PRINCIPAL EXAMINER'S REPORT

BOTSWANA
EXAMINATIONS
COUNCIL

BGCSE SCIENCE SINGLE

2024

Advancing learning, certifying your future

PAPER 1: MULTIPLE-CHOICE

General Comments

The 2024 candidates performed much better than the 2023 cohort as the mean increased by 3.46. Unlike in the previous year, the candidates did not find the questions targeting the lowest levels of cognitive scales difficult. It is worrisome that the candidates as in the previous year's find the questions on dilution difficult, they seem to calculate the final volume well but never subtract the initial volume from the final volume. There were two (2) questions in which the candidates struggled with selecting the correct answer, where the proportion correct is less than 45%, while there are 14 questions in which the proportion correct is above 90%.

Generally, Multiple-Choice items have a guessing factor that is considered to be the lowest proportion of getting an item correct without knowing the answer. For a Multiple-Choice item with four options, the guessing factor is 25% and any item which has the proportion of candidates who got the item correct lower than the guessing factor is a cause for concern. Candidates should be encouraged to always read the question for understanding before they select an answer. The report is mainly in table format showing the number and percentage of candidates at each of the options. The key for reading the table:

N	the number of candidates who selected each of the options
%	percentage of candidates who selected each of the options
Key	the option that was taken as the answer

Comments on Individual Items

Item 1

Option	N	%	Key	Comment
A	65	0.02	B	The item was averagely done. Half of the candidates were not able to convert weight to mass. Among those who did not score multiplied the constant *g* with the weight instead of dividing the weight with constant *g*.
B	1471	0.50		
C	119	0.04		
D	1302	0.44		

Item 2

Option	N	%	Key	Comment
A	661	0.22	D	The item was poorly done. Though most candidates were able to deduce the block that will have the greatest acceleration, those who did not get it correct showed no clue as they were almost spread equally among the three distractors.
B	653	0.22		
C	421	0.14		
D	1222	0.41		

Item 3

Option	N	%	Key	Comment
A	483	0.16	D	The item was poorly attempted. Majority in the cohort could not identify an expression or formula used to calculate the power of an object.
B	882	0.30		
C	433	0.15		
D	1159	0.39		

Item 4

Option	N	%	Key	Comment
A	967	0.33	A	The item was poorly done. Majority of the candidates went for option D showing a misconception or no clue on the magnitude of expansion of the three states of matter. Centres are advised to do experimental practice to their candidates for imparting the required knowledge.
B	461	0.16		
C	416	0.14		
D	1113	0.38		

Item 5

Option	N	%	Key	Comment
A	400	0.14	D	The item was poorly as majority in the cohort showed a misconception that expansion occurs by increase in size of the particles rather than increase in the space between the particles.
B	303	0.10		
C	1368	0.46		
D	886	0.30		

Item 6

Option	N	%	Key	Comment
A	733	0.25	C	The item was poorly done as majority in the cohort showed no clue on the transfer of heat from the Bunsen burner to the pot and inside water.
B	721	0.24		
C	966	0.33		
D	537	0.18		

Item 7

Option	N	%	Key	Comment
A	1109	0.38	D	The item was poorly done as majority in the cohort could not define the term frequency.
B	404	0.14		
C	390	0.13		
D	1054	0.36		

Item 8

Option	N	%	Key	Comment
A	632	0.21	C	The item was fairly attempted as most candidates showed knowledge on why electricity cables between the poles become looser during a hot day.
B	408	0.14		
C	1785	0.60		
D	132	0.04		

Item 9

Option	N	%	Key	Comment
A	425	0.14	C	The item was almost averagely done as 48% of the candidates were able to calculate the wavelength of the waves with frequency of 3 Hz and speed of 300 m/s.
B	268	0.09		
C	1411	0.48		
D	853	0.29		

Item 10

Option	N	%	Key	Comment
A	358	0.12	C	The item was poorly done. The candidates showed no clue on the calculation of the expression used for refractive index.
B	816	0.28		
C	978	0.33		
D	805	0.27		

Item 11

Option	N	%	Key	Comment
A	308	0.10	B	The item was fairly done. Most candidates were able to recall that power quantity is measured in watts.
B	2191	0.74		
C	334	0.11		
D	124	0.04		

