THE NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

CANDIDATES' ITEM RESPONSE ANALYSIS REPORT FOR PRIMARY SCHOOL LEAVING EXAMINATION (PSLE) 2018

SCIENCE

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PREFACE

This report on the analysis of candidates' responses to the Primary School Leaving Examination (PSLE 2018) in Science subject has been prepared to highlight challenges facing candidates in attempting national examinations. It gives feedback to all education stakeholders (pupils, teachers, policy makers, curriculum developers and quality assurance officers) on how candidates responded to examination items. The report indicates the number and percentage of candidates who chose each of the given options, those who were unable to answer correctly, those who did not answer according to instructions and those who omitted some items or gave more than one answer for a single item. The extracts for poor and good responses for questions 41 – 45 are also provided.

In general, the analysis shows that good performance of the candidates was due to having adequate knowledge on the tested topics, ability to identify the demands of the questions, ability to relate knowledge learnt in class to everyday life situations and arithmetic skills. However, few candidates with low scores were incompetent in those areas.

The Examinations Council expects that the feedback provided in this report will enable education stakeholders to take necessary steps towards improving the teaching and learning of science subject so as to improve the performance in future Examinations. Finally, the National Examinations Council of Tanzania would like to express sincere gratitude to the Examination Officers and all others who contributed to the preparation of this report.

Dr. Charles E. Msonde

EXECUTIVE SECRETARY

1.0 INTRODUCTION

The Primary School Leaving Examination (PSLE) 2018 in Science subject was held on 6th of September. The number of candidates registered were 957,904, out of which 944,144 (98. 6%) sat for the examination. Analysis of the candidates' performance in the Science subject examination indicates that 722,885 (76.6**%**) candidates passed the examination. This performance represents an increase of 4.0% when compared to the PSLE of 2017, in which, 660,640 (72.6%) candidates passed. However, this analysis does not involve 6,424 candidates who attempted supplementary examination.

In PSLE 2018, the science examination paper consisted of sections A and B with a total of 45 questions from 8 topics. Section A consisted of 40 multiple choices questions in which candidates were required to answer all questions by choosing the correct answer and shade its respective letter on special answer sheets (OMR) provided. The analysis of candidates' answers in this section was done according to their choices: A, B, C, D and E. It also considered explaining possible reasons for choices made in each question. The letter of the correct answer has been marked with a star (*) in tables and charts. Furthermore, the percentage of candidates who did not follow instructions on how to answer the questions has been included in this analysis under the heading 'others' as indicated in the respective tables and charts.

Section B consisted of 5 short answer questions; candidates were required to answer by filling in the blank space provided. The analysis of candidates' answers in this section was based on the quality of candidate's responses and their performance in a particular question. Extracts of poor and good responses of the candidates have been used to show ability of candidates in responding to questions. Statistics

which shows performance of the candidates in each question are presented using charts.

2.0 ANALYSIS OF CANDIDATES' ANSWERS

2.1 Section A: Multiple Choice

Question 1: Which pair is correct about reproductive parts in plants and animals?

A Pollen grain in plants and sperms in animals
B Filament in plants and fallopian tube in animals
C Fruit in plants and testes in animals
D Flower in plants and uterus in animals
E Seeds in plants and ovary in animals.

The question intended to measure candidates' ability in identifying the reproductive parts in plants and animals. Figure 1 shows that, the performance of the candidates in this question was poor since 76.8 per cent which is equivalent to 720,753 candidates opted for incorrect responses A, C, D and E instead of the correct answer B.

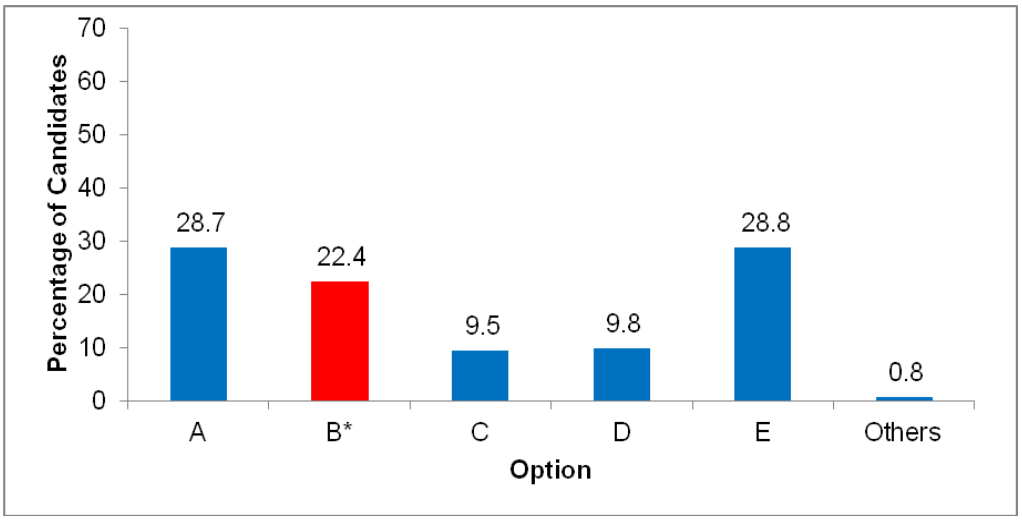

Figure 1: Candidates' performance in question 1

The candidates who opted for incorrect answers did not know that seeds, fruit, pollen grain and sperm are not parts of the reproductive system. They did not realize that seed and fruit results from reproduction in plants. Also, pollen and sperm are reproductive cells while flowers represent the general reproductive system in plants.

However, 22.4 per cent which is equivalent to 210,492 candidates opted for the correct response B, *filament in plants and fallopian tubes in animals.* These candidates were aware that filament is a male reproductive part in plants that holds anthers while fallopian tube is a female reproductive part in animals that allows the ova produced in ovaries to pass through to the uterus.

Question 2: In order for plants to continue living in their environment they need

A air and soil
B air and water
C soil and fertilizer
D soil and water
E temperature and air.

Table 1: Number and Percentage of Candidates in each Option

Option	**A**	**B***	**C**	**D**	**E**	**Others**
No. of Candidates	62,542	627,458	36,523	90,312	117,366	3,757
% of Candidates	6.7	66.9	3.9	9.6	12.5	0.4

This question intended to measure candidates` ability to identify the requirements for plants to continue living in their environment. Statistics in Table 1 shows that, the candidates' performance in this

question was good as 627,458 (66.9%) candidates opted for the correct answer B, *air and water.* These candidates had sufficient knowledge on the importance of air and water for the life of plants. Plants need carbon dioxide and water for photosynthesis process. They also need oxygen gas for respiration.

Further analysis indicates that 306,743 (32.7%) candidates opted for incorrect options A, C, D and E instead of the correct answer B. These candidates did not realize that soil is not the key requirement for plants as some of the plants can grow in water. In addition the candidates did not recognize that optimum temperature is required for survival of plants in their environment.

Question 3: Rice plants reproduce by using

A leaves
B seeds
C roots
D trunks
E branches.

Table 2: Number and Percentage of Candidates in each Option

Option	**A**	**B***	**C**	**D**	**E**	**Others**
No. of Candidates	138,280	420,992	107,933	138,307	126,473	5,973
% of Candidates	14.7	44.9	11.5	14.7	13.5	0.6

This question intended to measure the understanding of candidates on the concept of reproduction in plants particularly in rice plants. The performance in this question was average since 420,992 (44.9%) candidates opted for the correct answer B, *seed*. These candidates knew that rice reproduce by seeds.

However, 510,993 (54.5%) candidates opted for distractors A, C, D and E. These candidates did not know that leaves, trunks and roots of rice plants are not involved in reproduction. The role of leaves in plants is to manufacture food through photosynthesis, while roots absorb water and mineral salts from the soil to the trunk and leaves. Moreover, rice plants do not have branches as branches are found in large plants like trees.

Question 4: Which group represents animals with backbone?

A Snake, scorpion, spider and crocodile.

B Snail, snake, monitor lizard and fish.

C Monitor lizard, snake, spider and fish.

D Snail, fish, frog and crocodile.

E Lizard, snake, monitor lizard and crocodile.

Table 3: Number and Percentage of Candidates in each Option

Option	A	B	C	D	E*	Others
No. of Candidates	55,035	64,837	53,345	183,020	575,884	5,837
% of Candidates	5.9	6.9	5.7	19.5	61.4	0.6

This question intended to measure the ability of candidates in identifying animals with backbone in the groups provided. The performance in this question was average since 575,884 (61.4%) candidates opted for the correct answer E*, Lizard, snake, monitor lizard and crocodile*. These candidates had sufficient knowledge on the topic which enabled them to distinguish between animals with and without backbone.

Further analysis shows that, 356,237 (38%) candidates opted for distractors A, B, C and D. Among them, 247,857 (26%) candidates opted for D and B, since they did not understand that a snail is an

animal with soft body and without backbone. Also, 108,380 (11.6%) candidates who opted for A and C did not know that scorpion and spider are animals with pairs of jointed appendages without backbone.

Question 5: Larvae is one of a growth stage of

A bee
B tsetse fly
C jigger
D cockroach
E butterfly.

Table 4: Number and Percentage of Candidates in each Option

Option	**A**	**B**	**C**	**D**	**E***	**Others**
No. of Candidates	78,140	73,636	83,540	86,839	609,686	6117
% of Candidates	8.3	7.9	8.9	9.3	65.0	0.7

This question aimed at measuring candidates' understanding on the growth stages of insects. The candidates` performance in this question was good as 609,686 (65.0%) candidates opted for the correct answer E, *butterfly.* These candidates had sufficient knowledge that larva which is caterpillar, is one of the growth stages in butterfly. Butterfly undergoes four growth stages namely; egg, larva (caterpillar), pupa and adult butterfly. Each stage in their growth is accompanied by unique behaviours. The butterfly at caterpillar stage is characterized by quick locomotion to search for food from the leaves of plants such as maize and beans.

Further analysis shows that, 322,155 (34.4%) candidates opted for incorrect responses A, B, C and D. These candidates did not know

that insects in those distractors lack larva stage known as caterpillar in their growth, their larva stage is called nymph. For example, the growth of cockroach passes through three stages namely; egg, nymph and cockroach.

Question 6: Which of the following are characteristics of living things?

A Growth, respiration, synthesis of food, movement.
B Growth, respiration, sleeping, movement.
C Growth, respiration, movement and reproduction.
D Growth, sight, movement and reproduction.
E Growth, synthesis of food, movement and reproduction.

Table 5: Number and Percentage of Candidates in each Option

Option	A	B	C*	D	E	Other
No. of Candidates	67,385	35,377	657,247	41,404	131,926	4,619
% of Candidates	7.2	3.8	70.1	4.4	14.1	0.5

This question aimed to test candidates' understanding on identifying the characteristics of living things. The performance in this question was good since 657,247 (70.1%) candidates opted for the correct answer C, *Growth, respiration, movement and reproduction.* These candidates had sufficient knowledge about characteristics of living things which are growth, respiration, movement, reproduction, sensitivity, nutrition and excretion.

However, 276,092 (29.4%) candidates opted for distractors A, B, D and E. Candidates who opted for distractors A and E, did not realize

that synthesis of food is a characteristic of plants and some few other organisms. Candidates who opted for distractors B and D were not aware that sleeping and sight are behaviours of some few animals only.

Question 7: Electricity is caused by the flow of

A electrons
B protons
C neutrons
D charge
E atoms.

Table 6: Number and Percentage of the Candidates in each Option

Option	**A***	**B**	**C**	**D**	**E**	**Others**
No. of Candidates	527,595	47,604	120,890	135,071	99,353	7,445
% of Candidates	56.2	5.1	12.9	14.4	10.6	0.8

This question intended to measure the candidates' understanding on the formation of electricity. The performance of candidates in this question was average since 527,595 (56.2%) candidates chose the correct answer A*, electrons*. These candidates knew that electricity is the flow of electrons through a conductor like wire when connected to the source of electricity.

However, 402,918 (43%) candidates opted for distractors B, C, D and E. These candidates did not realize that, an atom is the smallest particle of an element made up of neutron, proton and electron. What flows are the electrons and not protons, neutron or the whole

atom. Also, a charge can either be negative (electron) or positive (proton) but the positive charge does not produce electricity.

Question 8: Which of the following is a characteristic of chameleon?

A Change of the tune of its sound.

B Selects certain types of food.

C Changes its body colour.

D Does not excrete wastes

E Changes motion

This question aimed to measure candidates' understanding on the characteristics of a chameleon. Figure 2 shows that, 90.1 per cent which is equivalent to 844,772 candidates opted for the correct answer C, *Changes its body colour*. This question had good performed as compared to other questions in this paper. The candidates were aware that chameleon changes its colour by absorbing the colour of the environment for protection against enemies.

