever is among the transmitted diseases. Furthermore, the candidates who chose distractor D, *Asthma and tuberculosis* failed to understand that tuberculosis is a transmitted disease which is caused by bacteria. Likewise, those who opted for distractor E, *Hemophilia and gonorrhea* lacked the knowledge that gonorrhea is among the sexually transmitted diseases caused by bacteria.

Question 37: What kind of food are the people who do manual work of carrying luggage supposed to eat in large quantity?

A Vitamins
B Oils
C Minerals
D Carbohydrates
E Proteins

The question assessed candidates' understanding on the importance of carbohydrate rich foods for the people who do manual work. The performance in this question was average. since 608,810 (54.96%) candidates managed to respond correctly to the question while 483,613 (43.66%) candidates failed. Table 210 shows the candidates' performance in each option.

Table 21: Number and Percentage of Candidates in each Option

Option	A	B	C	D*	E	Others
No. of Candidates	118,739	65,884	74,712	608,810	224,278	15,377
% of Candidates	10.72	5.95	6.74	54.96	20.25	1.39

The statistics in Table 21 show that 54.96 per cent of the candidates opted for the correct response D, *Carbohydrates.* These candidates

had enough knowledge about the fact that people who do manual work like porters and wheel barrow or trolley pushers need to eat a balanced diet containing sufficient amount of carbohydrates to give their bodies enough energy.

On other hand, 43.66 per cent of the candidates who failed to identify the correct response lacked knowledge about the importance of carbohydrate rich foods in human bodies especially for people who do manual work. For example, those who chose distractor A, *Vitamins* did not understand that vitamins do not provide energy to the human body but they help to protect the human body against diseases. The candidates who opted for distractor B, *Oils* failed to understand that oils provide heat and energy to a human body. Moreover, those who opted for distractor C, *Minerals*, failed to realize that minerals help to strengthen the bones, teeth and brain but are not responsible for energy provision. Also, the candidates who chose distractor E, *Proteins*, lacked competence that proteins are vital for building human bodies.

Question 38: The human digestive system is made up of several parts. Which part absorbs water and minerals?

A Large intestine
B Small intestine
C Stomach
D Gall bladder
E Oesophagus

The question assessed candidate's competence to identify various systems of the human body especially the functions of the digestive system in the large intestine. Statistics show that the candidates' performance in this question was weak because only 250,375 (22.60%) candidates opted the correct answer A*, Large intestine.* Almost, three quarters of the candidates, 840,176 (75.84%) chose the distractors B, *Small intestine,* C, *Stomach,* D, *Gall bladder* and E, *oesophagus.* The summary of the candidates' performance on this question is shown in Figure 17.

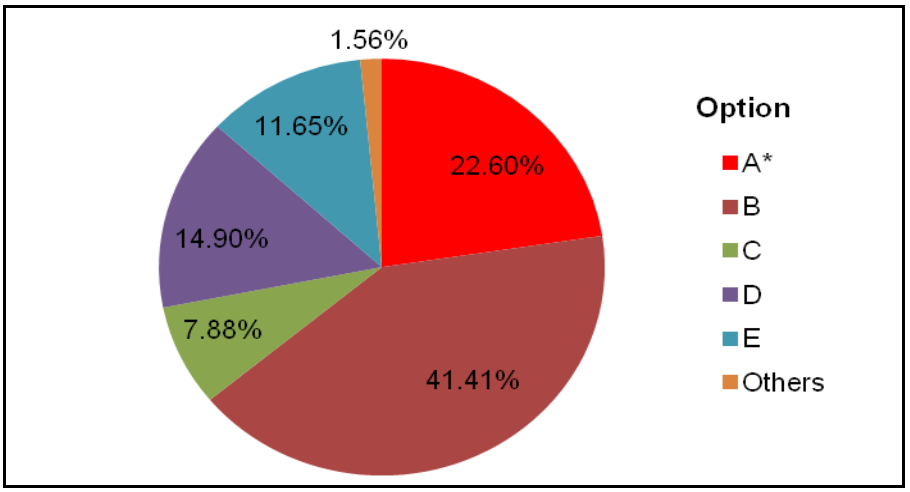


Figure 17: Candidates' Performance on Question 38

The candidates who opted for a correct response A, *Large intestine* had good understanding about the function of the large intestine in the digestion system which is to absorb water and minerals.

However, the candidates who opted for distractor B, *Small intestine* lacked knowledge about the function of small intestine in the human body which is to absorb digested food nutrients and not absorption of water and minerals. On the other hand, the candidates who chose distractor C, *Stomach* failed to understand the function of stomach in the digestive system, which is to store food temporarily, produce gastric juice which contains digestive enzymes and hydrochloric acid that kills germs that might be swallowed with the foods. Those who opted for distractor D, *Gall bladder* did not understand the function of gall bladder which is to release bile that digests/breaks down fats and oil but not for the absorption of water and minerals. Moreover, the candidates who chose option E, *oesophagus* lacked knowledge that, oesophagus is part of the alimentary canal through which food passes from the mouth to the stomach.

Question 39: The density of wood is 20 kilograms per cubic metre. If the volume of wood is 90 cubic metres, find the mass of the wood.

A 110.0 kg
B 0.222 kg
C 4.5 kg
D 1800 kg
E 180.0 kg

This question measured the candidates' competence to identify scientific and technological theories specifically to calculate the mass of wood. Among the 1,090,911 (98.48%) candidates who responded to this question, only 133 447 (12.05%) candidates chose the correct answer D, *1800 kg.* A total of 957,464 (86.43%) candidates failed to select the correct response. Instead, they chose distractors A, B, C and E as shown in Figure 18.

