

INTEGRATED SCIENCE 2

1. **GENERAL COMMENTS**

The standard of the paper was the same as previous year. Each major question tested various concepts in all the sciences viz Chemistry, Biology, Physics and Agriculture. However, performance of candidates were below those of the previous years.

2. **SUMMARY OF CANDIDATES' STRENGTHS**

- (1) Adherence to the rubrics of the paper.
- (2) Handwriting of most candidates very legible.
- (4) Fluidity of language in presentation was good.

3. **SUMMARY OF CANDIDATES' WEAKNESSES**

- (1) Inability to apply scientific knowledge to explain physical phenomena.
- (2) Failure to answer major questions on fresh pages.
- (3) Inability to write and balance chemical reactions.

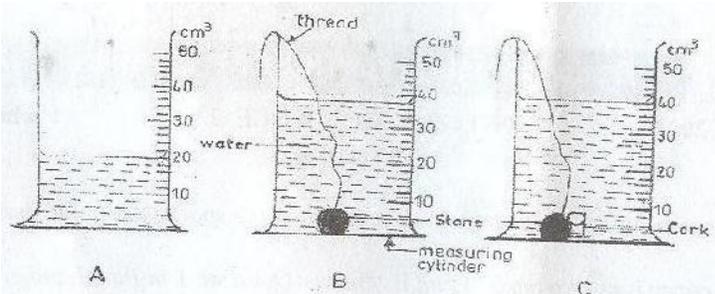
4. **SUGGESTED REMEDIES**

- (1) Students must be encouraged to pay attention to details during science lessons.
- (2) Teachers must impress upon their students to answer major questions on fresh pages to avoid mixture of responses.
- (3) Teachers must assist their students to write and balance chemical equations frequently during science lessons.

5. **DETAILED COMMENTS**

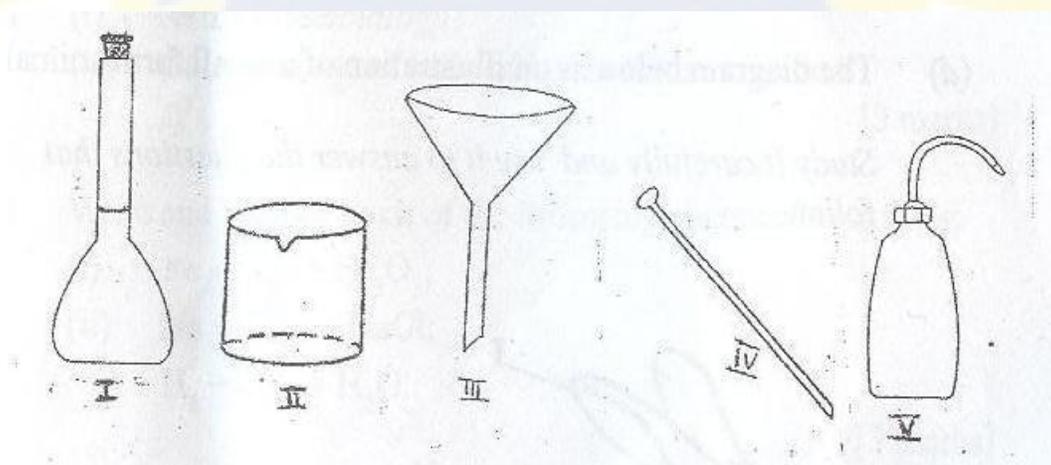
Question 1

- (a) **The diagrams below are illustrations of an experiment in the laboratory using a piece of stone, a cork of mass 4.0 g and other necessary materials.**



The initial volume of water in A was read and noted. A string was attached to a piece of stone and the stone lowered gently into the water as shown in B. The volume was again read and noted. Finally, the cork of mass 4.0 g was attached to the stone and both materials lowered gently into the water as shown in C. The volume was read and noted.

- (i) Why did the level of the water rise when the stone was lowered gently into it as shown in diagram B.
 - (ii) Why was it necessary to attach the stone to the cork before lowering it gently into the water as shown in diagram C?
 - (iii) What would have happened if the cork alone were lowered gently into the water?
 - (iv) What is the volume of the
 - (r) stone?
 - (s) cork
 - (v) Calculate the density of the cork.
 - (vi) Why were the materials lowered gently in to the water?
- (b) A salt solution was prepared in the laboratory using the set of apparatus illustrated below. Study the illustrations carefully and used them to answer the question that follow.

