SCIENCE (513/02)

General Comments

This paper consists of two sections, section **A** and **B**. All questions are compulsory in Section A and candidates choose one question from section B.

The highest mark obtained was **56** in 2020 compared to 57 in 2019. There was a noticeable number of candidates who scored the lowest mark of **00**. Even though the highest mark was 56 it does not mean that the paper was easy as very few candidates were able to get marks higher than 50.

Candidates had challenges attempting questions on application of scientific information and questions that involved investigative skills. Candidates seemed to have problems in the description and drawing conclusions from experimental activities.

Questions that were more challenging to most candidates were **Questions 2 (a),**

3 (b)(iii), **4 (b)(iii)**, **5 (a)(ii)**, **6 (a)(iii)**, **7 (a)(i)** and **7(a)(iv)**. Some of the reasons which attributed to the performance not being good were:

- Failure to state reasons where questions require some explanations. For example, in **Questions 2 (b) (iv)** some candidates would give an answer like *the plant growth will be slow* and fail to state a reason why.

- Incorrect spelling of some of the scientific terms such as '*anemometer', 'ventricle', 'potential', 'thermometer'* to mention a few.

- Failure to answer high order questions where diagrams or given tables had been provided.

Comments on Specific Questions

Question 1

(a) This question required candidates to name the gas that caused the flame of the fire to be bigger after air had been blown by a plate on the fire. Most candidates were able to name the gas correctly as oxygen. The few that failed to respond correctly gave wrong responses such as carbon dioxide, nitrogen, air or wind.

(b) **(i)** Candidates were required to name the clear liquid which was used in the experiment to investigate the properties of air. This question was not well attempted. Candidates failed to name the clear liquid as limewater. They gave incorrect responses such as water, lime, juice, clear liquid carbon dioxide, lemon water, milky white, and gas.

   (ii) Candidates were required to state what the results of the clear liquid becoming milky when Sam has breathe out into the test-tube shows about the air we breathe out. This question was generally well attempted. Most candidates were able to state that it showed the presence of carbon dioxide in the expired air. Wrong responses that were written by other candidates included dirty air, warm, oxygen, bad smell, gas and air.

   (iii) Candidates were required to explain why the clear liquid for Andrew did not change when he breathed out into the test-tube. Most candidates were able to respond correctly to this question. They were able to explain that the glass tube was short and did not reach to the clear liquid thus resulting in the carbon dioxide not reacting with the lime water. A few of the candidates were not able to give correct explanations. Some of their incorrect responses were; Andrew did not have enough energy to blow into the clear liquid, there was no limewater or there was no carbon dioxide.

(c) **(i)** Candidates were required to name the change of state that takes place when margarine changes into a liquid. This question was well attempted. The correct answer was melting which most candidates were able to name. However, some gave wrong responses like evaporation, heating and dissolving.

(ii) Candidates were required to describe how margarine can be made into a solid again. This question was not well done. Most candidates gave wrong responses like cooling it, solid, dissolving. The correct response was by putting the margarine in a refrigerator.

(d) **(i)** Candidates were required to interpret the weather forecast for diagram **M**. This question was fairly done. Candidates were able to respond correctly as partly cloudy. Most candidates gave wrong answers such as sunny cloudy, sunny, cloudy. Some wrote wrong spellings such as party cloudy, paty cloudy instead of partly cloudy.

(ii) Candidates were required to suggest the most suitable clothes to wear during weather **L**. This question was well attempted. Candidates were able to give the suitable clothes such as was raincoat, rain boots, or gum boots and rain-suit. Some candidates were not awarded marks for writing wrong answers like umbrella, hats, warm clothes, sunglasses. Some wrote wrong spelling for coat, e.g. "coart" and no mark was accredited for that response.

(iii) In this question candidates were required to describe two ways to be safe when exposed to weather condition **N**. The question was fairly attempted. Some candidates were able to respond correctly by stating that one needed to stay away from tall building or tall things like trees, avoid touching metals or water, avoiding following cattle, avoiding crowded places and not using cell phones or any electronic gadgets. Those who did not get the intended marks responded wrongly by stating that one needed to stay indoors, not eat, cover mirrors and shiny things.