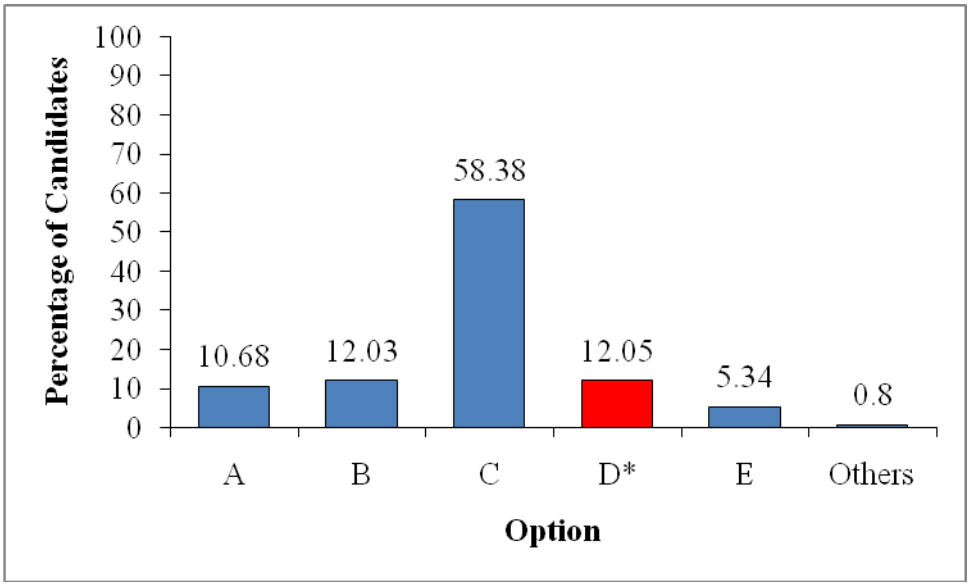


Figure 18: Candidates' Performance on Question 39

The statistics in Figure 18 show that most of the candidates (86.43%) failed to respond correctly to this question. Those candidates who opted for distractors A, *110.0 kg,* B, *0.222 kg, C, 4.5 kg* and E, *180.0 kg* lacked knowledge of solving word problems

involving density. Most of them lacked the arithmetic skills as they faced a challenge on how to multiply whole numbers. For example, some of them wrote; mass = 90 + 20 = 180 kg, instead of mass = 90 x 20 = 1800 kg. Also, some of the candidates applied incorrect formulae such as $\text{mass} = \text{density} + \text{volume}$ and $\text{mass} = \frac{\text{density}}{\text{volume}}$ instead of $\text{mass} = \text{density} \times \text{volume}$ to find the correct answer.

However, a few candidates (12.05%) responded correctly to this question. Those candidates had sufficient knowledge on the formula and procedure to calculate the mass of wood as follows: $\text{mass} = 20\ \text{kg/m}^3 \times 90\ \text{m}^3 = 1800\ \text{kg}$. Therefore they managed to identify that option D, *1800 kg* is the correct answer.

Question 40: Submarine is a type of ship which can either sink or float on water. What should be done when a submarine is in the water and is required to float?

A Water should be removed and the tanks filled with air.
B Water should be removed and the tanks left empty without air.
C To increase the upthrust in the tanks by using a light fluid.
D To remove the air from the tanks to reduce weight.
E To balance upthrust and gravitation force in the submarine.

This question was set based on the competence in performing investigations and discoveries in science and technology. The question intended to assess the candidates' ability to identify the condition which enables a submarine to float or sink in water. A total of 1,090,548 (98.44%) candidates attempted this question, out of which 283,239 (25.57%) candidates answered correctly while 807,309 (72.87%) failed. This implies there was weak performance on this question. Figure 19 shows a statistics of candidates' performance in each option.

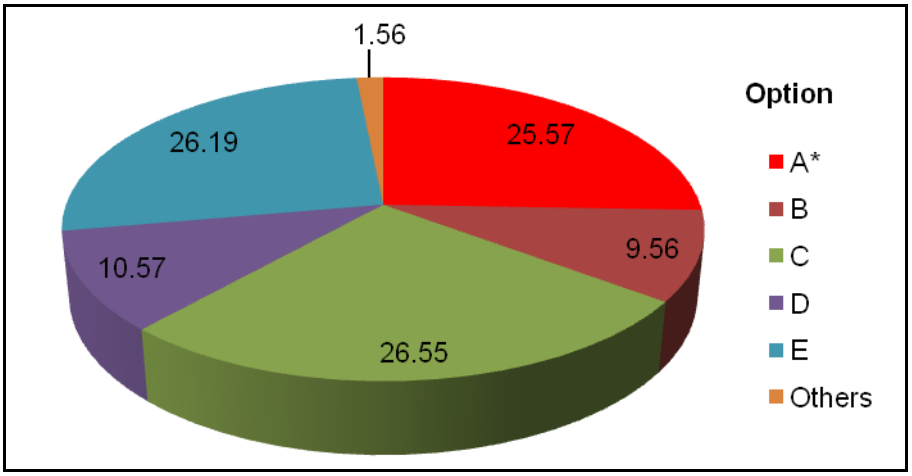


Figure 19: Candidates' Performance on Question 40

Figure 19 show that, a larger number (807,309) of candidates failed to respond well to this question by choosing among the distractors B, C, D and E. These candidates lacked knowledge about the concept of floatation as they failed to identify the condition which enables a submarine to float or sink in water. For instance, those who chose distractor B, *water should be removed and the tanks left empty without air* failed to understand that filling air in the tanks enables a submarine to partially submerge. On the other hand, there were some candidates who opted for distractor C, *to increase the upthrust in the tanks by using a high fluid.* These candidates failed to realize that upthrust force is not added in the tanks but it is naturally found in the water. The candidates who opted for distractor D, *to remove the air from the tanks to reduce weight* failed to understand that the removal of air from the tanks leads to higher density of submarine than that of water and as a result the submarine will sink in water. Nevertheless, those who chose distractor E, *to balance upthrust and gravitation in the submarine* failed to understand that, floating and sinking of a ship depends on things filled in the tanks either water or air and not the balancing of upthrust and gravitational force.