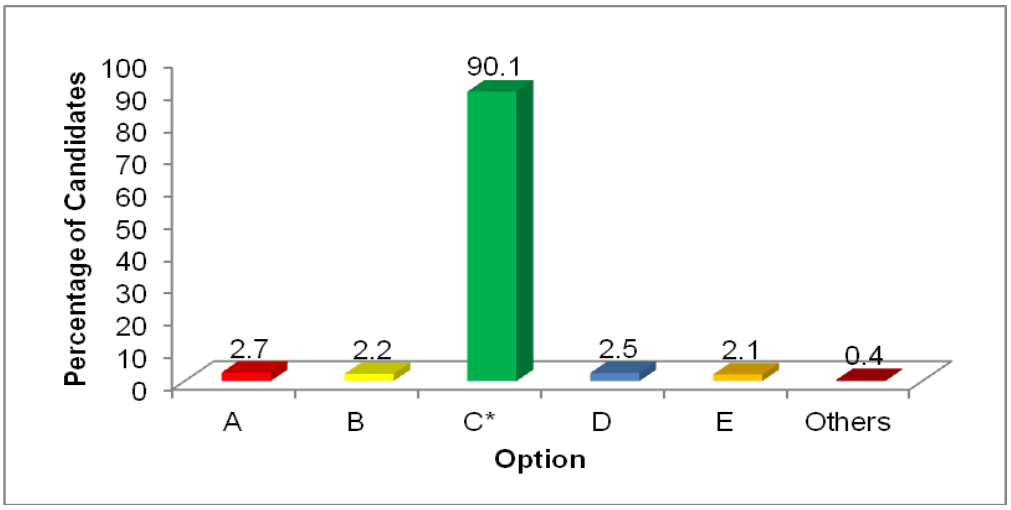

Figure 2: Candidates'' performance in question 8

However, few candidates 9.5 per cent equivalent to 89,751 candidates opted for incorrect responses A, B, D and E. The candidates' who opted for A, *Change of the tune of its sound*, B, *Selects certain types of food and* E, *Changes motion* failed to realise that those behaviours are also found in other animals. On the other hand, those who opted for D, *Does not excrete wastes* did not realize the fact that, excretion is not a distinguishing characteristic of chameleon as all living thing excrete wastes.

Question 9: Which among the following is a mammal?

A Snail.

B Duck.

C Bat.

D Lizard.

E Frog.

Table 7: Number and Percentage of Candidates in each Option

Option	**A**	**B**	**C***	**D**	**E**	**Others**
No. of Candidates	40,503	54,208	720,998	49,532	67,724	4,993
% of Candidates	4.3	5.8	76.9	5.3	7.2	0.5

The question intended to measure the candidates' ability to identify an animal found in the group of mammals. The candidates `performance in this question was good since 720,998 (76.9%) candidates opted for the correct response C, *Bat*. These candidates had sufficient knowledge about the characteristics of mammals. They recognized that the main characteristic of mammals is having mammary glands. Therefore they were able to identify the bat as a mammal.

However, 211,967 (22.9%) candidates who opted for distractors A, *Snail,* B, *Duck,* D, *Lizard,* and E, *Frog* did not realize that the animals in these distractors lay eggs and do not have mammary glands so they are not mammals.

Question 10: Which of the following is not a function of roots in plants?

A To absorb mineral salt
B To absorb water
C To hold the plant
D To manufacture food for plant
E To store plant food.

Table 8: Number and Percentage of Candidates in each Option

Option	**A**	**B**	**C**	**D***	**E**	**Others**
No. of Candidates	223,441	71,445	78,758	387,265	170,199	6,850
% of Candidates	23.8	7.6	8.4	41.3	18.1	0.7

The question aimed to measure the candidates' understanding on the plant parts and their functions. Table 8 shows that, the performance in this question was average since 387,265 (41.3%) candidates chose the correct answer D, *To manufacture food for plants*. These candidates were aware that plant roots are not concerned with manufacturing food since that process occurs in the leaves.

On the other hand, 544,843 (57.9%) candidates opted for incorrect responses A, *To absorb mineral salt*, B, *To absorb water*, C, *To hold*

the plant and E, *To store plant food*. These candidates did not understand the demand of the question since all the mentioned functions in distractors are performed by the roots.

Question 11: Which gas is reduced from the atmosphere by plants?

A Carbon dioxide.

B Oxygen.

C Hydrogen.

D Carbon monoxide

E Nitrogen.

Table 9: Number and Percentage of Candidates in each Option

Option	A*	B	C	D	E	Others
No. of Candidates	419,778	163,479	90,721	82,111	173,003	8,866
% of Candidates	44.8	17.4	9.7	8.8	18.4	1.0

The question aimed to measure the candidates' understanding on the type of gas used by plants during photosynthesis. Statistics show that, the performance in this question was average since 419,778 (44.8%) candidates opted for the correct answer A, *Carbon dioxide.* These candidates knew that plants use atmospheric carbon dioxide for photosynthesis. This process tends to reduce carbon dioxide from the atmosphere as its accumulation leads to green-house effect and hence climate change.

Further, analysis shows that, 509,314 (54.3%) candidates opted for the incorrect responses B, C, D and E. These candidates did not know that during photosynthesis, plants use carbon dioxide from the atmosphere and not the other gases.

Question 12: What is to be done to make water safe for drinking?

A boiled and covered

B filtered by using clean cloth and kept

C boiled, filtered and preserved

D kept under the sunlight for the whole day and cooled

E putting in earthen pot and covered

Table 10: Number and Percentage of Candidates in each Option

Option	A	B	C*	D	E	Others
No. of Candidates	37,502	22,781	832,546	23,066	18,321	3,742
% of Candidates	4.0	2.4	88.8	2.5	2.0	0.4

This question intended to measure candidates' understanding on the steps to be followed when preparing safe water for drinking. The data show that, the performance in this question was good since 832,546 (88.8%) candidates chose the correct answer C, *boiled, filtered and preserved*. These candidates were aware that boiling, filtering and preservation of water helps to kill pathogens remove wastes and prevent contamination respectively.

However, 101,670 (10.8%) candidates opted for distractors A, B, D and E. These candidates were not aware of important steps to be followed when preparing safe drinking water as a result they opted for wrong response.

Question 13: The following are the essential needs for the life and growth of plants **except**

A artificial fertilizer

B water

C carbon dioxide gas

D sun light

E fertile soil.

Table 11: Number and Percentage of Candidates in each Option

Option	A*	B	C	D	E	Others
No. of Candidates	661,211	38,334	130,858	51,890	50,326	5,339
% of Candidates	70.5	4.1	14.0	5.5	5.4	0.6

This question intended to measure candidates' ability to identify essential needs for the life and growth of plants. The performance of the candidates in this question was good as 661,211 (70.5%) candidates chose the correct answer *A, artificial fertilizer*. These candidates could identify that plants need: water, carbon dioxide gas, sunlight and fertile soil for their life and growth. They also realised that, artificial fertilizers are not essential needs for the life and growth of plants, since organic fertilizers such as animal dung and composite manure can be used in place of artificial fertilizers.

On the other hand, a total of 271,408 (29.0%) candidates opted for distractors B, *water*; C, *carbon dioxide*, D, *sun light* and E, *fertile soil*. These candidates lacked knowledge on the essential needs for life and growth of plants. They also, did not understand the task of question which required them to choose from the given options, the need which was not essential for the life and growth of plants.

Question 14: The gas needed by the animals in order to live is

A oxygen

B carbon dioxide

C nitrogen

D hydrogen

E carbon monoxide.

Table 12: Number and Percentage of Candidates in each Option

Option	A*	B	C	D	E	Others
No. of Candidates	715,601	125,349	36,057	29,282	27,653	4,016
% of Candidates	76.3	13.4	3.8	3.1	2.9	0.5

The question intended to measure candidates' ability to identify the type of gas needed by animals in order to live. Generally, the performance of candidates in this question was good since 715,601 (76.3%) candidates opted for the correct answer *A*, *Oxygen.* These candidates were aware that all living things use oxygen gas in the process of respiration.

Nevertheless, 190,688 (20.3%) candidates chose distractors B, *Carbon dioxide*, C, *Nitrogen* and D, *Hydrogen*. These gases including oxygen constitute air but animals use only oxygen for life. However, 27,653 (2.9%) candidates who chose distractor E, *Carbon monoxide* lacked knowledge that this air if used by animals can cause death.

Question 15: A person who eats food which is very rich in fat is likely to get

A beriberi

B epilepsy

C high blood pressure

D diabetes

E low blood pressure.

Table 13: Number and Percentage of Candidates in each Option

Option	A	B	C*	D	E	Others
No. of Candidates	101,042	91,189	559,520	75,341	105,402	5,464
% of Candidates	10.8	9.7	59.7	8.0	11.2	0.5

The question tested candidates` understanding on the effects of eating food rich in fat. The performance in this question was average as 559,520 (59.7%) candidates chose the correct answer C, *high blood pressure.* These candidates knew that the fat in food tend to deposited in the blood vessels. This action reduces the diameter of the blood vessels and consequently causes high blood pressure.

However, a total of 372,974 (39.7%) candidates opted for incorrect responses A, *beriberi,* B, *epilepsy,* D*, diabetes* and E, *low blood pressure.* These candidates were not aware of the causes of different diseases. Low blood pressure is caused by other heart diseases and shortage of blood in the body. Also, beriberi is caused by deficit of vitamin B_1 in the body. Furthermore, epilepsy is a disorder in the nervous system not caused by eating foods. In addition, diabetes is caused by eating excess carbohydrates rich food and hereditarily.

Question 16: A disease caused by defects in the red blood cells is called

A Beriberi

B Sickle cell

C Cancer

D Diabetes

E Tuberculosis.

Table 14: Number and Percentage of Candidates in each Option

Option	A	B*	C	D	E	Others
No. of Candidates	50,190	646,947	139,369	48,403	47,998	5,051
% of Candidates	5.4	69.0	14.9	5.2	5.1	0.6

This question intended to measure candidates' ability to identify a disease caused by defects in the red blood cells. The candidates' performance in this question was good since 646,947 (69.0%) candidates selected the correct answer B, *sickle cell*. These candidates understood that sickle cell is a disorder that occurs when red blood cells are affected and deformed into a sickle like structure.

On the other hand, a total of 285,960 (30.6%) candidates opted for distractors A, *beriberi*, *C, cancer*, D, *diabetes* and *E, Tuberculosis.* These candidates lacked knowledge on the causes of other disease since beriberi is caused by lack of vitamin B_1. Likewise, cancer is a disease that affects any cell in the body but not necessarily blood cell. Moreover, diabetes is caused by failure of the insulin in controlling the level of blood sugar (glucose) in the body while tuberculosis is a bacterial disease that affects respiratory system particularly lungs.

Question 17: Which gas is lacking in the room with closed windows while there is charcoal fire?

A Hydrogen

B Carbon monoxide

C Carbon dioxide

D Oxygen

E Nitrogen.

The question aimed at assessing the ability of candidates' to identify the gas which will lack in a closed room and in it there is charcoal fire. The candidates` performance in this question was average since 60.6 per cent equivalent to 568,723 candidates chose the correct answer D, *Oxygen* as shown in Figure 3. These candidates were aware that charcoal, which is carbon burns by combining with oxygen to form carbon dioxide and carbon monoxide gases. The carbon monoxide gas produced combines with oxygen in the room to form carbondioxide. Thus, oxygen continues to diminish due to the reaction with carbon monoxide.

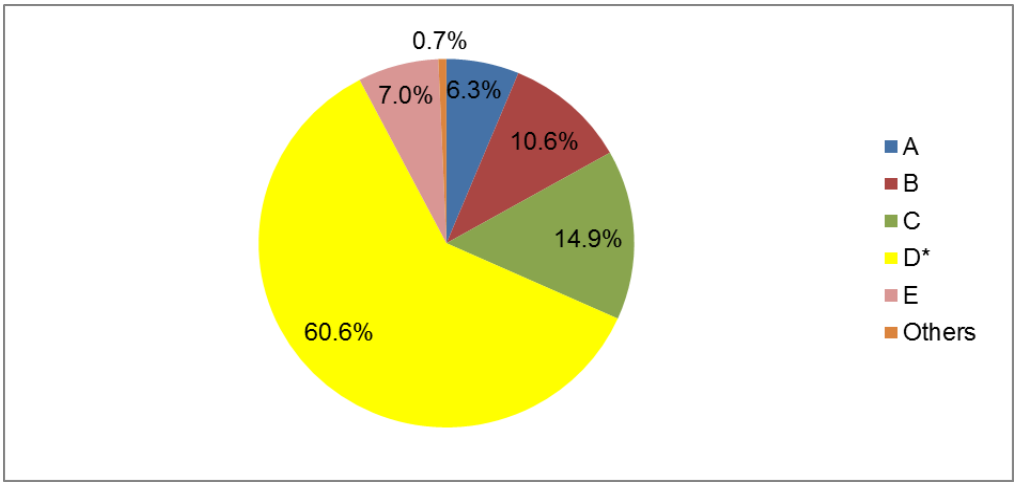

***Figure 3*:** Performance of the candidates in question 17

However, 38.8 per cent equivalent to 362,734 candidates opted for incorrect answers A, *hydrogen*, B, *carbon monoxide* C, *carbon dioxide* and E, *nitrogen*. These candidates lacked knowledge that carbondioxide and carbon monoxide gases are produced by burning charcoal in a room with closed windows. Also hydrogen and nitrogen gases are not involved in the combustion process; hence they cannot be affected by burning charcoal.