Question 2

(a) The candidates were required to state with two reasons why the group of plants belonged to plant **I**. Most candidates correctly identified plant **I** as a flowering plant. The correct reason given was that it had flowers. However, most candidates failed to state the second reason which was that the plant propagates asexually instead they mentioned the leaves of the plant which had nothing to do with flowering plants. Others did not refer to the diagram e.g. *they produce fruits*. Another correct classification of plant **I** was that it was dicotyledonous plant. Most candidates incorrectly mentioned that plant **I** was a flowering plant instead of being a dicot. It seemed Candidates could not differentiate between a flowering plant and a dicot plant resulting in them not earning the second mark.

Expected response: dicot plants have broad leaves, branching/netted/lateral veins.

(b) The candidates were required to state the characteristics of living things shown by the living organisms **H** and **I**. Most candidates did not refer to the diagram when stating the characteristics of organisms **H** and **I**. They gave general characteristics of organisms like feeding, movement and growth which were not depicted by the diagram thus losing the maximum points. Others gave wrong responses like urinating, having young ones (for **H**), germination, parent plant, young plant which were just taken from the diagrams without any interpretation. **Expected response**: excretion for **H** and reproduction for **I**.

(c) **(i)** Candidates were required to name the structure labelled **J** of a bean seed that was planted and observed over eight days. Most candidates failed to name the part labelled **J** as a seed coat or testa. They wrote wrong answers such as bean coat, seed court and seed caught.

(ii) In this question candidates were required to state the function of the structure named **L**. This question was well attempted. Most candidates gave the correct answer as absorb water or dissolved nutrients or anchoring the plant to the soil, although some wrote wrong spelling of absorb as absorve, or absorp and lost marks.

(iii) Candidates were required to state one condition required for the seed to germinate. The question was well attempted. However, marks were lost for writing only temperature instead of **suitable** temperature. Other wrong responses were: sunlight, rain, oxygen, watering.

(iv) Candidates were required to explain the effects of removing part **K** which was the leaf on the growth of a plant. This question was challenging. Candidates were describing the processes (e.g. photosynthesis and transpiration) that takes place on leaves. They wrote wrong responses like the plant will die, the plant will lose a lot of water, the plant will not be able to transpire, it will wilt and die, leaves will become yellow.

Expected response : slows plant growth/ stops plant growth;

photosynthesis will not occur/ plant will not make food/no food for the plant;

Question 3

(a) **(i)** This question required candidates to draw a beam of light. The question was fairly attempted. A number of candidates were able to draw the beam of light correctly. Wrong beams of light that were drawn were: a torch shining, arrows, the sun with its rays, plants and ray of light. **Expected response:** a beam drawn by showing two lines with arrows going to the same direction.

(ii) The question required candidates to name two natural sources of light. It was a well attempted question. Most candidates were able to name the sources of light as the sun and stars. They rarely wrote lightening which was also a correct answer. Incorrect responses mentioned were: moon, sunlight, fire, and torch.

(b) **(i)** Candidates were required to state the type of energy that the ball had as it was on the table and when it was falling. It was a well attempted question except for a few who confused kinetic and potential energy and those that described the type of energy. Candidates correctly identified potential energy as the type of energy the ball had on the table. However, quite a number of candidates had challenges writing the correct spelling of potential energy. Some of the wrong spellings written were: protectional, potecsial, pothesial. Wrong answers that were given included stored energy, moving energy not moving, force of gravity, kenect, kinec, khinethic and low density.

Expected responses: potential energy on the table and kinetic energy when the ball is falling.

(ii) The candidates were required to state the law of conservation of energy. This question was challenging. A majority of candidates wrote their own interpretation of the law. They gave responses like energy cannot be made, energy cannot be destroyed and energy cannot be created or made. Some gave a definition of energy instead of the law of conservation of energy. The correct response was energy can neither be made nor destroyed.

(c) Candidates were required to state two ways of conserving electrical energy at home. This question was not well attempted. Some candidates used other sources of energy like solar, gas, fire wood and coal instead of stating ways of saving electrical energy thus lost the marks. Other wrong responses were cooking outside, boiling water and using coal stove for boiling water, not cooking beans on an electrical stove.

Expected responses: were light only rooms that are occupied, use energy savers, boil only the amount of water enough for what is required for use.

(d) **(i)** Candidates were required to state one use of an electromagnet. Candidates performed quite well on this question. Candidates who wrote the general use of a magnet (e.g. attracting magnetic substances from non-magnetic ones) were not awarded any marks.

Expected response: used in electric bell/ loud speakers/ telephones earpieces or computer hard drives or moving heavy loads.