However, 283,239 (25.57%) candidates who opted for the correct response A, *Water should be removed and the tanks filled with air* had enough understanding about the concept of floatation. They knew that when a submarine is totally submerged, water in the tanks

will be replaced with air thus its density becomes less than that of water. Therefore, the submarine floats.

2.2 Section B: Short Answer Items

Question 41: Plants have chloroplasts which absorb sunlight energy for photosynthesis. Which other things are used by plants as raw materials for photosynthesis?

The question assessed the candidates' competence on identifying the raw materials required by plants to manufacture their own food. The statistics show that the candidates' performance on this question was good since 709,966 (64.1%) candidates scored 01 to 02 marks. Figure 20 indicates the distribution of candidates' scores in this question.

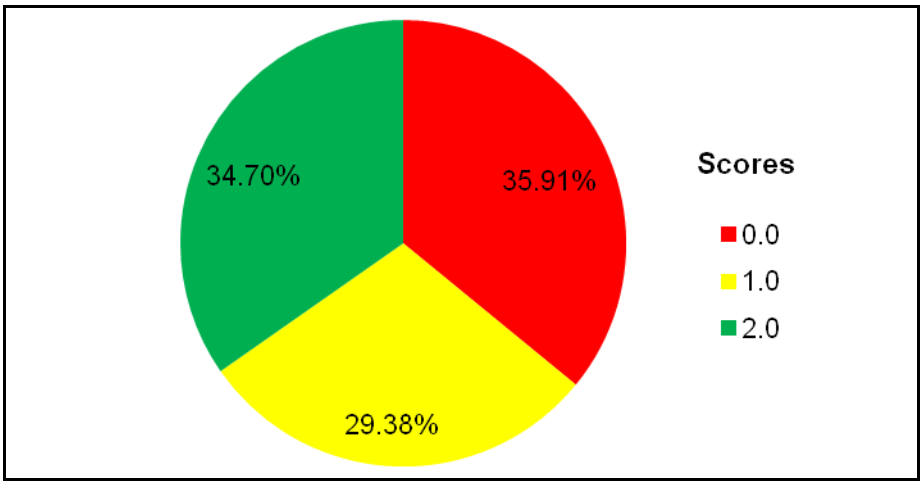
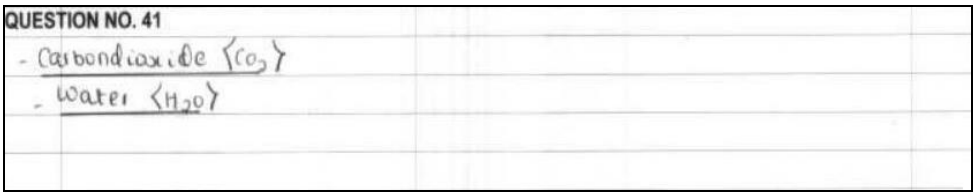


Figure 20: Candidates' Performance in Question 41

Data in Figure 20 shows that, 384,441 (34.7%) candidates were able to answer this question correctly and scored 02 marks. These candidates were able to identify other requirements which are carbon dioxide gas and water. This indicates that they had enough knowledge about the necessary conditions needed by plants for photosynthesis to take place. Extract 41.1 provides a sample of the correct response from one of the candidates.

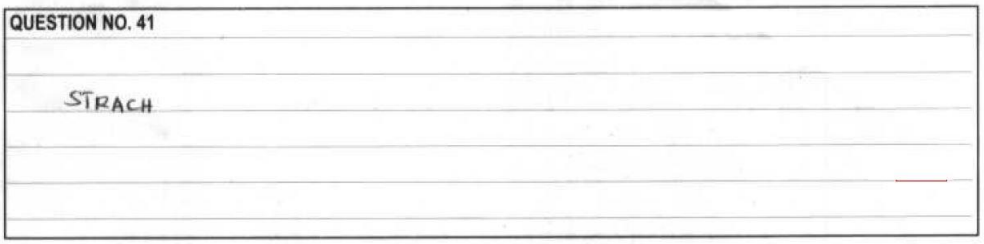


Extract 41.1: A sample of correct response in question 41

Extract 41.1 shows that the candidate was competent about the raw materials that needed for photosynthesis.

Further analysis of the candidates' responses reveals that 29.4 per cent of the candidates who scored 01 mark, wrote only one requirement used by plants as raw materials for photosynthesis. Some of the incorrect responses provided by some of candidates were: *roots* and *osmosis.* These responses reveal that the candidates failed to understand that roots are responsible for absorption of water, minerals and nutrients from the soil. On the other hand, osmosis is the process by which water molecules move from one solution of low solute concentration to a solution of high solute concentration through a semi-permeable membrane.