Question 18: What object can we use so as to make our images be seen clearly?

A Concave mirror
B Convex mirror
C Plane mirror
D Concave lens
E Convex lens.

Table 15: Number and Percentage of Candidates each Option

Option	**A**	**B**	**C***	**D**	**E**	**Others**
No. of Candidates	52,448	58,357	583,112	141,643	95,980	6,418
% of Candidates	5.6	6.2	62.2	15.1	10.2	0.7

This question aimed to measure the candidates' ability to identify the suitable device used to show clear image. The performance of the candidates in this question was average since 583,112 (62.2%) candidates opted for the correct answer C, *Plane mirror*. These candidates were aware that, plane mirrors form image of similar shape to that of the real object unlike the other mirrors. Also they

knew that lenses cannot form image since they have a property of allowing light to pass through.

However, a total of 348,428 (37.1%) candidates chose distractors A, *Concave mirror*, B, *Convex mirror*, D, *Concave lens* and E, *Convex lens*. These candidates did not understand that lenses cannot be used to form image of objects due to its property of refracting light rays. Also, plane mirror forms image of the similar shape with object unlike concave and convex mirrors.

Question 19: Why is it important to wash fruits before eating?

A to remove poison
B to remove germs
C to remove sap
D to remove bad smell
E to remove salts.

Table 16 : Number and Percentage of Candidates in each Option

Option	A	B*	C	D	E	Others
No. of Candidates	78,664	708,687	61,927	58,647	25,494	4,539
% of Candidates	8.4	75.6	6.6	6.3	2.7	0.5

This question intended to test the candidates understanding on the importance of washing fruits before eating. Table 16 shows that the performance of candidates was good since 708,687 (75.6%) candidates chose the correct response B, *to remove germs*. These candidates were aware that fruits need to be washed well before eating in order to remove germs.

On the other hand, 224,732 (24%) candidates opted for distractors A, *to remove poison*, C, *to remove sap,* D, *to remove bad smell* and E, *to remove salts.* These candidates did not know that sap, salts, bad smell and poisons on some fruits cannot be removed by washing.

Question 20: Which part of the digestive system involves the digestion of proteins?

A Mouth.
B Small intestine.
C Large intestine.
D Oesophagus.
E Stomach.

Table 17: Number and Percentage of Candidates in each Option

Option	A	B	C	D	E*	Others
No. of Candidates	171,731	368,368	120,034	88,126	181,853	7,846
% of Candidates	18.3	39.3	12.8	9.4	19.4	0.9

The question aimed at measuring candidates` ability to identify a part of the digestive system involved in the digestion of protein. The performance of the candidates in this question was poor since 748,259 (79.7%) candidates selected distractors A, *mouth*, B, *small intestine,* C*, Large intestine and D, Oesophogus* instead of the correct answer E, *Stomach.*

Candidates who opted for distractors A, B, C and D had insufficient knowledge that protein digestion occurs to the large extent in the stomach. The function of the mouth is to break food into small pieces by using teeth that can easily be swallowed for digestion. Small intestine absorbs different nutrients needed by the body.

Large intestine absorbs water, mineral salts and vitamins, while oesophagus is used as a passage of food to stomach.

However, a total of 181,853 (19.4%) candidates opted for the correct response E, *Stomach.* These candidates had sufficient knowledge on the functions of different parts of the digestive system. Thus, they were able to realize that digestion of protein takes place in the stomach.

Question 21: Which diseases are caused by malnutrition?

A Marasmus, kwashiorkor, rickets, goiter
B Obesity, diabetes, cough, diarrhea
C Marasmus, kwashiorkor, polio, yellow fever
D Rickets, trachoma, goiter, marasmus
E Bilhazia, malaria, tuberculosis, rickets.

Table 18: Number and Percentage of Candidates in each Option

Option	A*	B	C	D	E	Others
No. of Candidates	458,224	126,303	202,851	95,756	45,879	8,945
% of Candidates	48.9	13.5	21.6	10.2	4.9	0.9

The question intended to measure candidates` understanding on the diseases caused by malnutrition. Candidates` performance in this question was average since 458,224 (48.9%) candidates were able to select the correct response A, *Marasmus, kwashiorkor, rickets and goiter*. These candidates had adequate knowledge on the effects of malnutrition in the body. They were able to recognize that marasmus is caused by lack of sufficient nutrients that provide energy to the body. Kwashiorkor is caused by lack of protein.

Similarly, rickets occurs due to lack of vitamin D particularly to children and goitre is caused by shortage of iodine in the body.

On the other hand, 470,789 (50.2%) candidates opted for distractors B, *Obesity, diabetes, cough, diarrhoea;* C, *Marasmus, kwashiorkor, polio, yellow fever; D, Rickets, trachoma, goiter, marasmus* and E, *Bilhazia, malaria, tuberculosis, rickets.* These candidates could not realize that these distractors, contained communicable diseases like malaria, tuberculosis, bilhazia, trachoma and yellow fever which are not associated with lack of nutrients in the body.

Question 22: What is lost in excess when a person is suffering from diarhoea?

A Air.
B Water
C Proteins.
D Starch.
E Vitamins.

This question intended to measure candidates` understanding on the effects of diarrhoea in the body. The performance of the candidates in this question was good since 77 per cent equivalent to 722,396 candidates opted for the correct answer B*, water* as shown in Figure 4. These candidates had enough knowledge on the effects of diarrhoea. They realized that diarrhoea causes loss of water and not the other nutrients.

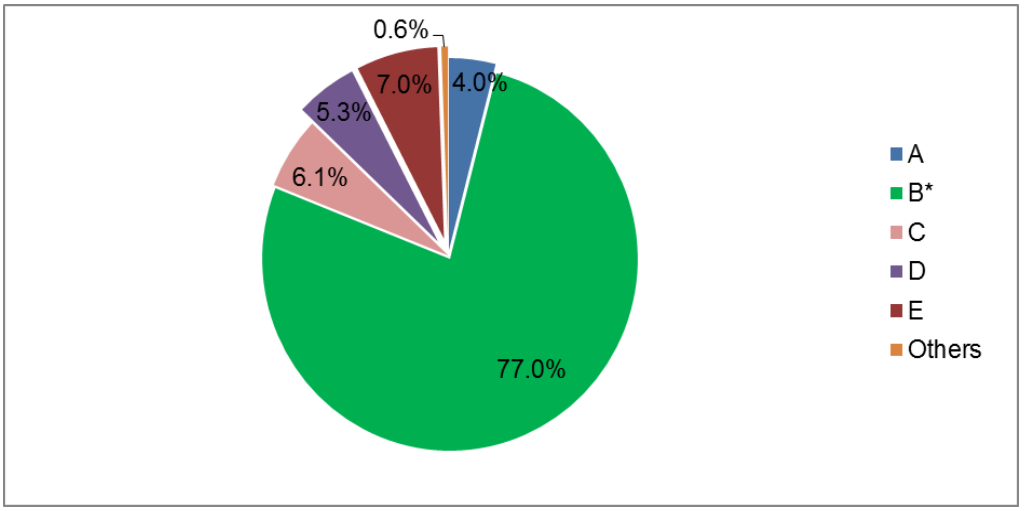

***Figure 4*:** Performance of the candidates in question 22

On the other hand, a total of 22.3 per cent equivalent to 210,255 candidates chose distractors A, *Air*, C; *Proteins*, D, Starch and E, *vitamins.* These candidates did not realize that diarhoea occurs once food has been digested and all the important nutrients have been absorbed. Therefore, what is taken out of the body is water and remains of undigested food.

Question 23: Which of the following nutrients is more preferred to children under five years?

A Starch, water and protein.

B Proteins, vitamins and salts.

C Salts, proteins and water.

D Vitamins, starch and water.

E Carbohydrates, water and salts.

The question assessed candidates` understanding on nutritional requirements for children under five years old. The performance of the candidates in this question was average since 47.9 per cent

equivalent to 449,352 candidates chose the correct response B, *Proteins, vitamins and salts* as shown in Figure 5. These candidates were aware that the role of protein is to build the body, vitamins are use to strengthen body immunity and salts helps to strengthen bones.

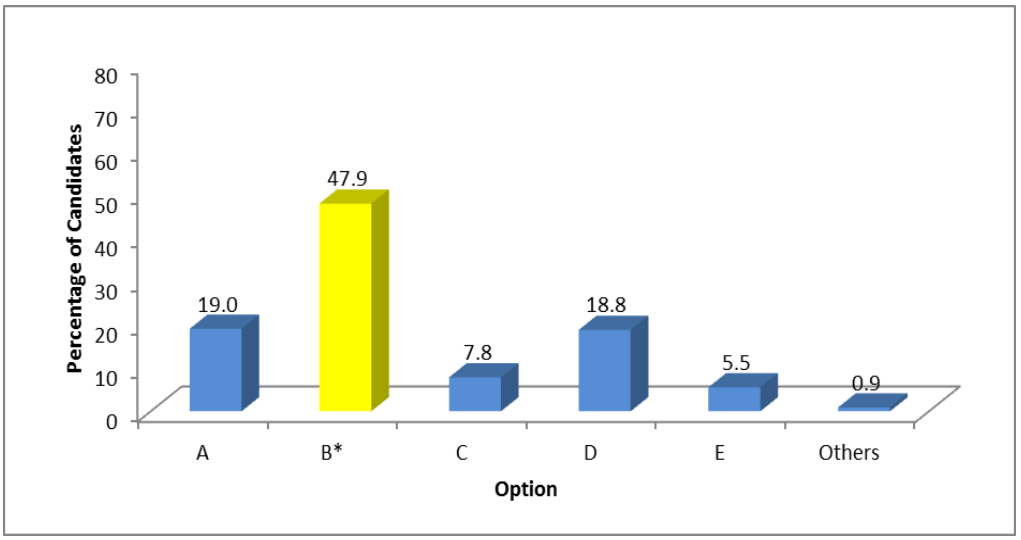

***Figure 5*:** Performance of the candidates in question 23.

On the other hand, 51 per cent 480,169 candidates chose incorrect responses A, *Starch, water and protein,* C, *Salts, proteins and water*, D, *Vitamins, starch and water* and E, *Carbohydrates*, *water and salts.* Candidates who opted for A and C were not aware that children need vitamins to strengthen body immunity against diseases. Also those who chose distractor D and E did not realize the significance of proteins to growing children.

Question 24: Which among the following diseases is caused by bacteria?

A Heart.

B Tuberculosis.

C AIDS.

D Bilharzia.

E Diabetes.

Table 19: Number and Percentage of Candidates in each Option

Option	A	B*	C	D	E	Others
No. of Candidates	34,131	551,141	95,579	215,087	36,214	5,806
% of Candidates	3.6	58.8	10.2	22.9	3.9	0.7

The question assessed the ability of the candidates to identify a disease caused by bacteria. The Performance in this question was average since 551,141 (58.8%) candidates chose the correct response B, *Tuberculosis.* These candidates had enough knowledge which enabled them to recognize the causes of different diseases. This enabled them to realize that tuberculosis is caused by bacteria.

On the other hand, a total of 381,011 (40.5%) candidates opted for incorrect responses A, *Heart*, *C, AIDS*, *D, Bilharzia* and *E, Diabetes.* The candidates who opted for distractor A, did not know that the heart is an organ and not a disease. Those who opted for distractor E, did not know that diabetes is not caused by germs instead it is caused by life styles and the eating of food rich in carbohydrates. Furthermore, candidates who opted for distractors C and D did not know that those diseases are caused by other germs apart from bacteria. AIDS is caused by Human Immunodeficiency Virus while

Bilharzia is caused by parasitic worms known as schistosoma living in dirty and stagnant water.

Question 25: Which of the following are found in the fire brigade vehicle?

A Oil tank, carbon dioxide gas and water.

B Water tank, carbon dioxide gas and oxygen gas.

C Fire brigade troop, water and carbon dioxide gas.

D Water tank, carbon monoxide tank and acetylene gas.

E Water tank, a tank of mixed gases and large coats.