Item 12

Option	N	%	Key	Comment
A	1115	0.38	C	The item was poorly done. The question proved to be more demanding as the candidates could not recall the term that describes the opposition of electric current. Option A obtained more choices than the answer.
B	314	0.11		
C	1005	0.34		
D	523	0.18		

Item 13

Option	N	%	Key	Comment
A	326	0.11	B	The item was fairly done. Most candidates could determine the current in the conductor passing 20 coulombs of charge in 2 seconds.
B	1845	0.62		
C	116	0.04		
D	670	0.23		

Item 14

Option	N	%	Key	Comment
A	1187	0.40	A	The item was poorly attempted. Most candidates were not able to identify a radioactive emission among the options, instead they went for common name like radio showing lack of knowledge on radioactive emissions.
B	280	0.09		
C	1018	0.34		
D	472	0.16		

Item 15

Option	N	%	Key	Comment
A	260	0.09	C	The item was poorly attempted. Though a higher percentage of the candidates went for the correct answer, most candidates were not able to identify the particles that are present in the nucleus of an atom.
B	784	0.27		
C	1048	0.35		
D	865	0.29		

Item 16

Option	N	%	Key	Comment
A	438	0.15	C	The item was poorly done as almost all of the candidates could not determine the salt and type of hardness of water that forms scum with soap solution before boiling but forms lather easily after boiling.
B	720	0.24		
C	750	0.25		
D	1049	0.35		

Item 17

Option	N	%	Key	Comment
A	909	0.31	B	The item was averagely done. Almost half in the cohort were able to determine the elements that could react together to form an ionic compound using the periodic table letters W, X, Y and Z.
B	1520	0.51		
C	279	0.09		
D	249	0.08		

Item 18

Option	N	%	Key	Comment
A	2806	0.95	A	The item was well done. Majority of the candidates showed that they are well skilled concerning diffusion.
B	45	0.02		
C	13	0.00		
D	93	0.03		

Item 19

Option	N	%	Key	Comment
A	365	0.12	D	The item was poorly attempted. Majority in the cohort though were told that solution of calcium hydroxide, they could not manage to deduce the pH of aqueous solution.
B	551	0.19		
C	993	0.34		
D	1048	0.35		

Item 20

Option	N	%	Key	Comment
A	1459	0.49	D	The item was averagely done. Majority in the cohort could not determine the gas produced in a reaction of metal and nitric acid. Majority went for ammonia. Centres are advised to give more examples of acid and metal reactions to their cohort.
B	354	0.12		
C	555	0.19		
D	589	0.20		

Item 21

Option	N	%	Key	Comment
A	1172	0.40	C	The item was poorly attempted. Majority of the candidates could not interpret the brackets and the coefficients in the formulas; hence, they chose option A obtained from adding one Zn, one O and two hydrogen atoms. Centres are advised to give more practice on calculation of A_r for complex compounds.
B	514	0.17		
C	968	0.33		
D	303	0.10		

Item 22

Option	N	%	Key	Comment
A	1960	0.66	A	The item was fairly done. Most of the candidates managed to recall the metal used for making aeroplane bodies.
B	308	0.10		
C	522	0.18		
D	167	0.06		

Item 23

Option	N	%	Key	Comment
A	1058	0.36	B	The item was poorly done. Most of the candidates went for option A, showing that majority had no clue on the general formulas of the alkenes and alkanes, while a third could not differentiate between a hydrocarbon and an organic alcohol and/or carboxylic group of compounds.
B	1045	0.35		
C	526	0.18		
D	328	0.11		

Item 24

Option	N	%	Key	Comment
A	631	0.21	D	The item was poorly done. The candidates had no clue as they are equally spread across the options. They could not process the information given showing lack of application skills. The candidates show know that arrangement of metals according to their reactivity always requires high order skills.
B	790	0.27		
C	796	0.27		
D	740	0.25		

Item 25

Option	N	%	Key	Comment
A	366	0.12	B	The item was averagely done as 50% of the candidates were able to deduce a change that will decrease the rate of the reaction between magnesium metal and nitric acid.
B	1486	0.50		
C	701	0.24		
D	404	0.14		

Item 26

Option	N	%	Key	Comment
A	693	0.23	A	The item was fairly attempted. Most candidates were able to identify a gas that contributes directly to global warming.
B	2023	0.68		
C	117	0.04		
D	124	0.04		