However, 35.9 per cent of the candidates scored 0 marks for different reasons such as some of them wrote “stomata” and “chloroplasts” as they did not understand that stomata is used for gaseous exchange the leaf of a plant and chloroplasts are mesophyll cells which possess chlorophyll. Some candidates wrote “oxygen gas” as they were not aware that oxygen gas is a product of photosynthesis. Moreover, some wrote “soil” and “manure” without knowing that manure contains some nutrients which help the plant to grow. Likewise, some of them wrote “pollination”, “heat”, “animals” and “chemicals” due to lack of awareness that pollination is the process through which pollen grains from the anther of the flower are transported to the female stigma of the same or different flower. Generally, those candidates failed to realize that heat, animals and chemicals are not raw materials which are needed for photosynthesis. Extract 41.2 provides a sample of the incorrect response given by one of the candidates who attempted this question.



Extract41.2: A sample of incorrect response to question 41

In extract 41.2 the candidates mentioned starch failed to realize that starch is not requirements for photosynthesis.

Question 42: A pregnant mother was instructed by the doctor when attending maternity clinic that in the first three months after delivery, she should breastfeed her child instead of using powdered milk. Why was she given this advice?

The question assessed the candidates' competence to apply health principles for good health specifically, understanding the importance of breast feeding to a child within the first three months instead of using powdered milk. The candidates' performance in this question was good since 77.6 per cent of the candidates responded correctly while 22.4 per cent failed. Figure 21. shows the statistics of the candidates' performance on this question.

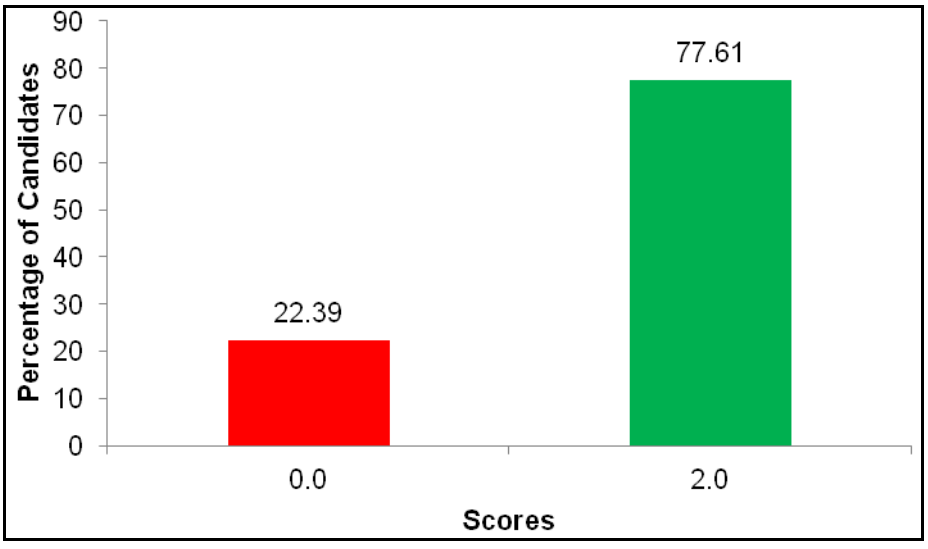
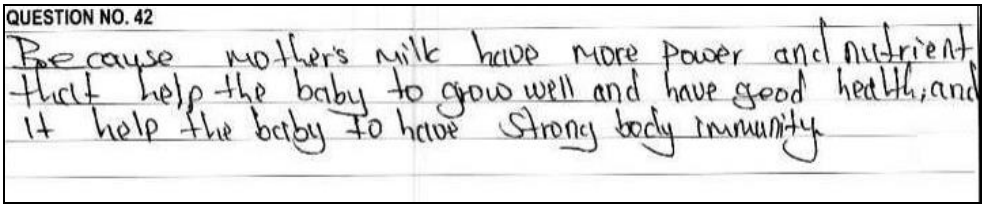


Figure 21: Candidates' Performance on question 42

The analysis of candidates' responses shows that 859,733 (77.6 %) candidates managed to provide the correct answer and scored all 02 marks. These candidates explained well the importance of breast feeding for the child because it contains all necessary nutrients for the child's growth especially for the development of the child's body immunity. Extract 42.1 provides a sample of a correct the response from one of the candidates.

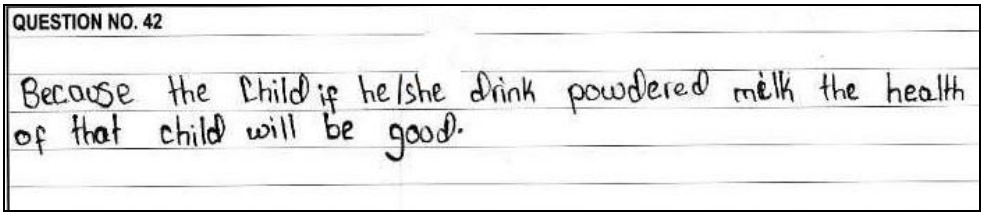

QUESTION NO. 42

Because mother's milk have more power and nutrient that help the baby to grow well and have good health; and it help the baby to have strong body immunity

Extract 42.1: A sample of correct answer in question 42.

Extract 42.1 shows that the candidate had enough knowledge about the importance of the mother's milk to a child.

However, 248,067 candidates equivalent to 22.4 per cent scored 0 marks. Some of these candidates wrote that the breast feeding should be done to the child because the baby is affected with diseases. They failed to understand that, breast feeding is given to the child in order to protect them against diseases. Also, others responded that, by giving the reason that children do not eat food. Such candidates were not aware that breast feeding considered to be a balanced diet which provides all nutrients required like carbohydrates, proteins, vitamins, water, fats and mineral salts. Generally, they lacked knowledge that mother's milk is needed to strengthen the health of a child because it contains all nutrients required for the child's growth. Extract 42.2 provides a sample of an incorrect response.