Table 20: Number and Percentage of Candidates in each Option

Option	**A**	**B**	**C***	**D**	**E**	**Others**
No. of Candidates	167,308	229,367	336,876	113,438	81,663	9,306
% of Candidates	17.8	24.5	35.9	12.1	8.7	1.0

This question intended to test candidates' awareness on what is carried by the fire brigade vehicle. Generally, the performance in this question was average since 336,876 (35.9%) candidates opted for the correct answer C, *Fire brigade troop, water and carbon dioxide gas.* These candidates were aware that in the fire brigade vehicle, a fire brigade troop is needed as they are people specialized in fire fighting process. Also, water and carbon dioxide gas are fluids for fire fighting.

However, a total of 591,776 (63.1%) candidates chose distractors, A, B, D and E. These candidates did not know that some of the mentioned things in these options support fire and cannot be carried

in the fire brigade vehicle. For instance, oxygen supports combustion. Also oil and acetylene cannot be used as fire extinguisher because they are flammable when exposed to fire. Likewise, mixed gases can include flammable gases like oxygen.

Question 26: Which of the following sentences provide a meaning of first aid?

A An immediate help given to a person before going to hospital.

B An immediate help given to a person after arriving at the hospital.

C An immediate assistance given to a person after by a health practitioner.

D An assistance given to a person who fainted.

E An assistance given to a person who has been bitten by a snake.

Table 21: Number and Percentage of Candidates in each Option

Option	**A***	**B**	**C**	**D**	**E**	**Others**
No. of Candidates	795,746	47,041	39,138	27,641	24,061	4,331
% of Candidates	84.8	5.0	4.2	2.9	2.6	0.5

The question aimed to measure candidates' understanding on the meaning of First aid. Statistics shows that, the candidates` performance in this question was good since 795,746 (84.8%) candidates chose the correct answer A, *An immediate help given to a person before going to hospital.* These candidates had enough knowledge on the meaning of first aid as the immediate help given to a person before going to hospital.

On the other hand, a total of 137,881 (14.7%) candidates selected distractors B, C, D and E. The candidates who opted for distractor B *immediate help given to a person after arriving at the hospital* did not know that, first aid is provided at the place of an incident before the victim is taken to hospital. Also, candidates who opted for distractor C, *An immediate assistance given to a person by a health practitioner* did not know that, first aid is provided by any person who is nearby the incidence, not necessarily a health expert. Moreover, candidates who opted for distractors D, *An assistance given to a person who fainted and* E, *An assistance given to a person who has been bitten by a snake* could not know that these are some of the first aid incidences and not the meaning of first aid.

Question 27: What will you do if you see your friend's clothes are burning with fire?

A Smear with oil

B Put water into the injury

C Cover him with a blanket and thick cloth

D Blow him with oxygen gas

E Put off the already burned clothes

Table 22: Number and Percentage of Candidates in each Option

Option	**A**	**B**	**C***	**D**	**E**	**Others**
No. of Candidates	47,928	53,093	672,894	59,094	99890	5059
% of Candidates	5.1	5.7	71.7	6.3	10.6	0.5

This question intended to measure candidates' ability on identifying a method that can be used to put off fire from a victim whose clothes are burning. Candidates' performance in this question was good since 672,894 (71.7%) candidates opted for correct response C,

C*over him with a blanket and thick cloth*. These candidates had appropriate knowledge on the procedures required in providing First Aid to victims whose clothes are burning. It is recommended to cover the victim with blanket and thick clothes so as to stop fire by limiting oxygen supply.

However, a total of 260,005 (27.7%) candidates opted for distractors E, *Put off the already burned clothes*, D, *blow him with oxygen*, B, *put water into the injury* and A, *smear with oil*. These candidates did not understand that distractor E, is not a correct answer because putting off clothes cannot stop burning. Also, distractor D is not the correct answer because oxygen supports burning. Similarly, distractor A and B explain ways to reduce pain to a victim and not ways of extinguishing fire.

Question 28: Which of the following behaviours **do not** contribute to the spread of HIV?

A Sexual intercourse, drunkerdness, breast feeding.

B Sharing needle, transfusion of blood with HIV.

C Shaking hands, playing, sharing meals.

D Poor AIDS education and unsafe sex.

E Prostitution and the use of illicit drugs.

Table 23: Number and Percentage of Candidates in each Option.

Option	A	B	C*	D	E	Others
No. of Candidates	32,668	71,057	747,239	47,182	36,634	3,189
% of Candidates	3.5	7.6	79.7	5.0	3.9	0.3

The question intended to measure candidates` ability to identify behaviours which does not contribute to the spread of HIV. The performance in this question was good since 747,239 (79.7%) candidates opted for correct response C, *Shaking hands, playing, sharing meals*. These candidates understood that HIV is transmitted by contact with infected blood and other body fluids by an uninfected person. All behaviours which do not lead to blood contact do not contribute to the transmission of HIV.

However, a total of 187,541 (20.0%) candidates opted for distractors A, B, D and E. These candidates did not understand the question since they were identifying behaviours which contribute to HIV transmission.

Question 29: Why people living with HIV need food rich in nutrients?

A Their disease is of long time.
B Their life is short, so they need enough food.
C They get hungry every time.
D They need to strengthen body immunity.
E They need to be fat so as to avoid stigmatization.

Table 24: Number and Percentage of Candidates in each Option

Option	A	B	C	D*	E	Others
No. of Candidates	65,895	135,095	48,110	638,993	45,186	4,679
% of Candidates	7.0	14.4	5.1	68.1	4.8	0.50

The question intended to assess the candidates' understanding on the importance of food rich in nutrients to HIV victims. The performance in this question was good since 638,993 (68.1%)

candidates opted for the correct response D, *They need to strengthen body immunity.* These candidates were aware that nutrients help to strengthen body immunity since HIV attacks the body immunity and make the body weak.

On the other hand, a total of 294,281 (31.4%) candidates opted for distractors A, B, C and E. These candidates did not know that, HIV affects the body immunity therefore; the victim of HIV needs food rich in nutrients to increase the body immunity.

Question 30: The correct method for identifying a person infected with AIDS is

A to test for tuberculosis.

B to measure the behaviour of the body temperature.

C to check loss of weight in a short time.

D to check presence of wounds in the mouth and face.

E to measure the body immunity in the blood.

Table 25: Number and Percentage of Candidates each Option

Option	A	B	C	D	E*	Others
No. of Candidates	37,729	47,801	62,915	63,392	719,703	6,418
% of Candidates	4.0	5.1	6.7	6.8	76.7	0.7

The question intended to measure candidates' ability to identify the correct method which can be used to identify a person affected with HIV/AIDS. Statistics show that, the performance of candidates in this question was good since 719,703 (76.7%) candidates opted for the correct response E, *to measure the body immunity in the blood*.

These candidates had realized that HIV affects the body immunity therefore; the proper method to recognise a person who has been affected by HIV is through measuring the amount of immunity in the blood.

However, a total of 211,837 (22.6%) candidates chose the distractors D, *to check presence of wounds in the mouth and face C, to check loss of weight in a short time*, *B, to measure the behaviour of the body temperature* and A, *to test for tuberculosis.* These candidates did not understand that HIV cannot be diagnosed by physical appearance. A person can be HIV positive but not suffering from AIDS. However, a person can show symptoms like lose in weight and having wounds in the mouth and face while suffering from other diseases.

Question 31: Which activity shows that air occupies space?

A Breathing through the mouth and nose.

B Occurrence of air bubbles when a bottle is immersed in water.

C Sneezing and coughing for a long time.

D When vapour move in the air.

E Immersing a stone in an eureka can and water overflows.

Table 26: Number and Percentage of Candidates in each Option

Option	**A**	**B***	**C**	**D**	**E**	**Others**
No. of Candidates	359,571	243,666	76,616	127,098	122,291	8,716
% of Candidates	38.3	26.0	8.2	13.6	13.0	0.9

This question intended to measure candidates' understanding on the activity which shows that air occupies space. Statistics show that, the candidates` performance in the question was poor as 685,576 (73.1%) candidates opted for distractors A, *Breathing through the mouth and nose,* C, *Sneezing and coughing for a long time,* D, *When vapour move in the air* and E, *Immersing a stone in an eureka can and water overflows.*

The candidates who opted for distractor A, lacked knowledge that when air enters the lungs by inhaling and exhaling mechanisms exchange of gases takes place, this is not an evidence that air occupies space. Similarly, candidates who opted for distractor C lacked knowledge that sneezing occurs due to interruption of solid particles and liquid into air passage, thus has no relationship with air occupying space. Also, candidates who opted for distractor D, about vapour movement in the air, it is difficult to justify that vapour occupies space because air moves randomly. Candidates who opted for distractor E, that the amount of water displaced is equal to the mass of a stone, lacked knowledge that it is the stone which occupied space and not air.

However few candidates 243,666 (26.0%) managed to select the correct answer B, *Occurrence of air bubbles when a bottle is immersed in water*. These candidates had sufficient knowledge that presence of air bubbles in water which tends to burst when exposed to atmosphere is an indication that air occupies space.

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Question 32: Observe Figure Number 1, and then answer the question that follows.

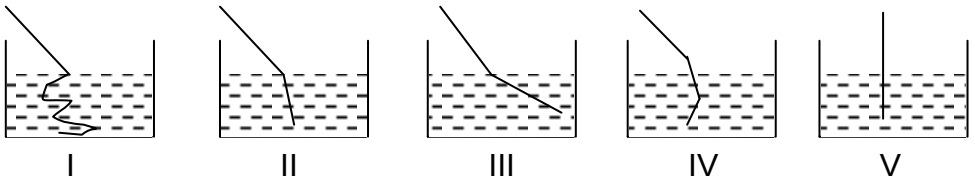


Figure No. 1

Which among the following shows the characteristic of light ray when penetrating in water?

A II B IV C III D I E V

Table 27: Number and Percentage of Candidates in each Option

Option	A*	B	C	D	E	Others
No. of Candidates	219,774	62,046	334,128	223,315	92,278	6,417
% of Candidates	23.4	6.6	35.6	23.8	9.8	0.7

This question focused at assessing candidates' ability to identify the characteristics of a beam of light which travel from one media to another with differing densities. The statistics show that the general performance in this question was poor since, only 219,774 (23.4%) candidates opted for correct response A, *II*. These candidates were aware on the characteristics of light. They were able to identify that the light ray will be refracted in the water medium.

Moreover, majority of the candidates 711,767 (75.9%) opted for incorrect responses B, C, D and E. These candidates lacked knowledge on the principles guiding light rays travelling across different media. One of the principle states that;

When the beam of light travels from a low density medium to a high density medium, it will be refracted closer to the normal and when it travels from high density medium to low density medium it will be refracted away from the normal.

Basing on this principle, candidates who opted for distractor C, *III* did not know that, the diagram in this option showed that the beam of light was refracted away from vertical line which is not correct since, water is denser than air. Also, those candidates who chose distractor D, *I* and B, *IV* lacked knowledge on the fact that light rays bend at the border separating media with different densities but not within the media. Candidates who opted for distractor E, *V* lacked knowledge on the behaviour of light rays in two different media since light rays bend.

Question 33: What will happen if a glass fully of water is covered with a glass lid and turned upside down?

A Water will be poured
B The lid will be removed
C The glass will break
D Water will not be poured
E Water will pour in droplets

This question intended to assess candidates' understanding on the impact of atmospheric pressure. Statistics show that candidates performance in this question was average since only 38.2 per cent equivalent to 357,989 candidates were able to choose the correct answer D, *Water will not be poured* as shown in Figure 6. These candidates had knowledge of how force due to air pressure opposes the glass cover from falling down hence water will not be poured.

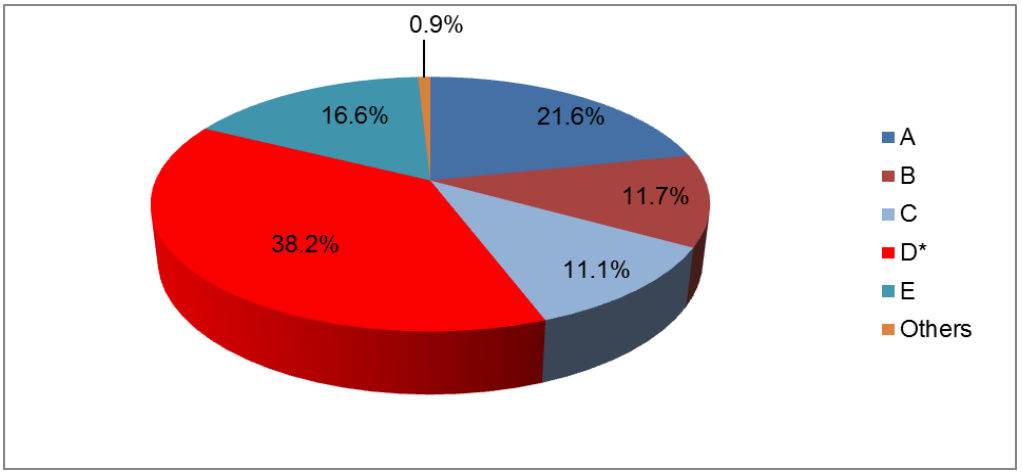


***Figure 6*:** Performance of the candidates in question 33.

On the other hand, 61.0 per cent equivalent to 572,025 candidates failed the question by choosing distracters A, *Water will be poured*, B, *The lid will be removed*, C, *The glass will break* and E, *Water will pour in droplets.* These candidates lacked knowledge that air pressure hinders the lid from dropping by applying pressure upward; hence water will not be poured. Also, they didn't know that the glass cannot be broken as it is supported.