Item 27

Option	N	%	Key	Comment
A	1051	0.36	C	The item was poorly done as most of the candidates went for option A and D rather than option C. Candidates should know that whenever a carbonate is heated, carbon dioxide gas is produced as it is that same gas which turns lime water milky.
B	269	0.09		
C	596	0.20		
D	1041	0.35		

Item 28

Option	N	%	Key	Comment
A	225	0.08	C	The item was fairly done as majority of the candidates proved to have an understanding on the functions of the parts of a neurone cell.
B	209	0.07		
C	2312	0.78		
D	211	0.07		

Item 29

Option	N	%	Key	Comment
A	1326	0.45	D	The item was poorly done. Majority of the candidates could not process the information given. The cohort could not determine the osmosis gradient that will cause the liquid in the glass tube to rise to the highest level from the three liquids given.
B	653	0.22		
C	487	0.16		
D	491	0.17		

Item 30

Option	N	%	Key	Comment
A	946	0.32	B	The item was poorly done as majority of the candidates could not recall the three conditions required for photosynthesis to take place.
B	1299	0.44		
C	599	0.20		
D	113	0.04		

Item 31

Option	N	%	Key	Comment
A	300	0.10	B	The item was averagely attempted as half of the cohort managed to apply the periodic trends to deduce that phosphorus has the smallest atomic radius as compared to the elements given. But 44% went for option B, showing a misconception that needs to be addressed.
B	1565	0.53		
C	242	0.08		
D	850	0.29		

Item 32

Option	N	%	Key	Comment
A	630	0.21	A	The item was well attempted as the majority of the candidates determined the charge in Coulombs used when a current of 2.5 A is passed through dilute hydrochloric acid for 60 minutes and 20 seconds. Centres are commended for making their cohort to be efficient in this concept.
B	1422	0.48		
C	644	0.22		
D	261	0.09		

Item 33

Option	N	%	Key	Comment
A	1277	0.43	A	The item was fairly attempted as most of the candidates managed to identify a change that could be made in the reaction of the production of ammonia which will increase the rate at which equilibrium is achieved. However, 20% went for option D.
B	466	0.16		
C	75	0.03		
D	1139	0.39		

Item 34

Option	N	%	Key	Comment
A	1520	0.51	B	The item was fairly attempted done. Majority of the candidates were able to determine a product of thermal decomposition of potassium nitrate.
B	346	0.12		
C	648	0.22		
D	443	0.15		

Item 35

Option	N	%	Key	Comment
A	1858	0.63	A	The item was well done as almost all candidates were able to recall a metal commonly used to make aircrafts.
B	334	0.11		
C	690	0.23		
D	75	0.03		

Item 36

Option	N	%	Key	Comment
A	487	0.16	A	The item was well done. Though the question required the cohort to process data, indeed they managed to identify a pair of equations in which the products from the reactions change the colour of the universal indicator to orange and green.
B	1039	0.35		
C	994	0.34		
D	437	0.15		

Item 37

Option	N	%	Key	Comment
A	637	0.22	C	The item was fairly done. Almost half of the cohort determined an element which has two electrons in the outer shell that are not used in forming bonds. However, options B and D got a larger share too.
B	323	0.11		
C	1106	0.37		
D	890	0.30		

Item 38

Option	N	%	Key	Comment
A	197	0.07	D	The item was poorly done. Though 40% of the candidates were able to identify a term in which a compound exists in two structural forms with the same molecular formula, a good number of them went for options A and C.
B	201	0.07		
C	893	0.30		
D	1665	0.56		

Item 39

Option	N	%	Key	Comment
A	176	0.06	C	The item was well done. Most candidates were able to recall the term used to describe a compound that exists in two structural forms but with same molecular formula.
B	151	0.05		
C	2515	0.85		
D	110	0.04		

Item 40

Option	N	%	Key	Comment
A	1243	0.43	A	The item was well attempted as most candidates were able to identify a macromolecule with the same linkage as nylon.
B	1091	0.38		
C	394	0.14		
D	167	0.06		

PAPER 3: WRITTEN PAPER

General Comments

The overall performance in this paper was generally moderate. This year, a couple of candidates were able to score relatively high marks across all the three subjects. This is a highly commendable performance for these candidates. Science Single Award is an integrated Science. Candidates displayed varying competencies across the three subjects: Physics, Chemistry and Biology.