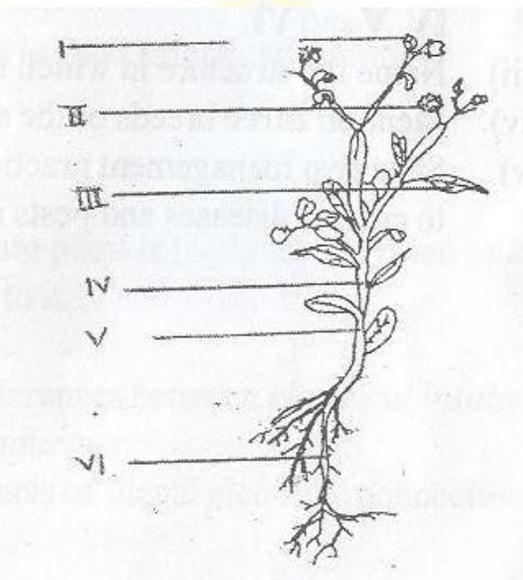


- (i) Name each of the apparatus labelled I, II, III, IV, and V.

(ii) State one function of each of the apparatus labelled I, II, III, IV and V.

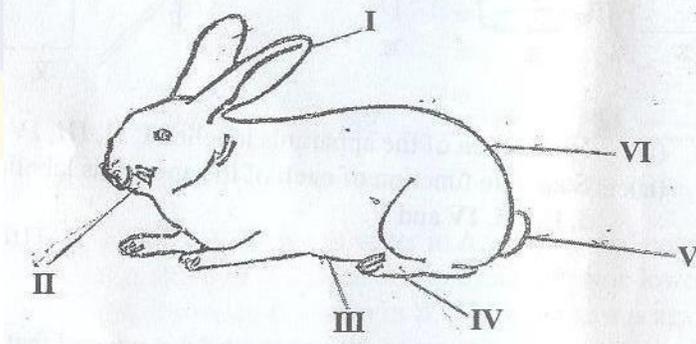
(c) The diagram below is an illustration of the external features of a flowering plant.

Study it carefully and use it to answer the questions that follow.



- (i) Name the parts labelled I, II, III, IV, and VI.
- (ii) State one function of each of the parts labelled I, II, III, V and VI.
- (iii) State the two main parts of a flowering plant.

(d) The diagram below is an illustration of a small farm animal.



- (i) Identify the animal.
- (ii) Name each of the parts of the animal labelled I, II, III, IV, V and VI.
- (iii) Name the structure in which the animal is kept.
- (iv) Mention three breeds of the animal.
- (v) State two management practices to be adopted in order to control diseases and pests in the rearing of the animal.

- (a) Majority of the candidates were able to give the reason why the rise of the volume of the water when the stone was gently lowered into it as shown in diagram B. The reason for attaching the stone to the cork before lowering it into the water was correctly stated by most candidates. Most candidates demonstrated their computational skills by calculating correctly the density of the cork. However, majority of the candidates were unable to give the reason for the rise in volume of water when the stone was lowered into it. It was wrong to state that it was because the stone had weight or density. The correct reason was that the stone displaced water/ occupied space/had its own volume.
- (b) The naming of the given apparatus were correctly done by the majority of the candidates. However, candidates must note that apparatus I is volumetric flask and not flat bottom flask and also apparatus labelled V is wash bottle and washing bottle. The second part of this sub-question was not answered correctly by most candidates.

The expected answers included:

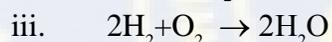
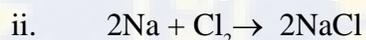
- I - Used to prepare standard solution or prepare solution of known volume
 - II - The beaker was used to dissolve the solute/ It could also be used to hold \ solution.
 - III - Transfer liquid into the flask
 - IV - To stir or mix solutions
 - V - The water it contains is used to top solutions up to required level without exceeding the level/It can be used to wash solution stuck to containers for effective titration experiments.
- (c) Majority of the candidates could identify the parts of the flowering plant illustrated except parts I and IV. Candidates must note that parts labelled I and IV are terminal bud and leaf stalk/petiole respectively. Their failure to name part labelled I correctly resulted in the stating of wrong function. Candidates must note that the terminal bud protects the growing regions or develops into flower.
- (d) This sub-question was well answered by most candidates. They correctly identified the farm animal illustrated, named the labelled parts, mentioned the breeds of the animal and stated the management practices to adopted to control diseases and pests in the rearing of the animal.