(ii) Candidates were required to describe one method of making an electromagnet weaker. Most candidates performed well on this question. Incorrect responses mentioned were: adding the cells, removing the cells, removing the coils, switching off the electromagnet and stroking the magnet

Expected responses: to reduce the number of cells or reducing the current or reducing the number of coils on the electromagnet.

Question 4

(a) **(i)** Candidates were required to name the part of the heart labelled **M** from a diagram showing a human heart. This question was not well done by most candidates. They failed to give the correct response as the left ventricle. Most candidates gave wrong responses such as the right artery, right ventricle, right atrium, blood section or kidney. Some candidates wrote wrong spelling of ventricle e.g. ventri.

(ii) In this question candidates were required to describe two features of the blood vessel that identified it as an artery. This question was not well done. The majority of candidates did not refer to the diagram when answering the question. They gave the function of an artery like it transport blood to the body, carries blood with high pressure. Other wrong answers that were given were: it has a big wall, has cell wall and it is an animal cell.

Expected response: it has a thick muscular wall, has a narrow lumen/passage/opening.

(b) **(i)** Candidates were required to arrange the given parts in the order in which the food would travel along the alimentary canal. This question was fairly done. Most candidates were able to arrange the parts in correct order such as gullet, stomach, small intestine and large intestine. However, some lost the second mark because they started with the large intestines followed by the small intestines.

(ii) Candidates were required to name the end product of digested beef. The question was poorly done. Candidates gave wrong answers like anus, rectum, faeces, protein, nutrients, fatty acids. The correct response was amino acids.

(iii) Candidates were required to describe what happened to food after it has been digested. The question was poorly attempted. Most of the candidates were describing the route taken by food from the mouth throughout the alimentary canal. The correct response was that food is absorbed in the small intestine into the blood stream and transported to all parts of the body (cells and tissues).

(iv) Candidates were required to state a nutrient lacking in Simo's diet that was needed for a healthy skeleton. Most candidate did quite well on this question. They were able to state the correct required nutrient as calcium or vitamin D. Wrong responses that were given by some of the candidates were cabbage, vegetable, vitamins and minerals.

(v) Candidates were required to suggest a food substance that could be added to Simo's meal to make it balanced. This question was a challenging. Candidates simply wrote

(vi) vegetables or fruits instead of writing examples of correct protective food like spinach, cabbage, lettuce, oranges, apples etc. This made them to lose marks. Other wrong answers given included milk and body building foods.

Question 5

(a) **(i)** Candidates were required to explain why the change of milk to sour milk was a chemical change. Most candidates did not perform well in this question. They only mentioned one part of the correct answer that the change is irreversible and lost the second mark. Wrong responses given included milk will turn sour, it got rotten, it was not in the refrigerator and it was stored for a long time. The expected response was that the change is irreversible and milk had changed into a new substance when it turned sour or it had different properties from milk now as it was sour milk.

(ii) Candidates were required to describe how they would use a universal indicator paper to classify sour milk. The majority of candidates did not do well in this question. Most candidates used a litmus paper or pH instead of universal indicator paper when answering the question. Candidates who were able to make the correct description failed to state the conclusion made and this resulted in the loss of marks. The wrong responses they gave were: put the universal indicator in the milk and observe the colour change, if it turns red it will be an acid, if it turns blue, it is a base.

Expected response: put a drop of milk on a piece of universal indicator paper, the universal indicator would turn red/orange/ yellow and this shows that sour milk is acidic.

(b) **(i)** Candidates were required to define the term solvent. Most candidates failed to write the correct definition of a solvent. Wrong answers given were: a solvent is a solid that dissolves in a solution, a solid that dissolves in water, a solid that melts in a liquid, or is something that dissolve in a solution.

Expected response: liquid (substance) in which a solid/solute dissolves

(ii) Candidates were required to refer to the diagram in order to identify the best solvent for the paint. This question was not well attempted by most candidates. The majority of candidates were not able to interpret the information from the table. Wrong responses given included: water and paraffin. Other candidates identified the best solvent to be the one where **all** the paint was removed after 10 minutes. The expected response was that it was thinners.

(iii) Candidates were required to name the mixture formed by paint and thinners. The question was well attempted. Most candidate were able to give the correct answer as a solution. Those who got it wrong mentioned paint, thinners, residue and mixture.