Question 34: What important step is observed after identifying a problem in the society?

A Start an in depth investigation

B Formulate hypothesis

C Prepare questionnaires

D Prepare scientific experiments

E Collect information and data.

Table 28: Number and Percentage of Candidates in each Option

Option	A	B*	C	D	E	Others
No. of Candidates	189,021	306,272	72,150	141,694	221,271	7,550
% of Candidates	20.2	32.6	7.7	15.1	23.6	0.8

This question aimed at assessing candidates' understanding on the steps involved in scientific investigation. Performance in this question was poor since only 306,272 (32.6%) candidates chose the correct alternative B, *Formulate hypothesis*. This implies that, these candidates were having adequate knowledge on how scientific investigation is carried out.

However, a total of 624,136 (66.6%) candidates opted for distractors A, C, D, and E. The candidates who selected distractor E, *Collect information and data* lacked knowledge that data are collected after the hypothesis has been set. Similarly, candidates who chose incorrect alternative A, *Start an in depth investigation* were not aware that "in depth investigation" is done in each step of scientific investigation. Candidates who chose distractor D, *Prepare scientific experiments* did not know that identification of the problem is followed by the formulation of the hypothesis so as to identify tools and methods to be used during experimentation. Furthermore, candidates who selected distractor C, *Prepare questionnaires* were not aware that questionnaire is used as a tool for data collection and not a step in scientific investigation.

Question 35: What is the correct sequence of writing a scientific experiment report?

A Aim, method, apparatuses, results, conclusion.

B Apparatuses, aim, methods, results, conclusion.

C Methods, aim, apparatuses, conclusion, results.

D Methods, aim, conclusion, results, apparatuses.

E Aim, apparatuses, methods, conclusion.

Table 29: Number and Percentage of candidates in each Option

Option	A	B	C	D	E*	Others
No. of Candidates	215,651	125,709	94,995	37,137	456,871	7,595
% of Candidates	23.0	13.4	10.1	4.0	48.8	0.8

The question intended to assess candidates' ability in identifying steps needed to be followed during writing a scientific experiment report. The analysis in table 29 shows that, the general performance was average since 456,871 (48.8%) candidates selected the correct response E, *Aim, apparatuses, methods, results and conclusion*. These candidates had adequate knowledge on the stages to be followed in writing a scientific experiment report.

On the other hand, a total of 473,492 (50.5%) candidates selected the wrong responses A, *Aim, method, apparatuses, results, conclusion*; B, *Apparatuses, aim, methods, results, conclusion;* C, *Methods, aim, apparatuses, conclusion, results* and D, *Methods, aim, conclusion, results, apparatuses.* These candidates failed to realize that writing a scientific experimental report starts with aim, which determines the purpose of the experiment, followed by a list of apparati that were involved in the experiment, method, results and

conclusion. Therefore, they lacked adequate knowledge on the procedures involved in writing a scientific experimental report.

Question 36: How is iron protected from rusting?

A By applying ash.

B By washing with water.

C By painting.

D By covering with soil.

E By covering with soot.

Table 30: Number and Percentage of Candidates in each Option

Option	A	B	C*	D	E	Others
No. of Candidates	116,547	65,854	648,847	49,457	51,384	5,869
% of Candidates	12.4	7.0	69.2	5.3	5.5	0.6

This question aimed at assessing the candidates' understanding on the methods of preventing rusting. The general performance in this question was good since, 648,847 (69.2%) candidates chose the correct answer C, *By painting.* These candidates had adequate knowledge on how rusting occurs. They knew that, rusting is a result of the chemical reaction between iron and oxygen in the presence of water. Therefore, they were able to identify that painting prevents iron from direct contact with oxygen gas and water.

On the other hand, a total of 283,242 (30.2%) candidates chose incorrect responses A, B, D and E. These candidates could not establish the fact that ash, soot and soil can allow water and oxygen to pass through, thus creating conducive environment for rusting to occur. Those who opted for B, had insufficient knowledge on the

methods of preventing rusting because water is one of the major factors for rusting to happen.

Question 37: Which of the following is a group of metals?

A Chlorine, zinc, diamond and gold.

B Iron, carbon, nitrogen and oxygen.

C Oxygen, zinc, sulphur and chlorine.

D Copper, iron, carbon monoxide and zinc.

E Gold, zinc, aluminium and silver.

Table 31: Number and Percentage of Candidates in each Option

Option	A	B	C	D	E*	Others
No. of Candidates	174,544	188,900	207,296	89,733	267,307	10,178
% of Candidates	18.6	20.1	22.1	9.6	28.5	1.1

The question aimed to assess candidates' ability to identify elements which form a group of metals. The performance in this question was poor since 660,473 (70.4%) candidates opted for wrong response C, *Oxygen, zinc, sulphur and chlorine;* B, *Iron, carbon, nitrogen and oxygen;* A, *Chlorine, zinc, diamond and gold,* and D, *Copper, iron, carbon monoxide and zinc* instead of the correct answer E, *Gold, zinc, aluminium and silver*.

The candidates who opted for distractors A, B and C, could not distinguish between metals and non-metals. Whereas metals are elements that form positive ions, non-metals form negative ions. Thus oxygen, chlorine and sulphur are non-metals because they form negative ions. Those who opted for distractor D, could not identify *carbon monoxide a*s a compound and not an element and hence it is not in the groups of metals/non-metals.

However, 267,307 (28.5%) candidates chose the correct answer E, *Gold, zinc, aluminium and silver* since they had adequate knowledge on metals and non-metals. So, they were able to identify the correct group of metals.

Question 38: One example of an element is

A water
B salt
C hydrogen
D sugar
E carbon dioxide.

Table 32: Number and Percentage of Candidates in each Option

Option	A	B	C*	D	E	Others
No. of Candidates	193,481	181,975	393,443	61,552	100,175	7,332
% of Candidates	20.6	19.4	41.9	6.6	10.7	0.8

The question focused at measuring the candidates' understanding on the concept of an element. The performance of the candidates in this question was average since 393,443 (41.9%) candidates opted for the correct answer C, *hydrogen*. These candidates knew that an element is a substance made up of atoms of the same type that cannot be easily broken down by physical means. Therefore, hydrogen is an element made of the same atoms.

On the other hand, a total of 537,183 (57.3%) candidates opted for distractor A, *water*, B, *salt*, D, *sugar* and E, *carbon dioxide.* These candidates did not know the difference between elements and compounds. They were not aware that an element is made up of similar atoms while a compound occurs when two or more different

elements combine chemically. Therefore, water is a compound because it is made up of hydrogen and oxygen elements. Moreover, salt is a compound made up of a metal (example Sodium) and non-metal (example Chlorine), sugar is made up of elements carbon, hydrogen and oxygen. Lastly, carbon dioxide is made up of carbon and oxygen. Hence, these substances cannot be elements.

Question 39: Clouds moving down near the earth crust are called

A mist.

B dew.

C vapour.

D ice.

E rain.

Table 33: Number and Percentage of Candidates in each Option

Option	A*	B	C	D	E	Others
No. of Candidates	543,836	110,020	96,747	53,322	128,424	5,609
% of Candidates	58.0	11.7	10.3	5.7	13.7	0.6

This question aimed to measure candidates' ability to identify properties of clouds. The performance in this question was average since 543,836 (58.0%) candidates opted for the correct response A, *mist*. These candidates understood that mist is small cloud of water droplets floating in air near the earth's crust.

However, a total of 388,513 (41.4%) candidates opted for incorrect response B, *dew*, *C*, *vapour*, D, *ice* and E, *rain.* These candidates did not realize that dew, vapour, ice and rain are not clouds but forms of water in different states while, dew refers to water lost by plants during the night, ice means water in solid state. Moreover,

vapour is water in gaseous state whereas rain refers to water droplets which fall on the earth's crust from the atmosphere.

Question 40: Observe Figure Number 2 then answer the question that follows:

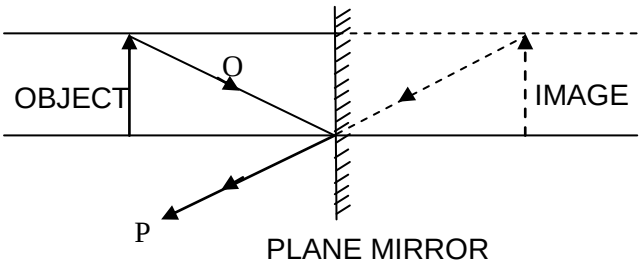


Figure No. 2

Letter P represents

A incident ray.

B reflected ray

C refracted ray

D parallel ray

E opposite ray

Table 34: Number and Percentage of Candidates in each Option

Option	A	B*	C	D	E	Others
No. of Candidates	222,399	476,378	61,130	115,431	57,072	5,548
% of Candidates	23.7	50.8	6.5	12.3	6.1	0.6

The question tested the candidates` understanding on the properties of light. The performance of the candidates in this question was average since 476,378 (50.8%) candidates chose the correct answer, B *reflected ray*. These candidates showed good understanding about the properties of light; they knew that the

incident ray "O" was reflected by the plane mirror to form the reflected ray "P".

On the other hand, a total of 456,032 (48.6%) candidates opted for incorrect responses A, C, D and E. The candidates who opted for distractor A, *incident ray* did not understand the meaning of incident ray since it is the ray that fall to the medium not away. For the case of candidates who opted for distractors D and E they did not consider the properties of light since there was no parallel and opposite ray to the ray "O". For those who opted for distractor C, did not understand the properties of light that a mirror reflects light and does not refract light.

2.2 Section B: Short Answer Questions

Question 41: Figure 3 shows the number of patients who attended at Mlingotini hospital in the year 2017 for treatment.

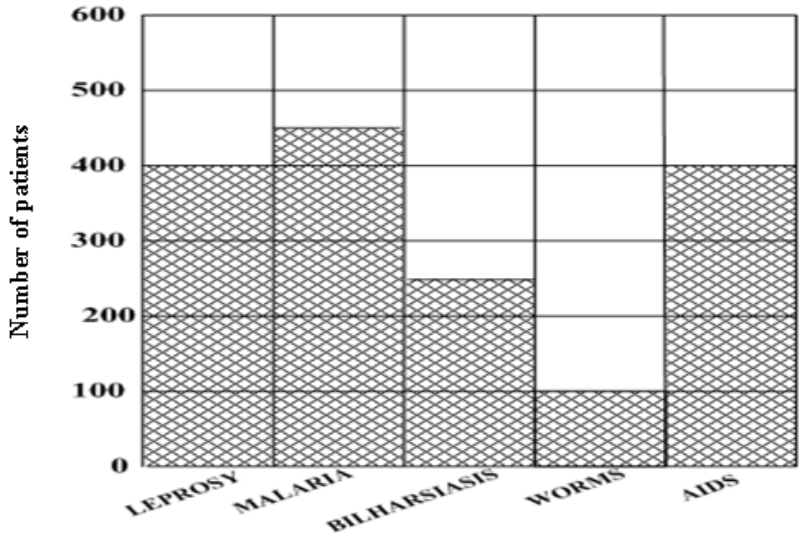


Figure No. 3

Calculate the percentage of patients who had non communicable diseases.

This question intended to measure candidates' ability in using statistics obtained from scientific investigation to give meaningful information. Performance in this question was poor as compared to all attempted questions in this paper since 99.8 per cent equals to 936,395 candidates scored 0 marks. Figure 7 shows candidates performance in question 41.