In Physics, candidates did fairly well in most questions. This is a welcome development. It is observed however, that most candidates performed poorly in questions that required them to describe or explain processes or concepts. Unlike in previous years, calculations were also fairly done, and in some instances, most candidates were able to recall and use formulas appropriately. This is highly commended for those Centres which were able to achieve this. Centres are once more encouraged to give candidates more practice in this type of question to build confidence among candidates.

In Biology as usual, candidates were able to access most marks, which implies that they were able to interpret the questions well. Centres are commended for the work well done in Biology. Continue reaching out to those candidates who find the subject difficult and upgrade them to their best potential. Once more, Centres are commended for working tirelessly in preparing candidates for their examinations.

The performance in Chemistry was generally moderate. Several questions posed a challenge to some candidates. The candidature, it appears, could not apply what they learnt in class, to an unfamiliar situation in most cases. They also lack precision in various area of chemistry such as writing a balanced chemical equation and drawing different structures of chemicals. Centres are encouraged to give candidates more practice in these areas.

Comments on Individual Items

1 **(a)** A fair number of candidates performed well when defining the term weight. Most of the candidates mentioned mass of the body or object instead of force of gravity acting on the body. A few candidates mentioned gravitational energy instead of gravitational force in their definition.

(b) **(i)** A good number of candidates responded well to the question. Most managed to recall the equation of weight, substitute correctly and gave correct calculated final answer. A few candidate wrote $W = ma$ instead of $W = mg$. Some candidates also wrote mass × gravity instead of mass × acceleration due to gravity.

(ii) A fair number of candidates attempted this question well. Most candidates were able to recall the correct equation for work done, $W = Fs$, and managed to apply it correctly.

(c) A significant number of candidates did well on this question. Some candidates wrote gravitational kinetic energy while others wrote gravitational energy to kinetic energy. Some candidates also confused energy with force, giving responses such as gravity or gravitational force.

Answers: **(b) (i)** 500 **(b) (ii)** 750

2 **(a)** Most candidates did not perform well in this question. A significant number of candidates responded with fire alarm or alarm bell, however, some candidates managed to score a mark for a correct name of any of refrigerator, electric iron, electric oven, electric kettle, air conditioner.

(b) A fairly good number of candidates performed moderately well on this question. Most of them showed that they understand that a thermostat switches on or off an appliance. A few candidates confused the purpose of a thermostat with that of a fuse. They responded by saying, it cuts the electricity when the heat is high or when the appliance gets too hot. Other candidates responded by saying, it switches off when current is too high. Centres are advised to emphasize on the difference between the purpose of a thermostat and a fuse.

(c) Most candidates performed poorly on this question. Some candidates responded by stating that metal X bends more than metal Y because its black in colour, therefore it will expand downwards. A fair number of candidates considered the terminals as the contacts.

3 **(a)** Generally, this question was poorly performed by most candidates. A good number of candidates performed well in this question. Some candidates confused radio waves with radioactivity giving responses like radio-active waves, radioactivity waves.

(b) This question was poorly performed by most candidates. Most candidates stated the first observation as vibrations were produced and mentioned nothing about no sound. Other candidates stated that vibrations were heard as an appropriate response.

(c) This question was moderately performed because candidates managed to recall the appropriate equation, $c = f\lambda$. However, changing frequency to the subject of the formula was the main challenge for some candidates. Centres are advised to give candidates more practice with questions that require changing the subject of the formula.

Answers: **(c)** 1.0×10^9 Hz

4 **(a)** The question was fairly done by most candidates. Most candidates managed to identify voltage label on the bulb but could not tell that 60 W was a label for the power. Most candidates only scored 1 mark for this question.

(b) The question was poorly done. Though the candidates were provided with the formula, they could not change the subject of the formula provided to make the current, I the subject. This led to most of them failing to calculate the current.

(c) The question was poorly done. A few candidates were able to recall either one of the two equations, $E = VIt$ and $E = Pt$. Most of the candidates who recalled the equation had a challenge in substituting the correct values, especially where they had to convert the time to SI units and/or writing appropriate units thus leading to them losing marks.