QUESTION NO. 42

Because the child if he/she drink powdered milk the health of that child will be good.

Extract 42.2: Sample of incorrect response in question 42.

In extract 42.2, the candidate provided an incorrect reason that the health of the child will be good if he/she drinks powdered milk.

Question 43: If a pupil connected a circuit which has the potential difference of 12 Volts and the current of 3A is flowing in it; find the resistance in the circuit.

The question measured the candidates' ability to calculate resistance in a circuit. Statistics show that, the candidates' performance on this question was weak since 62.2 per cent of the candidates scored 0 to 0.5 marks. A few candidates (37.8%) scored 01 to 02 marks. Figure 22 indicates the analysis of the candidates' performance on this question.

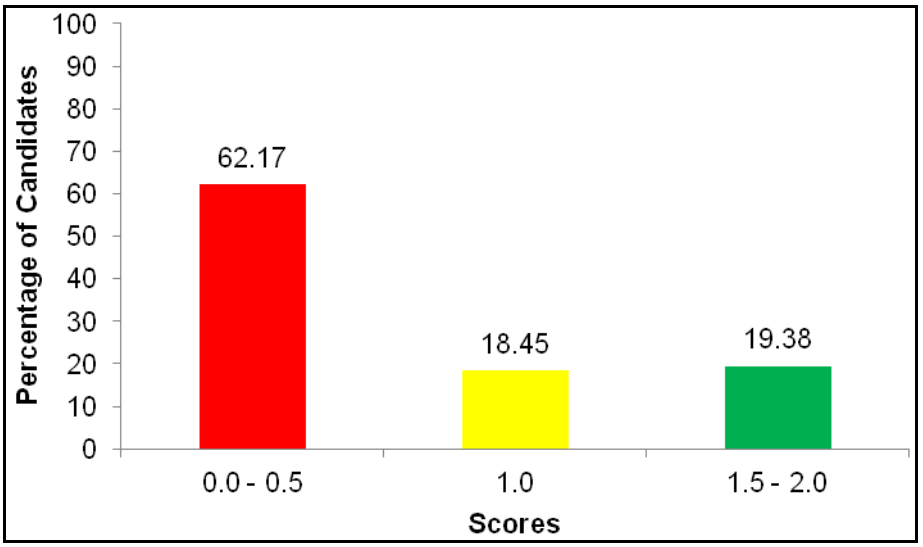
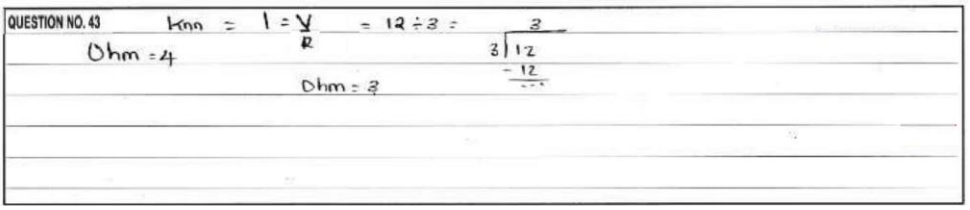


Figure 22: Candidates' Performance on question 41

The data in Figure 22 indicate that a total of 419,918 candidates corresponding to 37.9 per cent scored 0 mark. These candidates lacked knowledge to calculate the resistance by using the formula $R=\frac{V}{I}$. Most of them were not competent as they lacked arithmetic skills in applying the formula and making correct

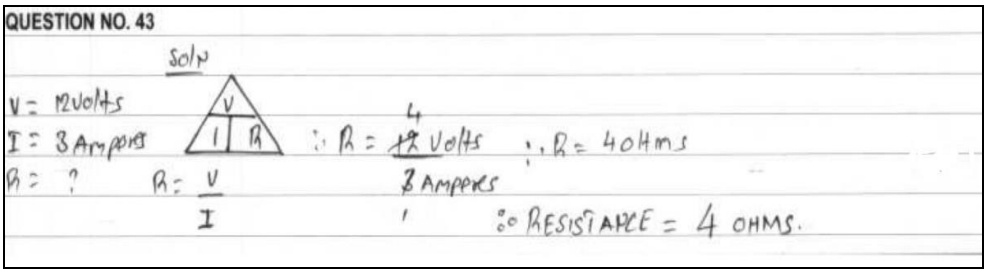
manipulation of data to get the required answer. Some of the candidates applied the incorrect because instead of dividing voltage by current as seen in the formula $R=\frac{V}{I}$, they applied the formula like $I=V\times R$ and $R=\frac{I}{V}$. Others wrote; $I=\frac{V}{R}=\frac{12}{3}=4\ A$ which is the formula to find electric current not resistance. Nevertheless, some of them wrote incorrect answers like 4 kg, 5 volts, 14 Ohm and 15 A without performing any calculations. All these incorrect responses justify that they lacked numerical skills especially to determine the resistance in the circuit. It also, suggest that, they did not understand the S.I unit of resistance which is Ohm (Ω). Extract 43.1 is a sample of poor response given by one of the candidates in this question.



Extract No. 43.1: A sample of incorrect response in question 43.

Extract 43.1 displays the response of a candidate who applied incorrect formula but also he/she was not accurate in dividing the data ended with incorrect answer.