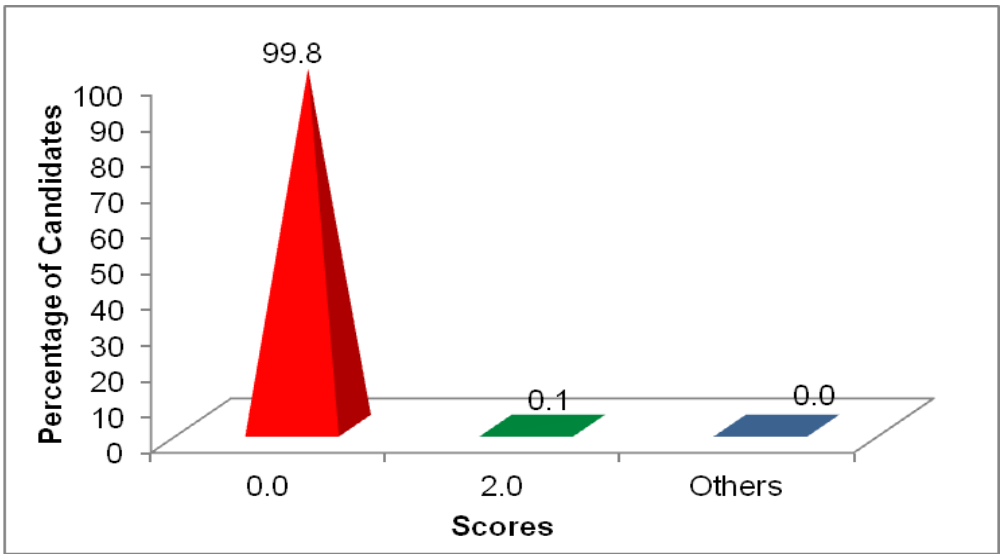
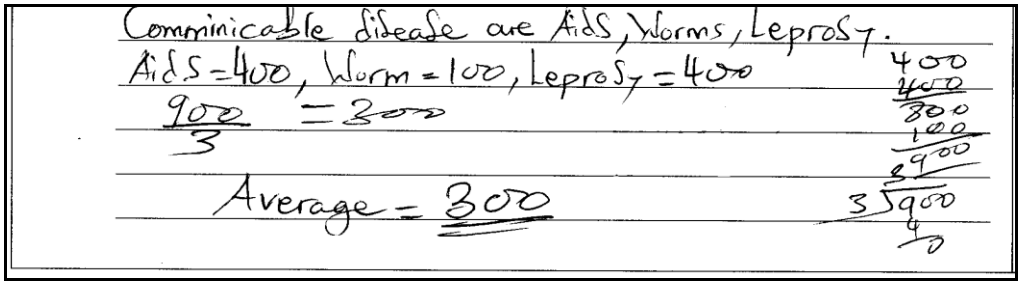


***Figure 7*:** Candidates' performance in question 41.

The analysis of candidates' responses showed that among the 936,395 candidates who got 0 marks some lacked knowledge on calculating percentage. Similarly, others failed to identify non-communicable disease. However, few candidates mentioned names of diseases such as malaria, leprosy, bilharsiasis, worms and AIDS instead of calculating the percentage as per demand of the question. Extract 1 shows the sample of response from a candidate who failed

to identify non-communicable diseases as well as computing percentage.

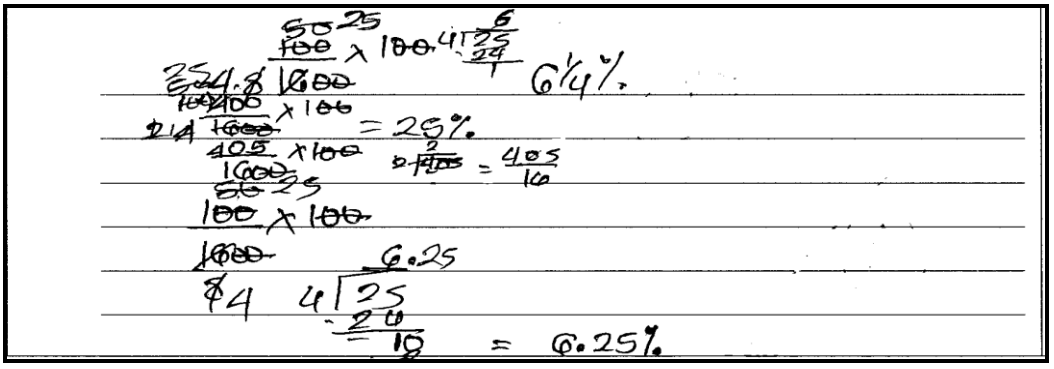
Extract 1



Extract 1: Sample of a response from a candidate who failed to calculate the percentage. He/she calculated an average of three disease.

However, 0.15 per cent equivalent to 1,366 candidates identified the non communicable disease which is worms disease and correctly computed the required percentage of the patients. This implies that the candidates understood the difference between communicable and non communicable diseases, and they knew the formula for calculating the percentage. Extract 2 shows a sample of a response from a candidate who identified and computed the percentage of patients suffered from non communicable diseases correctly.

Extract 2



The Extract 2: Sample of a response from a candidate who computed the percentage of patients suffered from non

communicable disease (worms) by dividing number of patients suffered from worms (100) by total number of patients (1600) multiply by 100%.

Question 42: (a) List two necessary conditions for seed germination.

(b) How do non-identical twins result?

This question intended to measure candidates` understanding on necessary conditions for seed germination as well as how non-identical twins occurs. Performance in this question was poor whereby 61.6 per cent equivalent to 578,078 candidates scored 0 and 0.5 marks out of 2 marks as shown in Figure 8.

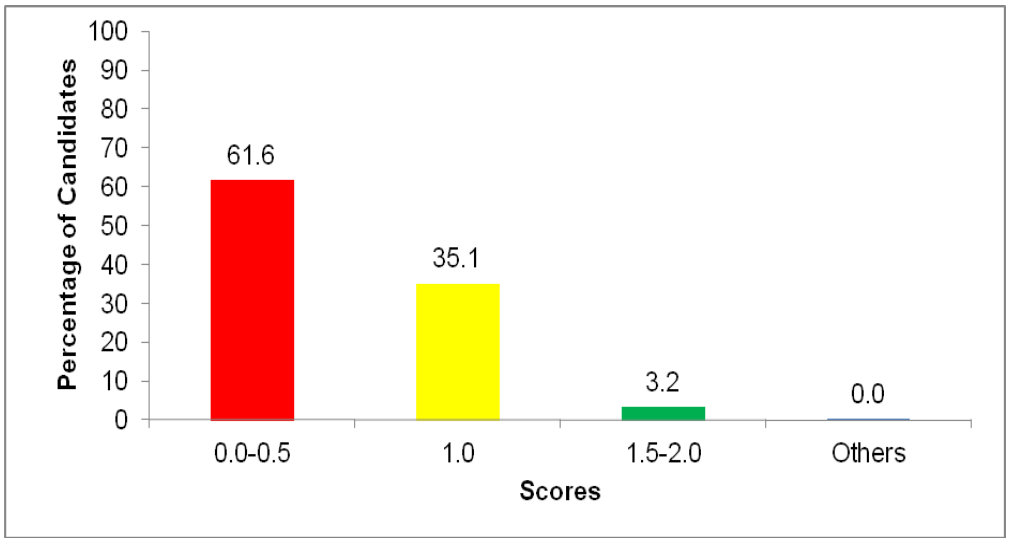
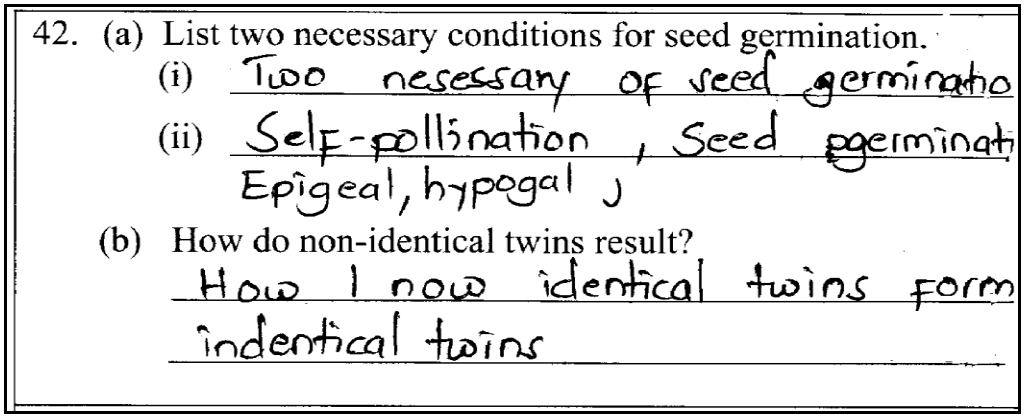


Figure 8: Perfomance of candidates in question 42.

The analysis of candidates' responses shows that, candidates who scored 0 and 0.5 mark did not understand that water/moisture, moderate temperature and oxygen gas are necessary conditions for seed germination. They also did not know that non-identical twins occur when two ova are fertilized by two different sperms. Therefore, some of them wrote irrelevant answers such as *ovary, stamen* and,

seed and cotyledon as necessary conditions for seed germination. Moreover others wrote that non identical twins occur when *XX mate with XY.* Extract 3 provides a sample of candidates' response for those who wrote incorrect answers in this question.

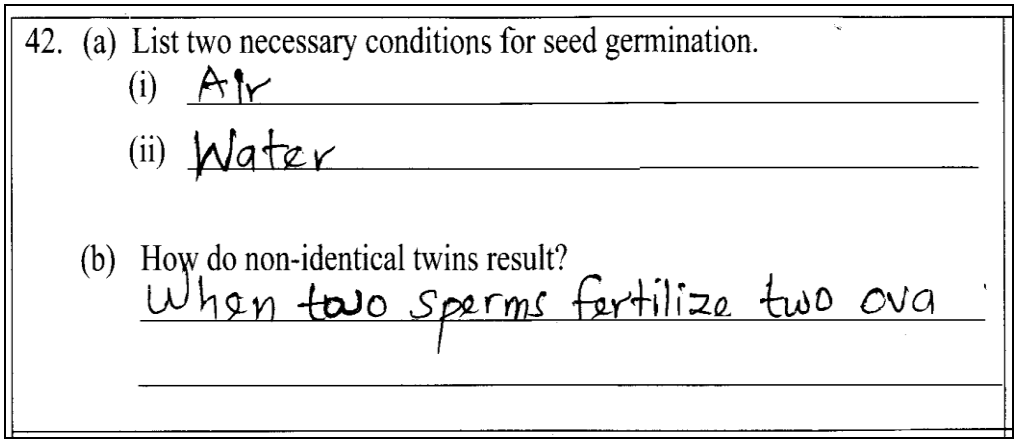
Extract 3


42. (a) List two necessary conditions for seed germination.
(i) Two nesessary of seed germinatio
(ii) Self-pollination , Seed pgerminati Epigeal, hypogal)
(b) How do non-identical twins result?
How I now identical twins form indentical twins

Extract 3: Sample of responses from a candidate who failed to answer correctly part (a) and (b) of the question. A candidate wrote about type of polination and germination instead of necessary condition for seed to germinate.

On the other hand, 38.4 per cent equivalent to 359,787 candidates got the question right as they scored 1 to 2 marks. These candidates knew the necessary conditions for seed germination and how non identical twins occur. Therefore, they answered correctly all/some parts of the question. Extract 4 shows a sample of the candidates` response who wrote the two necessary conditions for seed germination as well as the occurance of non identical twins.

Extract 4


42. (a) List two necessary conditions for seed germination.
(i) Air
(ii) Water
(b) How do non-identical twins result?
When two sperms fertilize two ova

Extract 4: Sample of the response from a candidate who answered the question correctly by writing the two necessary conditions for seed to germinate and how non identical twins occurs.

Question 43: Identify two ways by which the analyzed data can be presented.

This question aimed to measure candidates' ability to identify ways of presenting the analyzed data. The general performance in this question was poor since out of 937,839 (99.9%) candidates who attempted this question 790,138 (84.2%) candidates scored 0 marks. These candidates could not identify ways of presenting scientific data. Figure No. 9 shows the percentage of candidates who scored 0, 1 and 2 marks.