Answers: **(b)** 0.25 A **(c)** 216 000 J

5 Candidates were given a list of words to that they were to use to answer the part questions.

(a) **(i)** This question was fairly done as most of the candidates were able to choose copper(II) as a base. However, there were some who chose carbon monoxide or carbon dioxide as their bases which did not score. Centres are advised to emphasise much on examples of insoluble bases and make it clear to students that a base is not all about having oxide in their names" but should be an oxide of metallic elements in most cases.

(ii) The part question was fairly attempted as most candidates chose barium(II) sulphate as a salt that can be prepared by precipitation, even though they were a few who wrote copper(II) oxide which did not score.

(iii) The part question was poorly answered as majority of the candidates could not identify or recall carbon monoxide compound as a substance that can be used as a reducing agent in the extraction of iron.

(iv) The part question was poorly done. Majority of the candidates could not use the formula C_nH_{2n} to determine the organic compound with such homologous series feature. The cohort could not see that the general formula is for alkenes and not for alkanes as they went for ethane instead of propene.

(v) The part question was fairly answered as most candidates were able to identify or recall copper(II) sulphate as a compound that forms a blue solution dissolved in water.

(b) **(i)** This question was fairly done as majority in the cohort managed to score a minimum of one (1) mark as they recalled sand or silicon dioxide as another raw material other than limestone. Some gave the scientific name of limestone, which calcium carbonate, while a handful number remembered coal as the other raw material.

(ii) The part question was poorly done. Majority in the cohort could not remember the formula or name of limestone neither the use of limestone in the extraction of iron.

6 This question was fairly attempted, with some parts demonstrating a reasonable level of understanding from candidates. However, there were noticeable misconceptions and areas requiring improvement. The analysis of each part is as follows:

(a) This section was fairly well done. Most candidates successfully balanced the chemical equation provided. However, some candidates failed to simplify the equation into its simplest whole number ratio, which is essential in chemical equation balancing. The equation was

$$2\,Na(s) + Cl_2(g) \rightarrow 2\,NaCl(s)$$

Centres are advised to reinforce the importance of simplifying equations into the simplest whole-number ratios through regular practice.

(b) Performance in this section was satisfactory, as most candidates identified the correct type of bonding in sodium chloride as ionic or electrovalent. However, a recurring misconception was identifying the bonding as covalent instead of ionic. This suggests a need for a stronger emphasis on the properties and formation of ionic bonds during instruction. Centres are advised

to emphasize the distinctions between ionic and covalent bonding, particularly through practical examples and visual aids.

(c) This section was poorly attempted. Many candidates failed to draw the correct dot-and-cross diagram for sodium chloride, frequently depicting covalent bonding between sodium and chlorine atoms. This indicates a lack of understanding of how ionic compounds form through the transfer of electrons. Centres are advised to incorporate more practice sessions focused on drawing and interpreting bonding diagrams for ionic compounds.

(d) **(i)** This part of the question was fairly well attempted. Many candidates correctly named hydrochloric acid and either sodium hydroxide or sodium oxide as the acid and base that could be used to prepare sodium chloride. However, some responses revealed confusion about the relationship between the type of acid and the salt it produces. Centres are advised to encourage a deeper understanding of the relationship between the type of acid/base used and the resulting salt. Provide hands-on experiments where possible

(ii) This part was also fairly well done. Most candidates correctly suggested crystallisation as the method used to obtain sodium chloride crystals from the solution. However, there were frequent incorrect responses such as simple distillation or fractional distillation, which are inappropriate for separating a solute from a solution. Another unpopular answer was filtration. Centres are advised to clarify the appropriate methods for different types of mixtures, emphasizing their specific applications and limitations.

7 This question was poorly attempted by the majority of candidates, with notable misconceptions and a lack of clarity in responses across all sub-sections. The details are as follows:

(a) The part question required the candidates to state the meaning of the term unsaturated hydrocarbons. Very few candidates provided the correct response. Most candidates mistakenly referred to an unsaturated solution instead of an unsaturated hydrocarbon. Among those who recognized the term "unsaturated hydrocarbon," a common incorrect answer was simply stating the presence of a double bond or the presence of a double covalent bond without specifying that this bond occurs between carbon atoms. Expected Answer: The presence of a double covalent bond between carbon atoms. Therefore, Centres should emphasize the distinction between terms like unsaturated hydrocarbon and unsaturated solution.