Question 2

- (a) (i) **What is technology?**
 (ii) **State one use of technology in communication.**
- (b) **Write and balance each of the following chemical equations:**
- (i) $\text{Fe} + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3$;
 - (ii) $\text{Na} + \text{Cl}_2 \rightarrow \text{NaCl}$;
 - (iii) $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$

- (c) **State one function of each of the following components of a typical cell:**
(i) **nucleus;**
(ii) **chloroplast;**
(iii) **mitochondrion.**
- (d) **Mention four cultural practices in vegetable crop-production.**
- (e) **Name two agencies in food safety and quality assurance in Ghana.**

- (a) Majority of the candidates were able to explain correctly the term technology. However, some candidates stated that technology was the application of scientific method instead of scientific idea or knowledge to meet the needs of the society. Most candidates mentioned correctly computers, internet and mobile phones as application of technology in communication. Other examples included television, radio, fax machine and satellite.
- (b) Many candidates encountered difficulty in writing and balancing of the chemical equations given. Some of them instead of balancing the equation rather to write the name of the products. The correct balanced equations are given below:



In balancing the chemical equations, candidates were expected to ensure that each element has the same number of moles on the reactants and products side. For example, iron and oxygen have four and six moles respectively.

- (c) This sub-question was well answered with most candidates stating correctly the functions of the components of a typical cell such as nucleus, chloroplast and mitochondrion.
- (d) Majority of the candidates demonstrated their knowledge in crop production by mentioning correctly cultural practices in crop production such as weeding, staking, mulching, shading, pest control, pruning etc.
- (e) Many candidates were able to name correctly agencies in Ghana involved in food safety and quality assurance.

Question 3

- (a) **Explain why a tomato plant is likely to wilt if too much fertilizer is applied to it.**
- (b) (i) **Give two differences between electrical insulators and electrical conductors.**

- (ii) **State two effects of illegal electrical connections in the home.**
- (c) **Explain each of the following terms as used to describe change of state of matter:**
- (i) **condensation;**
- (ii) **freezing.**
- (d) (i) **State two diseases of the circulatory system in humans.**
- (ii) **Mention two ways in which each of the diseases you have stated in**
- (d) (i) **can be prevented.**
- (a) This sub-question was poorly handled by the most candidates. Candidates were expected to apply their knowledge on osmosis. It is important for them to note that once two solutions of different concentrations come into contact water molecules will flow from low to higher concentrated solution. Hence application fertilizer makes the soil solution of higher concentration so water flow out of the plant by osmosis. The tomato plant plasmolyses and wilt.
- (b) This sub-question was poorly answered by most candidates. The mention of electrical conductor and electrical insulator rule out conduction of heat to tally. Candidates were expected to compare presence of free electrons and ability to transport electrical current. Electrical conductor has electrons and conduct current whereas electrical insulator is weak in doing so. The second part of this question demanded effects of illegal electrical connections in the home. It was wrong for a candidate to state that it cause improper connection. This was a restate of the question. The following effects of illegal connections were correct responses:
- Overload of power supply
 - Drop in voltage of electricity
 - Leads to frequent power cuts
 - Leads to electrocution/electric shock
 - May cause fire outbreak
 - May damage electrical appliance
- (c) Performance on this sub-question was satisfactorily. It is important for candidates to note that condensation is the change from the gas state to the liquid state. It was not the other way round neither is it the change from gas state to liquid state without passing through the solid state. Candidates must not confuse condensation with sublimation. Also, candidates were expected to state that freezing was the change from liquid state to the

solid state. Addition of without passing through the gaseous state is another sublimation concept altogether.

- (d) This sub-question was fairly well answered by most candidates. They wrongly assumed that diseases of circulatory system in humans included shock or heart failure. These were not disease but effects of a heart disease. Candidates must note that 'cancer' is a disease of the circulatory system. However, when a candidate writes lung cancer it was wrong because the disease becomes that of respiratory system and not circulatory system. Expected answers included: hypertension (high blood pressure) low blood pressure, piles (haemorrhoids), arteriosclerosis, and varicose veins. However, most candidates were able to mention correctly the ways in which diseases of the circulatory system could be prevented.

Question 4

- (a) (i) **What is a transistor?**
(ii) **Give two uses of a transistor.**
- (b) **Mention the suitable solvent for each of the following solutes:**
(i) **grease;**
(ii) **ink stain;**
(iii) **starch;**
(iv) **cube sugar;**
(v) **oil paint;**
(vi) **iodine.**
- (c) (i) **What is a respiratory organ?**
(ii) **Name two structures of the respiratory system of humans.**
- (d) (i) **What is agricultural chain?**
(ii) **Name two types of agricultural chain.**

(a) This is sub-question was poorly answered by majority of the candidates. Candidates must note that the definition of a transistor required basic technical words as underlined: A transistor is a three terminal semiconductor device. Omission of any of the underlined results in a wrong definition. Also, the three terminal could be replaced with a base, emitter and collector. However, a few candidates correctly listed amplifier, switch, rectifier, tune radios, voltage regulator as uses of a transistor.