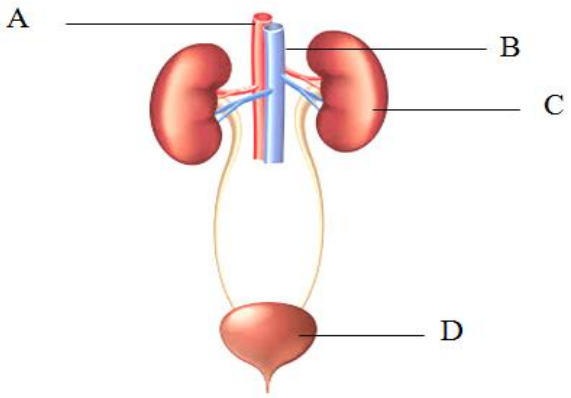
Further analysis reveals that, small number 198,044 (17.9.%) of candidates were able to answer this question correctly and scored 2 marks. Those candidates demonstrated their competency to calculate the resistance in the circuit by applying the correct formula which is $R=\frac{V}{I}$. Lastly, they were able to substitute the values correctly to get the required answer which is 4 Ohm. Extract 43.2 shows a sample of a good response from one of the candidates.



Extract No. 43.2: A sample of correct response in question 43.

Extract No. 43.2 shows the response of a candidate who managed to write the correct formula and substituted the given values correctly to obtain the correct answer.

Question 44: Observe the following figure and then answer the questions that follow:



(a) What are the functions performed by the parts labelled A and B.

(b) What is the relationship of the part labelled C and the one labelled D in performing their functions?

This question was divided into two parts (a) and (b). Part (a) assessed the candidates' competence in identifying the function of the parts labelled A and B in the human urinary system as shown in the figure. Part (b) measured the candidates' competence in identifying the relationship between the parts labeled C and D in performing their functions.

The performance of the candidates on this question was weak since more than two thirds (89.9%) of the candidates scored below 01 mark. However, few 111,738 (10.1%) candidates responded correctly as they scored marks ranging from 1 to 2 marks. Figure.23 shows the statistics of candidates' performance in this question.

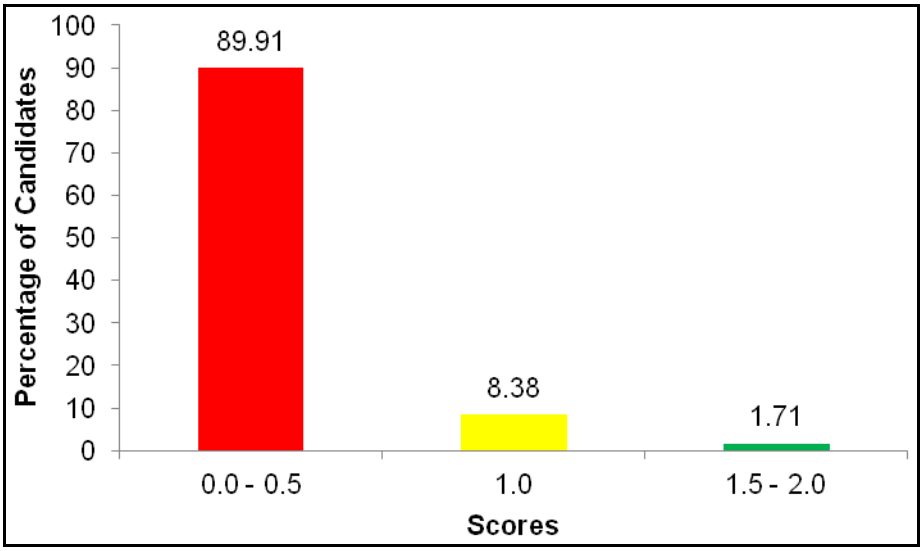
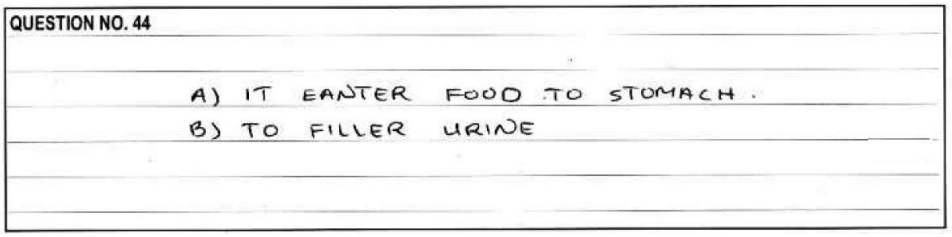


Figure 23: Candidates' Performance on Question 44

Data analysis in Figure.23 reveals that 996,062 candidates equivalent to 89.91 per cent failed to answer this question correctly. Hence scored 0 to 1 marks various reasons. For example, some of them wrote the functions of the parts represented by letters A and B which is to filter urine while that of letter C and D is to filter poison. Those candidates lacked the knowledge that filtering urine is done by the kidney and not by the part indicated by letters A and B because those parts are the blood vessels which carry blood towards and away from the kidney. Also the function of filtering poison is done by the liver and not by the part marked by letter C (kidney) and letter D (urine bladder).

Some of the candidates provided incorrect responses as they showed that letter C represents the fallopian tube whose function is to store female gametes from the male. These candidates

misconceived that reproductive system with the urinary system. Fallopian tubes are found in female reproductive system. Also, other candidates wrote that. Those candidates confused the respiratory system with the urinary system. Carbon dioxide gas and oxygen gas are taken in and out by the lungs. Extract 44.1 provides a sample of incorrect response from one of the candidates.