(b) The candidates were asked to draw the molecular structure of ethene and in this section also saw limited success, that is, the question was poorly done. Many candidates confused the structure of ethene with that of ethane or propene. A significant number of responses included incorrect structures where carbon atoms had more than four bonds, indicating a lack of understanding of the valency of carbon. Centres are advised to give candidates more practice in drawing and interpreting correct molecular structures, particularly ensuring adherence to carbon's tetra-valency.

(c) The performance in this section was poor. Many candidates failed to identify the correct chemical test for unsaturation. Common incorrect responses included the chemical tests for gases such as hydrogen, carbon dioxide, and oxygen. These errors suggest a gap in understanding the application of bromine water in testing for unsaturation. Expected Answer: Test: Bubble ethene gas through bromine water (or aqueous bromine). Result: Bromine water turns from brown to colourless. Centres are advised to perform laboratory sessions that reinforce

the chemical tests for unsaturation and their observations, ensuring candidates can accurately recall and apply this knowledge.

(d) **(i)** A fair number of candidates demonstrated some understanding on the process where ethene molecules react together to form a polymer called poly(ethene), but there were frequent incorrect responses. Common misconceptions included referencing "cracking" or "combustion" instead of the correct process.

(ii) This part was the most successfully answered. Most candidates were able to identify at least one environmental or health issue caused by improper disposal of plastics.

8 The question required the cohort to use a diagram showing the pathway of water from the soil into a plant. The overall performance for this question was above average with most candidates doing well in the last part of the question.

(a) The question was well done. Most candidates accessed the mark. Majority of the candidates were able to identify part V which was the root hair cell. The common answers which were not correct included: root cell, phloem and xylem.

(b) The question was poorly done. Marks for this question were not accessed by most candidates as they could not recall the names of the parts present in cell V that are not shown the diagram. Most candidates responded by indicating that the parts present in cell V were the cell wall and chloroplast, instead of nucleus, mitochondria, vacuole, cytoplasm or ribosomes.

(c) Poorly done. This mark was also difficult for candidates as many candidates could not give a visible feature of cell V in the diagram. Most common responses produced by candidates which were not correct included the following: it has long root hair cell and progesterone, instead of projection, extension or elongation.

(d) The mark was accessed by most candidates as they managed to circle a word, tissue, which best described the cortex labelled in the diagram. A few candidates circled the word, cell, and some selected system.

(e) The question was well done by most candidates as they were able to state the structural difference s between an animal cell and a plant cell. A common problem that was observed for some candidates was where candidates only discussed the structure of one cell and failed to compare it to the other cell. For example, some candidates indicated that a plant cell has a cell wall and said nothing about the animal cell. Centres are advised the emphasis to candidates to state both sides of the argument when they are expected to compare.

9 Most candidates did not do well on this question. They seemed not to understand the meaning of regions in the digestive system.

(a) Based on the diagram of fats particles in different regions of the digestive system, the cohort was expected to name or suggest the regions in the system where large particles and small particles of fats are found. In this question, most candidates used answers relevant for region 2 to answer region 1. Most common incorrect responses used included small intestine for region

1 instead of mouth, oesophagus, stomach and stomach for region 2 instead of small intestines or duodenum.

(b) **(i)** Candidates were expected to explain the change in the appearance of fat particles from region 1 to region 2. Candidates did well on this question except a few who confused the question for diffusion. Some candidates gave their response as movement of particles from a high concentration area to a low concentration area instead of fat was broken down into smaller particles and Bile was added to fat / Fat was emulsified. This shows that candidates thought the question was based on the concepts of diffusion. The other common and incorrect answer was lipase has emulsified fat to fatty acid and glycerol.

(ii) Candidates performed poorly in this question. Most candidates described the dangers of fats if not broken down instead of explaining why fats should be emulsified. Example: For instance, some candidates responded by writing statements such as, Fats will block arteries if they are not broken down.

10 In this question candidates were given three types of blood vessels A, B and C. The overall performance in this question was moderately below average. For most parts of the question, candidates did not do well. However, the performance was varied across different parts of the question.

(a) The question was poorly done. A moderate number of candidates were not able to identify blood vessels A and B. They confused blood vessel B for an artery instead of capillaries. Hence, they were able to score only one mark for correctly identifying blood vessel A as a vein.