(iv) Candidates were required to name a method used to separate a mixture of salt and water to obtain both the salt and the water. The question was well attempted. Most candidates were able to name the correct method as simple distillation. The wrong responses written were: filtration, evaporation, decanting and distillate.

Question 6

(a) **(i)** Candidates were required to name the instrument labelled **N**. Candidates performed well in this question except for a few who had challenges with writing the correct spelling for "anemometer". They wrote wrong spelling like anemeter, ananemometer and anometer.

Expected response: cup anemometer.

(ii) Candidates were required to state the function of instrument **O**. This question was not well performed by most candidates. Most candidates referred to the chicken on top of the wind vane. They responded wrongly by stating that it showed where chickens are sold. Other wrong responses were, stating the name of the instrument or direction of air. The correct response was it shows the direction of wind.

(iii) Candidates were required to explain why instrument **P** was placed on grass instead of a concrete floor. This was a challenging question. Wrong responses mentioned were: because the grass is soft, so that water can splash out and water the grass, to collect the correct amount of rain, to get the correct reading, it will break on concrete floor since it made of glass, the concrete is indoors instead of being outside and so that the water does not flow on the concrete.

Expected response: it prevents water from splashing into the instrument (rain gauge) which gives a wrong volume or increase the volume.

(b) **(i)** Candidates were required to describe how they would make a simple electromagnet using given apparatus. Most candidates were able to score 2 out of 4 from this question. They were able to score the first two points but failed to mention the connection of the wire to the cell. Most candidates used a nail which was not in the list of apparatus given instead of the steel rod, they also used cells or battery instead of the cell that was given. Wrong responses included the following: coil the steel rod around the conducting wire, coil the wire around the nail, connect the wire to the sides of the cells, connect the wire to the cell (missing the ends of the wire to the battery terminals).

Expected response: coil the conducting wires around the steel rod, connect the ends of the conducting wires to each end of the cell (positive and negative terminals).

(ii) Candidates were required to describe how they would test if the electromagnet has been successfully made. Most candidates were able to get the maximum points for this question. The few that did not get the full marks were candidates that gave incomplete answers for example, the magnet will attract the pins and not mentioning that you bring the electromagnet to the pins. Some candidates lost marks by using general knowledge or not referring to the apparatus. They used iron fillings or steel wool to test if they could be attracted by the magnet.

Expected response: you bring the electromagnet towards the pins, they will be attracted to show that the electromagnet was successfully made.

Question 7

This was not a popular question among the candidates.

(a) **(i)** Candidates were required to use the information in the table to draw a graph of temperature against the time. This question was challenging most candidates. Most candidates responded wrongly by not labelling the axes and excluding the units. They did not plot and join the points to show a line graph. Most candidates drew a bar graph instead of a line graph. Candidates were expected to label the X- axis as time/min and the Y- axis as temperature/ ºC, plot all the points correctly and join all points with a straight line.

(ii) This question required candidates to state the temperature of the water at 35 minutes using the graph. Most candidates did not respond well in this question. They lost marks by using wrong units. They would write 65º instead of 65 ºC. The expected response was 65 ºC.

(iii) Candidates were required to name the instrument used by the class to measure the temperature of the water. This was a well attempted question. Most candidates were able to name the instrument correctly as a thermometer.

(iv) The question required candidates to state what the graph tells them about the rate at which water cools between the temperatures 100 ºC and 40 ºC. This question was not well done. Most candidates failed to interpret the graph. They subtracted the 40ºC from a 100ºC to get a difference of 60ºC. Some said it shows water cooling. A few were able to state the correct answer that the water cools at a constant rate of 10 ºC every ten minutes. One candidate was able to even state that it shows that water cools at 1 ºC every passing minute.

(b) **(i)** Candidates were required to suggest and explain what the pupils observed when the balloons were brought closer to each other. Most candidates were able to answer the first part of observation and failed to give the explanation thus getting half the credit. They responded correctly saying there will be no attraction or they will repel. However, they did not explain the reason why they repelled. Some of the wrong answers given were that the balloons are charged, they have friction or they have static electricity.

Correct response: they will repel because they have the same charge.

(ii) The question required candidates to state the difference between static and current electricity. Most candidates were able to answer this question correctly by stating that static electricity involved the transfer of charge from one object to another due to friction and that current is a flow of charge in a circuit. Other candidates who did not get the maximum point are those that gave incomplete answers e.g mentioning the static electricity and not talking about the current electricity.