QUESTION NO. 44

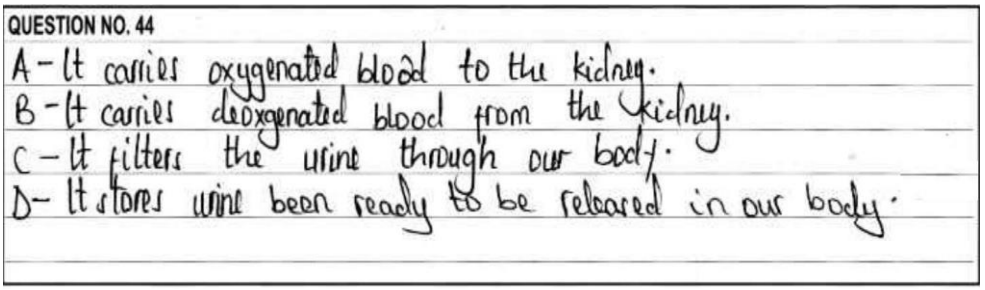
A) IT EANTER FOOD TO STOMACH.

B) TO FILLER URINE

Extract 44.1: A sample of an incorrect response in question 44.

Extract 44.1 shows that, the candidate identified the labelled A, as the aesophagus of the alimental canal.

On the other hand, 12,168 (1.1%) candidates responded correctly to this question and scored 2 marks. Those candidates had enough knowledge about the human urinary system as they managed to identify the part labelled by letter A that is a blood vessel which takes blood from the kidney to the heart. They also recognized that, the part labelled by letter B is a blood vessel whose function is to carry blood from the heart to the kidney. Moreover, they demonstrated their competence in explaining the relationship between the parts labeled by letter C (kidney) and D (urinary bladder). They explained that kidney filters blood waste-product which is temporarily stored in the urinary bladder. Extract No. 44.2 show the sample of a correct response given by one of the candidates.


QUESTION NO. 44
A - It carries oxygenated blood to the kidney.
B - It carries deoxygenated blood from the kidney.
C - It filters the urine through our body.
D - It stores urine been ready to be released in our body.

Extract No. 44.2: A sample of a correct response to question 44.

Extract 44.2 shows that the candidate was knowledgeable enough to explain the functions of some parts labeled by the letter A and B and to identify the relationship between the kidney and the urinary bladder.

Question 45: Health specialists insist that, people should frequently do physical exercises. Why is it important to adhere to this advice?

This question assessed the candidates' competency on maintaining health and the environment specifically on applying health principles for good health. The data analysis shows that, 1,004,965 (90.72%) candidates managed to answer this question correctly while 102,835 (9.28%) failed. This shows that, the performance of the candidates in this question is good as summarized in Figure 24.

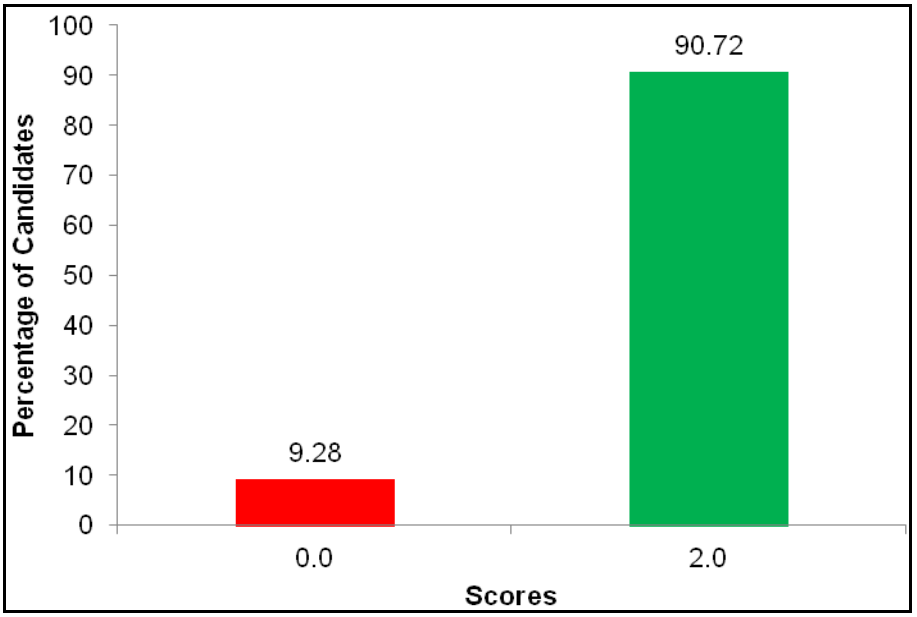
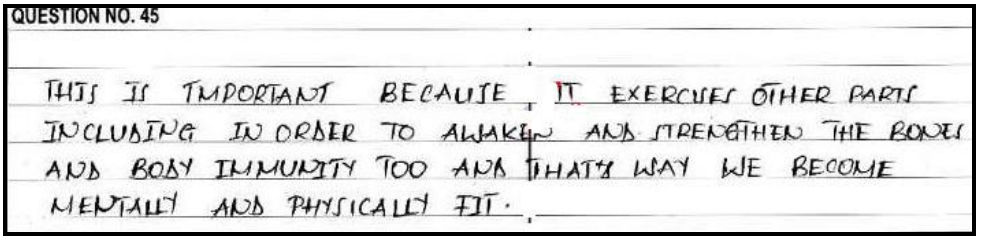


Figure 24: Candidates' Performance on Question 45

Statistics in Figure 24 reveal that 90.72 per cent of the candidates scored all the 2 marks allocated to this question. These candidates explained correctly the importance of doing physical exercises frequently which is to help in strengthening the body health by improving body immunity. This implies that, most of them had good understanding on applying health principles for good health. Extract 44.1 gives a sample of a correct response from one of the candidates.