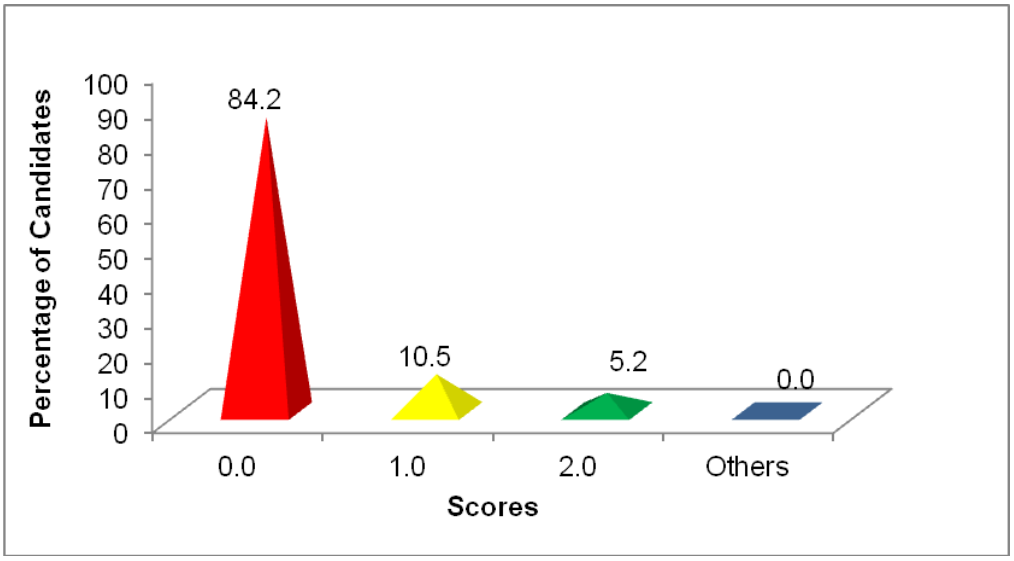
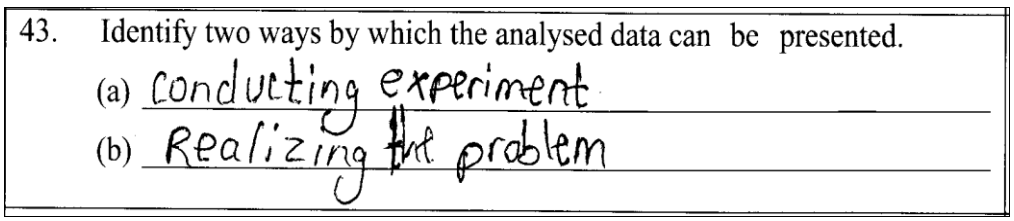


***Figure 9*:** Candidates' performance in question 43.

Out of 790,138 candidates who scored 0 marks, some candidates named ICT instruments used in communication like phone and Televisions, where as others listed steps involved in doing scientific investigation as shown in extract 5. Finally there were candidates who wrote ways of communication such as using letters.

Extract 5


43. Identify two ways by which the analysed data can be presented.

(a) conducting experiment

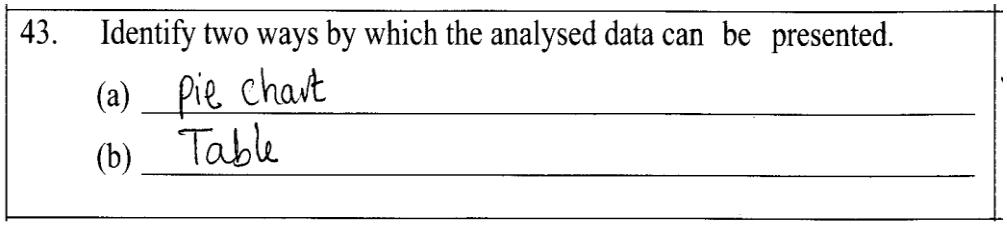
(b) Realizing the problem

Extract 5: Sample response from a candidate who listed some of the steps in doing scientific investigation instead of ways used to present analyzed data.

However, 15.8 per cent equivalent to 147,701 candidates scored 1 or 2 marks in this question. These candidates wrote correctly 1or 2

ways of presenting analysed scientific data which are tables, charts and graphs as shown in Extract 6.

Extract 6


43. Identify two ways by which the analysed data can be presented.

(a) pie chart

(b) Table

Extract 6: Sample of a response for the candidate who identified correctly two ways of presenting analysed data.

Question 44: Indicate whether each of the following processes is a **physical change** and a **chemical change**:

(a) Water to steam _____

(b) Burning of paper _____

(c) Rusting of iron _____

(d) Freezing of soda _____

This question intended to measure candidates' ability to identify chemical and physical changes in the given processes. Statistics shows that, out of 99.94 per cent which is equivalent to 937,878 (99.9%) candidates who attempted this question, 70.8 per cent which equivalent to 664,550 candidates managed to identify some or all processes correctly hence making a good performance for this question. Figure 10 shows the performance of candidates in this question.

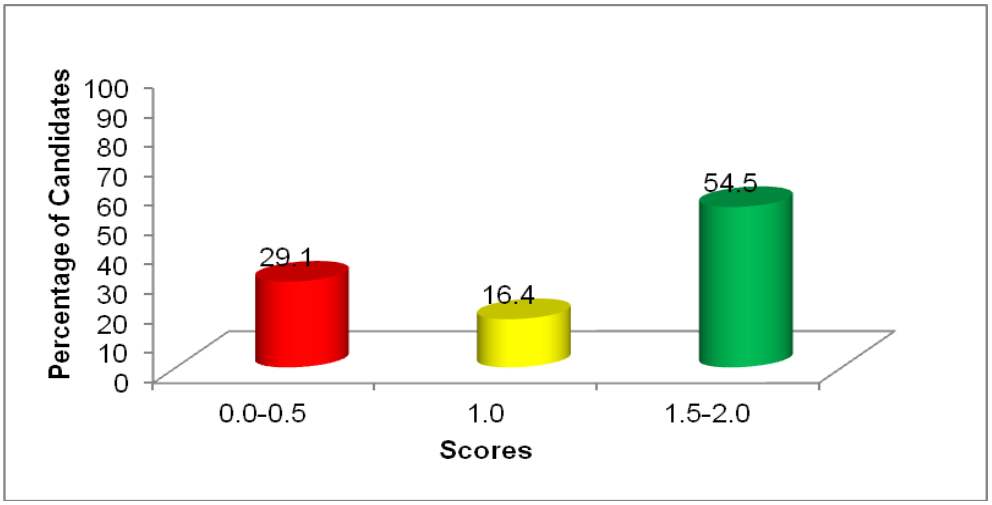
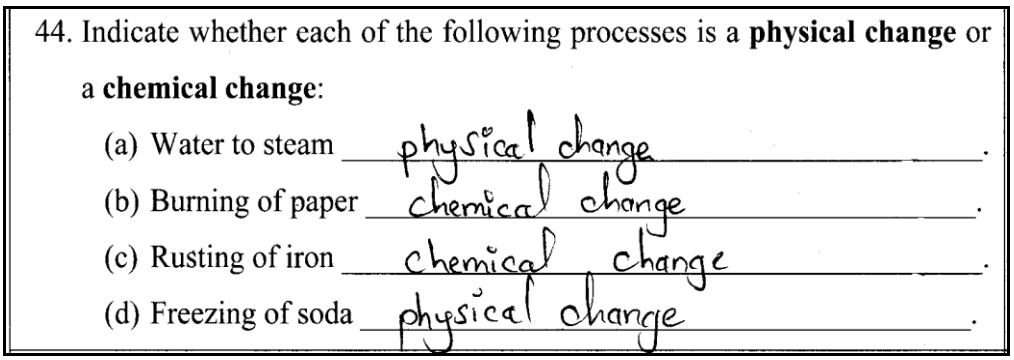


***Figure 10*:** Performance of the candidates in question 44.

The analysis of candidates' responses showed that, candidates who scored from 1 to 2 marks had adequate understanding on processes of chemical and physical changes, as they identified correctly two and more processes. An example of the correct answer provided by one of the candidates is as shown in Extract 7.

Extract 7


44. Indicate whether each of the following processes is a **physical change** or a **chemical change**:

(a) Water to steam physical change.

(b) Burning of paper chemical change.

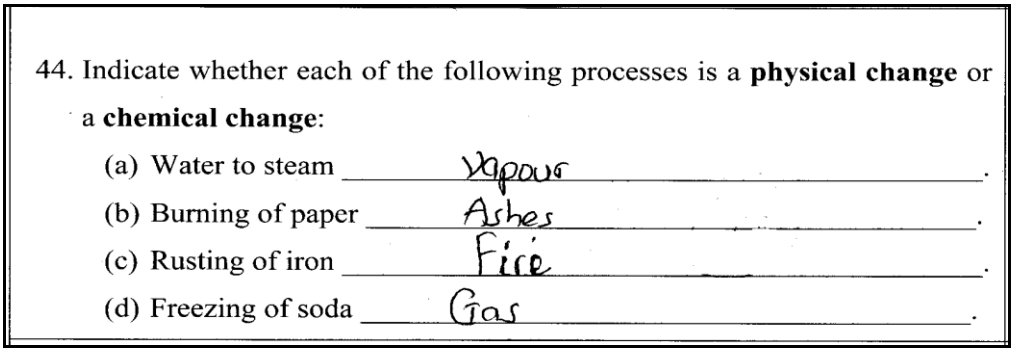
(c) Rusting of iron chemical change.

(d) Freezing of soda physical change.

The extract 7: Sample responses of a candidate who correctly identified the processes in (a) and (d) which were physical changes and, (b) and (c) which were chemical changes.

However, further analysis indicated that 29.1 per cent which is equivalent to 273,328 candidates scored 0 to 0.5 marks. These candidates were not able to identify physical and chemical changes. Some of them interchanged the processes, and others provided examples of changes of matter. For example, there were candidates who wrote examples of chemical changes such as *rotting of fruits, fermentation of milk, burning of paper and burning wood to ash*. Others did not understand the question, so they ended up writing output of given processes as shown in Extract 8.

Extract 8


44. Indicate whether each of the following processes is a **physical change** or a **chemical change**:

(a) Water to steam Vapour.

(b) Burning of paper Ashes.

(c) Rusting of iron Fire.

(d) Freezing of soda Gas.

Extract 8: Sample of the answer of a candidate who wrote the output of some processes instead of stating whether they are physical or chemical changes.

Question 45: If a student lifts a load with a force of 10N and sends it to home which is 500 m away; what will be the workdone?

This question intended to measure candidates' ability to calculate work done. Performance of the candidate was average since a total of 49.8 per cent which is equivalent to 467,484 candidates managed to calculate work done and scored 1 or 2 marks as indicated in Figure 11.

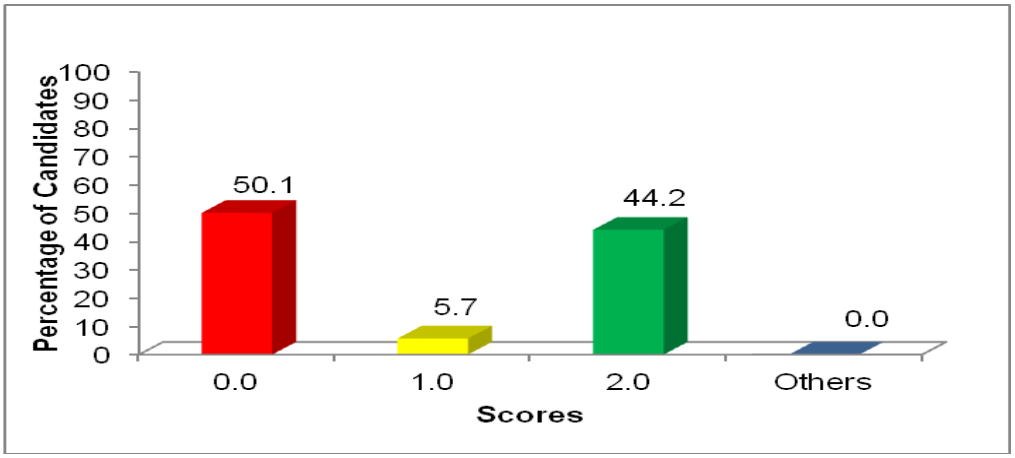
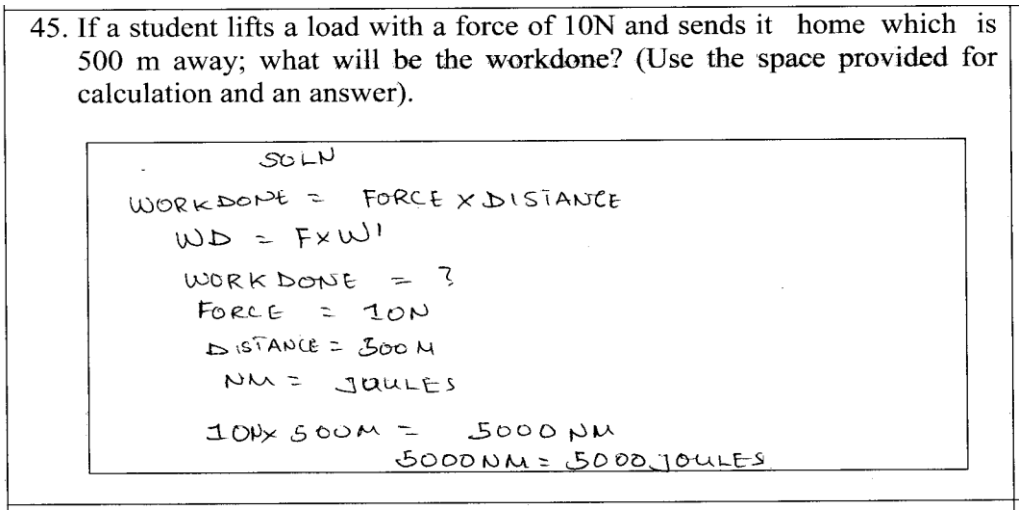


***Figure 11*:** Performance of the candidates in question 45.

Analysis of candidates' responses revealed that 44.2 per cent which is equivalent to 414,192 candidates had adequate understanding on how to calculate work done. They managed to write the correct formula for work done which is: $\mathbf{Workdone} = \mathbf{Force} \times \mathbf{Distance}$. They also substituted correctly the data in the formula and computed the correct answer which was 5,000 Newton Meter or 5,000 Joules. Extract 9 provides a sample response from the candidates who attempted question 45 correctly.