(b) Candidate were expected to give two differences between blood vessel A and blood vessel B and did not do well in this question. It was evident from their responses that they were more comfortable with comparing veins with arteries rather than with capillaries. Some of the most common incorrect responses included statements such as, blood vessel B/capillaries are thicker than veins and blood vessel A, veins carry blood at high pressure than blood vessel B/capillaries.

(c) Candidates were expected to explain how the fat deposits on the walls of blood vessel C affect how the heart works and they performed badly on this question. They described the condition shown on the blood vessel C instead of explaining how the condition can affect how the heart works. Some of the most common responses were fat deposit would block the blood vessel, no blood will pass and low blood pressure instead of volume of blood passing through is reduced or less oxygen, glucose supply (to heart muscles) or less energy, respiration (no energy / respiration).

(d) Candidates did exceptionally well on this question. Most candidates were conversant with ways of avoiding complications caused by blockages due to fats deposits on the walls of blood vessels. The most scoring points were do (regular) exercise; eat less cholesterol / less fatty food / junk food/ (balanced diet) / healthy food.

PAPER 4: ALTERNATIVE TO PRACTICAL TEST

General Comments

Just like in the previous years, the candidates still struggle to demonstrate acquisition of basic practical skills being tested on this component. Candidates not only struggle on Scientific skills but also lack basic communication skills. They either struggle to understand the questions or fail to express their answers well due to language barrier.

The candidates struggled with simple Mathematical operations, presenting values to correct accuracy, or with correct units. Biological drawings are still not up to scratch. Candidates lost marks by failing to draw clean and clear diagrams, or by drawing diagrams which do not resemble the original item or lacks details clearly visible. It was also common to have candidates drawing a line showing where length of their drawing was taken, on the drawing instead of along it.

Candidates were found wanting on questions where they are to plan investigations, make comparisons and reach conclusions. Candidates continue to show very little understanding on Qualitative Analysis. They never seem to remember the steps, observations and the conclusions made. Such that even when ions present in the unknown substance have been revealed, candidates still failed to identify the substance.

Comments on Individual Items

1 (a) (i) The question was fairly done. Some candidates were able to read the meter rule accurately. There were a few candidates who recorded the original length as 4 cm instead of 4.0 cm. Centres are encouraged to emphasise more on the accuracy of instruments.

(ii) This part question was fairly done. Most candidates were able to read the meter rule. An answer of 8.0 cm was common. An assumption is that the candidates did not measure but worked it out. A common mistake is that some candidates wrote units in the table while the table has units.

(b) This question was fairly done. The equation $e = l - l_o$ assisted candidates in answering the question.

c (i) This question was fairly done. A few candidates who failed to score the mark for correct plots is because they did not use the correct notation (fine crosses or circled dots). Although the axes were labelled some candidates plotted weight vs extension. There were some candidates who plotted length vs weight. Candidates are encouraged to read and follow instructions. Some candidates failed to score the mark for line of best fit because they did not draw a smooth line through the points.

(ii) This question was poorly done. The equation for gradient did not assist most candidates as it was intended to. Most candidates who were able to use the equation failed to score marks because they used points which were close together in the line or which were not covering more than half the line. Candidates should show evidence of points used by showing parallel lines in the graph or a triangle.

Answers: **(a) (i)** 4.0 cm **(ii)** 8.2 cm **(b)** 4.2 cm **(c) (ii)** 0.8

2 **(a)** This question was poorly done. Candidates did not know what the question required. Common answers were volume of water, temperature of water.

(b) This question was poorly done. Candidates did not understand the question. Most candidates thought there were four cubes. Most candidates accessed only one mark out of 4. Centres are encouraged to expose learners to practical work, even if it means demonstrations of these experimental skills. Candidates seem to confuse absorption, emission, and conduction.

(c) This question was poorly done. Most candidates stated the error instead of describing it. Common mistake was human error as opposed to human reaction time.

3 **(a)** This question was fairly done. Use of a ruler - most candidates failed to state a quantity (length) being measured using a ruler. Naming a funnel. Most candidates were able to name the funnel but there were some common wrong answers including *filtrator, separating funnel, visking tubing, distillatory and filter paper.* For a filter funnel most candidates wrote the use of a filter paper instead. The accepted use was to hold the filter paper, or for pouring liquids.