QUESTION NO. 45

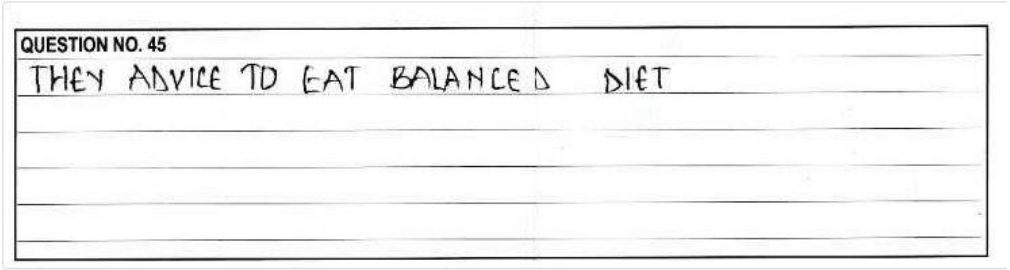
THIS IS TMPORTANT BECAUSE IT EXERCISES OTHER PARTS INCLUDING IN ORDER TO AWAKEN AND STRENGTHEN THE BONES AND BODY IMMUNITY TOO AND THATS WAY WE BECOME MENTALLY AND PHYSICALLY FIT.

Extract 45.1: A sample of a correct response to question 45.

Extract 45.1 shows the response of a candidate who correctly explained the advantages of doing physical exercises frequently.

On the other hand, 102,835 (9.28%) candidates failed to provide the correct response and therefore, scored 0 marks. Those candidates

lacked competence in applying daily life experience to reason why people are insisted to do physical exercises. For example, some of them wrote; *in order to give the body energy, causes to get blood pressure* and *in order to prevent opportunistic diseases.* These responses show that those candidates did not understand that physical exercises strengthen body health. However, they lacked knowledge that opportunistic diseases takes opportunity after a person has been infected by another disease such as HIV/AIDS, and thus it can be prevented by eating green vegetables and fruits. Also, other candidates wrote *physical body exercises causes chest pain*. These candidates failed to understand that chest pain may be caused by a fault in the respiratory system such as asthma and chest wound. Extract 45.2 provides a sample of an incorrect response from one of the candidates.



Extract 45.2: A Sample of an incorrect response to question 45.

Extract 45.2 shows that the candidate lacked knowledge about the importance of performing physical body exercises.

3.0 ANALYSIS OF THE CANDIDATES' PERFORMANCE ON EACH COMPETENCE

The Science and Technology subject paper assessed the competences in Health Care and Environment, Understanding the Basics of Science and Technology and Performing Scientific Investigations and Technological Discovery.

The analysis of statistics 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 52.10, 51.18 na 43.78 per cent, respectively. The summary of the performance of the candidates has been shown in Appendix A in each competence. Furthermore, the candidates achieved the highest performances of 90.72 in question 45 while question 39 had the least performance of 12.05 per cent.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 CONCLUSION

The general performance of the candidates for the 05 Science and Technology subject in 2021 Primary School Leaving Examination was good since 83.27 per cent of the candidates passed the examination. The good performance of the candidates was contributed by candidates' possession of competences in investigating things that are found in their environment, applying information and communication technology and applying cleanliness principles for health and good environment. Also, they had good reading and writing skills and ability to understand the questions. However, a few number of pupils (16.73%) failed to give correct responses due to inadequate mastery of the assessed competences. Some pupils encountered problems in understanding the demand of the questions and others showed lack of reading and writing skills.

4.2 RECOMMENDATIONS

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

(a) Teachers should guide students to perform different experiments while teaching the competences in Performing Scientific Investigations and Technological Discovery. This will help the candidates to understand and have long term memory. Also, the competences should be taught by relating daily life environment such as the occurrence of rainbow and images on mirrors.

(b) Teachers should use the approach of learning by doing like asking pupils arrange groups of natural foodstuffs and using charts to show different health care practices. All these will enhance pupils' mastery of the subject

(c) Teachers should use improvised locally available materials such as mobile phones and televisions in teaching Science and Technology concepts particularly in teaching Information and Communication Technologies. This will improve pupils' competences in the area of Science and Technology and will ultimately improve performance in future examinations.

APPENDIX A

PERFORMANCE PER COMPETENCE EXAMINED IN PSLE 2021

S/n	Main Competency	Specific Competency	PSLE 2021			
			Performance on each Question		Average Performance (%)	Remarks
			Question Number	% Performance		
1	Performing Investigations and Discoveries in Science and Technology	Investigating Various Things in the Environment	7	54.59	52.10	Average
			8	71.60		
			9	81.48		
			41	64.09		
		Identifying Various Types of Energy and Their Uses	5	55.04		
			10	57.77		
			11	54.90		
			12	54.07		
			13	55.00		
			14	38.24		
			23	55.15		
			26	58.79		
			27	57.63		
			29	46.83		
		Identifying Scientific Experiments Correctly	15	61.55		
			16	33.36		
			39	12.05		
			40	25.57		
2	Maintaining Health and the Environment	Applying Principles of Hygiene for Good health and Environment	3	21.42	51.18	Average
			31	83.04		
			32	72.54		
			33	32.22		
			34	72.78		
			35	46.62		
			36	52.82		
			37	54.96		
			42	77.61		
			45	90.72		
			30	73.33		
		Identifying Various systems of the	1	38.64		
			2	21.42		

		Human boy	4	57.93		
			6	41.37		
			38	22.6		
			44	10.09		
3	Applying Fundamentals of Science and Technology	Performing Scientific Experiments Correctly	28	58.79	43.78	Average
		Mastering Scientific Skills	24	32.57		
			25	71.06		
			43	37.83		
		Applying Information and Communication Technology (ICT)	17	39.55		
			18	66.04		
			19	31.60		
			20	15.48		
			21	35.73		
			22	49.17		