Extract 9


45. If a student lifts a load with a force of 10N and sends it home which is 500 m away; what will be the workdone? (Use the space provided for calculation and an answer).

SOLN

WORKDONE = FORCE X DISTANCE

WD = F x W1

WORK DONE = ?

FORCE = 10N

DISTANCE = 500 M

NM = JOULES

10N x 500M = 5000 NM

5000NM = 5000 JOULES

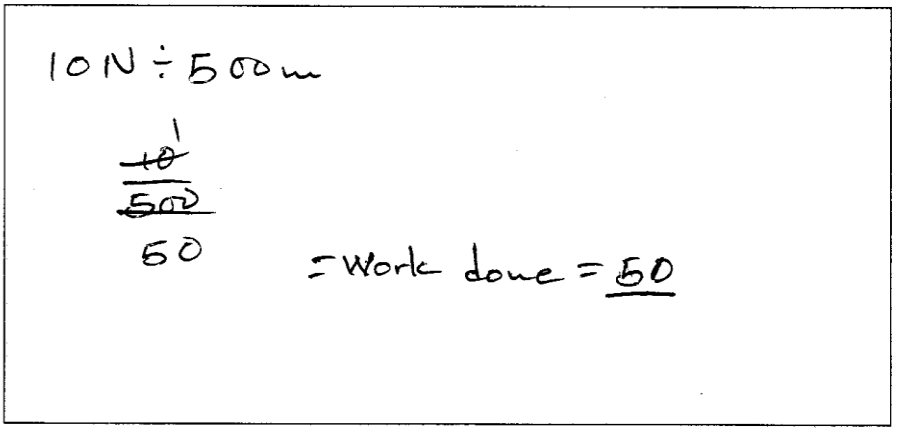
Extract 9: Sample of the response from a candidate who calculated the work done by following all the necessary steps.

Moreover, 5.7 per cent which is equivalent to 53,292 candidates scored 1 mark instead of all 2 marks. These candidates did not follow all the procedures of calculating the amount of work done like writing the answer without showing the method, units and writing the formula only without computation.

However, 50.1 per cent which is equivalent to 470,348 candidates did not score any mark due to lack of knowledge on how to calculate the work done. Others used incorrect formula as well as writing answers not related to the question as shown in Extract 10.

Extract 10

45. If a student lifts a load with a force of 10N and sends it home which is 500 m away; what will be the workdone? (Use the space provided for calculation and an answer).



Extract 10: A sample response from a candidate who incorrectly calculated work done by dividing effort by distance instead of multiplying them.

3.0 PERFORMANCE OF CANDIDATES IN EACH TOPIC

The Science paper had questions from a total of eight topics. Analysis of performance in each topic was carried out based on the percentage of candidates who excelled in attempting questions from the respective topic. The percentage of performance in each topic was calculated by taking the average of performance of all questions from that topic. The performance level was graded into three groups as follows:

Poor (0% - 39%), Average: (40% - 59%) and: Good: (60% - 100%).

The analysis involved comparison of performance attained in the year 2018 and that of 2017. Findings showed that out of 8 topics, 6 topics had good performance in 2018 compared to 2 topics which were performed well in 2017. This implies an increase of 4 topics with good performance compared to 2017. Performance in the topic of *HIV/AIDS* has improved substantially from 62.7% in 2017 to 74.8% in 2018, making a leading topic in performance. Similarly, 3 topics had average performance in 2018 compared to 6 topics in 2017. Unlike 2017, this year *Methods and Procedure in Science* topic has poor performance. Generally, the performance has improved in 7 topics while it has decreased in one topic. The summary of candidates' performance topic wise has been shown in the **appendices.**

4.0 CONCLUSION

Overall performance in PSLE 2018 Science subject was good as 76.6 per cent of the candidates passed the examination. Similarly, there was an increase of 4.0 per cent of candidates who passed

compared to performance in 2017. The topic of *HIV/AIDS* attained the highest performance of 74.8 per cent while the topic of *Methods and Procedures in Science* had the least performance of 24.3 per cent. Furthermore, question 8 achieved the highest performance of 90.1 per cent while question 41 had the least performance of 0.1 per cent.

Moreover, most of the candidates scored above the average because they had adequate knowledge about the concepts which were tested. Candidates who scored below the average did not have sufficient understanding of subject matter. Some of them failed to follow the instructions given.

The good performance in the topic of HIV/AIDS was attributed to the emphasis put on to educate the society by different stakeholders such as mass media. Contrary to that, majority of the candidates had weak performance in the topic of *Methods and Procedures in Science* because they lacked adequate understanding of the concepts and arithmetic skills.

5.0 RECOMMENDATIONS

In order to improve candidates' performance in Science, the following are recommended:

(a) Teachers should insist learners to read and follow examination instructions before attempting any question.

(b) Teachers should provide tasks with relevant skills which enable pupils to analyse and evaluate evidences, arguments, claims and beliefs so as to promote critical thinking and arithmetic skills.

(c) Teachers should expose and equip learners with questions` answering skills to enable them attempt short answer questions.

(d) Teachers should use the local available materials in teaching various abstract concepts such as the use of plane mirrors, glasses and water to teach properties of light.

APPENDIX A

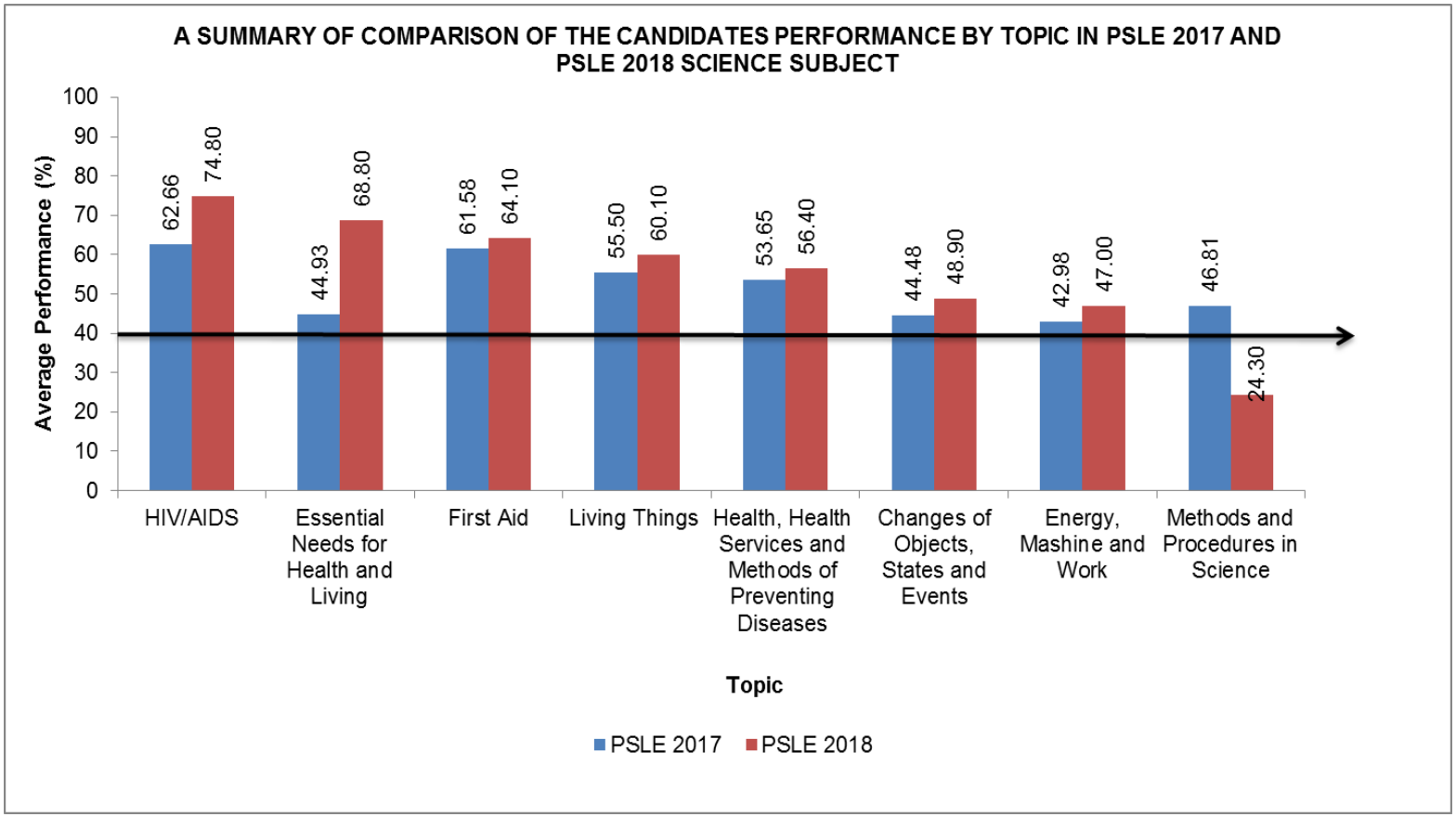
COMPARISON OF CANDIDATES' PERFORMANCE FOR EACH TOPIC IN 2017 AND 2018 PSLE SCIENCE SUBJECT

05 SCIENCE

S/N	Topic	PSLE 2017				PSLE 2018			
		Performance in each question		Average performance (%)	Remarks	Performance in each question		Average performance (%)	Remarks
		Question number	% performance			Question number	% performance		
1.	HIV/AIDS	16	68.02	62.66	Good	28	79.7	74.8	Good
		17	45.15			29	68.1		
		18	66.38			30	76.7		
		19	71.08						
2.	Essential Needs for Health and Living	35	38.29	44.93	Average	13	70.5	68.8	Good
		41	26.24			14	76.3		
		45	50.23			15	59.7		
		46	71.99						
		48	37.88						
3.	First Aid	13	81.92	61.58	Good	25	35.9	64.1	Good
		14	40.98			26	84.8		
		15	61.85			27	71.7		
4.	Living Things	1	29.61	55.50	Average	2	66.6	60.1	Good
		2	85.43			3	44.9		
		3	51.05			4	61.4		
		4	31.23			5	65.0		
		44	44.42			6	70.1		
						8	90.1		
						9	76.9		
						10	41.3		
						11	44.8		
						42	39.4		
5.	Health, Health Services and Methods of Preventing Diseases	6	61.36	53.65	Average	1	22.4	56.4	Average
		7	84.57			12	88.8		
		8	71.42			16	69.0		
		9	69.73			19	75.6		
		10	34.23			20	19.4		
		11	40.78			21	48.9		
		12	64.40			22	77.0		
		24	63.69			23	47.9		
		32	21.43			24	58.8		
		34	53.10						
		37	43.39						
		49	35.72						
6.	Changes of Objects, States and Events	33	15.92	44.48	Average	31	26.0	48.9	Average
		36	46.25			36	69.2		
		38	62.73			37	28.5		
		39	50.30			38	41.9		
		40	65.66			39	58.0		

S/N	Topic	PSLE 2017				PSLE 2018			
		Performance in each question		Average performance (%)	Remarks	Performance in each question		Average performance (%)	Remarks
		Question number	% performance			Question number	% performance		
		42	26.00			44	69.9		
7.	Energy, Mashine and Work	5	43.87	42.98	Average	7	56.2	47.0	Average
		21	29.58			17	60.6		
		22	45.25			18	62.2		
		23	47.78			25	35.9		
		25	34.60			32	23.4		
		26	19.69			33	38.2		
		27	71.02			40	50.8		
		31	52.06			45	48.8		
8.	Methods and Procedures in Science	20	60.31	46.81	Average	34	32.7	24.3	Weak
		28	52.56			35	48.7		
		29	53.32			41	0.1		
		30	37.45			43	15.7		
		43	30.41						

APPENDIX B


A SUMMARY OF COMPARISON OF THE CANDIDATES PERFORMANCE BY TOPIC IN PSLE 2017 AND PSLE 2018 SCIENCE SUBJECT
Average Performance (%)
100
90
80
70
60
50
40
30
20
10
0
62.66
74.80
44.93
68.80
61.58
64.10
55.50
60.10
53.65
56.40
44.48
48.90
42.98
47.00
46.81
24.30
HIV/AIDS
Essential Needs for Health and Living
First Aid
Living Things
Health, Health Services and Methods of Preventing Diseases
Changes of Objects, States and Events
Energy, Mashine and Work
Methods and Procedures in Science
Topic
PSLE 2017
PSLE 2018