(b) This sub-question was fairly well answered. Majority of the candidates mentioned wrong solvents for the solutes:

- i. Ink stain - Milk, alcohol, parazone, shaving cream, kerosene
- ii. Starch - Alcohol, acetone
- iii. Iodine - Alcohol, potassium iodide solution.

- (c) Many of the candidates encountered difficulty in explaining respiratory organ. It is inappropriate for candidates to state that respiratory organ is found in the respiratory system. It is important for candidates to note that respiratory system is an organ used by living organisms for gaseous exchange. However, few candidates were able to mention correctly trachea, lungs, alveolus, larynx, diaphragm and bronchus as structures of the respiratory system in humans.
- (d) This question was fairly well answered by most candidates. Candidates must note that an agricultural chain is a series of stages that are connected production of agricultural goods/services. The correct answer was dependant on the underlined. Types of agricultural chain included production, processing, supply and value.

Question 5

- (a) (i) **What are stars?**
 (ii) **Arrange in order, starting from the sun, the first four planets in the solar system.**
- (b) **State**
 (i) **two differences between plants and animals;**
 (ii) **two similarities between plants and animals.**
- (c) **Explain each of the following farming systems:**
 (i) **pastoral farming;**
 (ii) **ecological farming.**
- (d) **State the properties of water in terms of**
 (i) **odour,**
 (ii) **taste,**
 (iii) **effect on litmus.**
- (a) Majority of the candidates encountered difficulty in this sub-question. In answering this question candidates should have taken into consideration other bodies behave like the stars so technical words choice should have distinguished the stars from other bodies. For a example, if a candidate says ‘Stars are heavenly bodies’ one can assume rockets, satellites could be stars. Further qualification is that they burn to produce heat and light, so does rockets. It is important for candidates to state that stars are natural heavenly bodies that burn to produce heat and light. Arranging the first four planets in the solar system starting from the sun was well answered except that some candidates exceeded the required first four planets.
- (b) This sub-question was fairly well answered by most candidates. They were able to state correctly the differences between plants and animals. On the similarities candidates were expected to state any two of the life processes. To say that both die or live is unacceptable.
- (c) This sub-question was poorly answered by majority of the candidates. It is important for candidates to note that pastoral farming connotes a farmer keeping only animals and moving from place to place with them in search of food and

water. Ecological farming is one where chemicals or heavy machinery is not used and environment is protected.

- (d) This sub-question was well answered with many candidates stating correctly the properties of water in terms of odour, taste and effect on litmus.

Question 6

- (a) **What are**
(i) **annual plants?**
(ii) **perennial plants?**
- (b) **Mention one danger involved in each of the following activities in the laboratory:**
(i) **eating or drinking water in the laboratory;**
(ii) **washing hands with unknown liquid in a beaker;**
(iii) **walking barefooted.**
- (c) (i) **What is a digestive enzyme?**
(ii) **Give two examples of digestive enzymes in humans.**

- (d) **Give two differences between conduction and radiation of heat.**

- (a) This sub-question was poorly answered by most candidates. Candidates must note that an animal plant is not a plant that is cultivated yearly or grown once a year. This means man controlling its life cycle. The appropriate answer is that they are plants which grow in one year/season during which it produces fruit and seeds and then dies off. Also, to state that a perennial plant completes their life cycle in two years makes it biennial. A perennial plant completes its life cycle in more than two years.
- (b) This sub-question was poorly answered by majority of the candidates. Candidates were expected to state answers that reflect particular incidents. Eating or drinking water in the laboratory may result in the drinking of poisonous substances. It is enough for candidates to write 'It is dangerous'. Also, washing hands with unknown liquid in an beaker may result in burns/irritation/injury. For candidates to write 'It is dangerous' is inappropriate.
- (c) This sub-question was fairly well answered. Candidates must note that digestive enzyme is not an enzyme but a chemical/biological catalyst that help in breaking down food substances in the body. Examples of digestive enzymes included salivary amylase, pancreatic amylase, ptyalin, proteases/pepsin/rennin/trypsin.
- (d) This sub-question was poorly answered. Candidates were expected to make each point correspond before scoring marks. For example, in comparison it is wrong to say A is black but B is not. Expected responses were as follows:

DIFFERENCES

CONDUCTION	RADIATION
<ul style="list-style-type: none">- Travels through a vacuum- Does not depend on the colour if the body- Heat travels from one molecule to another	<ul style="list-style-type: none">- Black bodies radiate heat- Travels in a material medium well- Heat travel is by electromagnetic waves