(b) The question was poorly done. Candidates were struggling to express themselves on how to use a ruler to measure accurately. The Centres are encouraged to practice more of this kind of question to help the candidates with descriptive questions. As per the mark scheme, the ruler is placed along the length of the object. Most common *wrong answers include place an object on a flat surface, start taking a reading at the zero mark etc.*

(c) The question was fairly done. Candidates who lost marks were the ones who could not figure out the accuracy on the readings taken from the measuring cylinder. Some lost marks by repeating units on the table. Centres are encouraged to help learners by practicing more of question of taking reading from different calibrated apparatus with different accuracies. Correct readings were 25, 42, 54, 60 and 60.

(d) The question was Poorly done. One candidate managed to score on this question*, the most common wrong answer was 8 to 10 minutes*. It seems majority of candidates didn't know what a 'time interval' is. The expected answer was 0 to 2 minutes.

4 **(a)** The question was satisfactory answered. Majority of candidates scored correctly on this question. A few that lost the marks were the ones with incorrect answers including *cloudy, emulsion and milksh, or milky*. Candidates should be made aware by Centres that lime water is the one that turns milky or forms a white ppt not the carbon dioxide gas.

(b) **(ii)** The question was fairly done**.** Most candidates scored a mark by just writing the word Precipitate/ppt but most lost a mark by writing the incorrect colour of the precipitate. Most wrong answers include *precipitation*, which has a different meaning from precipitate. Centres encouraged to help learners realize that brownish is not a colour but just a description.

(ii) The question was poorly done. The common wrong answer includes soluble, insoluble solution, stating the precipitate formed. Instead, candidates were to state that the precipitate did not dissolve.

(c) The question was poorly answered. Common wrong answers include sodium hydroxide, iron carbonate, iron(II) carbonate, iron(II) oxide and writing formula instead of name. Correct answer is iron(III) carbonate.

5 **(a)** The question was well performed. Most candidates were able to draw large diagrams and included details such as stalk, and veins. However, most were not clean and clear. Some were shaded, others woolly etc. Centres are advised to encourage candidates to use well sharpened pencils and avoid artistical drawings. However, some candidates failed to capture the fine details, such as vein patterns and the serrated edges. Some had drawn a double line for the leaf margin of which is incorrect. Therefore, Centres should emphasise the importance of neat, accurate biological drawings. Conduct practice sessions to help students focus on details such as proportions and vein patterns and also emphasise that double line applies mainly to cross sectional specimens to indicate thickness such as the fruit 'skin'.

(b) **(i)** The task required the candidates to measure the longest length of the photograph. The question was fairly done as most candidates struggled with this task, with few failing to accurately measure the leaf's length. Either the line along the length was not shown, or if shown, it was not parallel to the length. This affected the accuracy. Some candidates drew the line on the drawing instead of next to it, along the length. It was also common to get some candidates giving incorrect accuracy and having values such as 50.9 mm instead of 59 mm or 5.9.

(ii) The task required the cohort to measure the Longest Length of their drawing. And the question was fairly done with similar issues noted as in part **(b)(i)**.

(c) This question was fairly done. Substitution was done successfully by most candidates. However, most candidates could not correctly express magnification. Some used an x (the lower cap mathematical one), instead of X or times. Some included units as well.

6 **(a)** The question was poorly done**.** Most candidates could not correctly state the total volume of the contents in the measuring cylinder leading to incorrect volume of froth produced. Total volume is 17 cm^3 and 7 cm^3 for volume of froth produced.

(b) Poorly done. Most candidates could not quantify the variable in concerned. e.g. Hydrogen peroxide instead of **volume** of hydrogen peroxide or potato cubes instead the size of the potato cubes. Other variables to be kept constant are pH and time. Centres are encouraged to practice more on investigative experiments, with more emphasis on controlling variables, and their impacts on the results.

(c) Poorly done. Most candidates stated raw potato as the control. Others stated both potatoes from P and R, instead of the letter R. Most candidates did not seem to remember that control experiments must have ideal conditions.

(d) Poorly done. Most candidates were clueless on what reliability is. Many candidates just mentioned variables. Correct answer is to repeat the experiment.

(e) Poorly done. Most candidates were not able to acknowledge differences in terms of froth formation rather they concentrated on differences in total volume. It was evident that most of the candidates were not aware that this was an enzyme catalysed reaction, and it included the production of a gas. The more froth represented high enzyme activity. Centres are encouraged to do more practice on Questions of this nature and hopefully the candidates may get more comfortable dealing with these questions.