3.6 GENERAL SCIENCE - 237

In 2019, the KCSE 237 General Science was examined in two theory papers; Paper one and paper two. Each paper has three sections A, B and C. Section A has Biology questions with 34 marks, section B Chemistry questions with 33 marks and section C Physics questions with 33 marks. Each of the papers is marked out of 100. This subject is mostly done by private candidates from non-formal education centers.

3.6.1 CANDIDATES OVERALL PERFORMANCE

The Table below is a comparative presentation of the candidates' performance in the two Papers from 2014 to 2019.

Table 13: Table showing performance of candidates for the last six years

Year	Paper	Candidature	Maximum score	Mean score	Standard deviation
2014	Paper 1	1384	100	9.73	9.30
	Paper 2	1384	100	8.69	8.91
	Overall	**1384**	**200**	**18.34**	**17.18**
2015	Paper 1	1385	100	11.22	11.56
	Paper 2	1382	100	6.87	8.22
	Overall	**1388**	**200**	**18.03**	**18.12**
2016	Paper 1	1,449	100	9.20	8.71
	Paper 2	1,438	100	5.65	6.5
	Overall	**1,455**	**200**	**14.74**	**14.30**
2017	Paper 1	1,473	100	11.34	11.17
	Paper 2	1,471	100	8.43	9.12
	Overall	**1,476**	**200**	**19.72**	**18.50**
2018	Paper 1	1,158	100	12.32	11.82
	Paper 2	1,154	100	7.2	8.84
	Overall	**1,161**	**200**	**19.45**	**19.74**
2019	Paper 1	1120	100	13.00	10.971
	Paper 2	1113	100	7.00	7.296
	Overall	**1120**	**100**	**20.00**	**18.267**

From the table, it can be observed that;

i) There is a slight improvement in the mean score from **19.45** in the year 2018 to **20.00** in the year 2019.

ii) The candidature dropped from **1161** in the year 2018 to **1120** in the year 2019, which is about 3.67% decline.

iii) Performance has improved in paper 1 from a mean of 12.32 in 2018 to a mean of 13.0 in 2019.

iv) Performance in paper 2 has dropped from a mean of 7.2 in 2018 to a mean of 7.0 in 2019.

v) Generally, there is still poor performance in this paper.

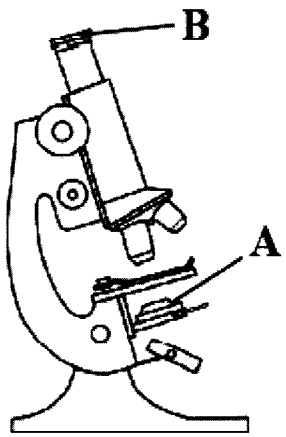
The following are discussions on some of the questions that were challenging to most candidates.

3.6.2 General Science Paper 1 (237)

SECTION A: BIOLOGY

Question 4

The diagram below represents a light microscope.



(a) Name the part labelled **B** (1 mark)
(b) State the function of the part labelled **A**. (1 mark)
(c) Identify two organelles of an animal cell that would be seen under the light microscope. (2 marks)

Weakness

Most candidates were unable to identify the labelled parts of the light microscope as provided for in the diagram and could not state their functions.

Expected response

(a) Eyepiece; Acc eyepiece lens.
(b) Concentrates/converge/condense light onto the specimen;

Advice to teachers

Teachers to expose learners more on microscopy work so as to link theory to practice.

Question 7

Describe absorption of water from the soil by the root hairs. (3 marks)

Weakness

Candidates were unable to relate and describe the logical flow of events that leads to absorption of water in the root.

Expected response

- Root hairs are surrounded by a film of water in the soil; the cell sap of the root hairs contains salts and sugars, hence is more concentrated/hypertonic;
- Water is drawn into the root hairs by osmosis; across the semi-permeable membrane of the root hair cells;

Advice to teachers

Teachers to put emphasis on the process of water uptake by the roots without a break in the procedure.

SECTION B: CHEMISTRY

The following questions were a challenge to most of the candidates.

Question 14:

14. (a) A student prepared an insoluble salt by mixing two different salt solutions.

(i) Identify the method used to prepare the insoluble salt. (1 mark)

(ii) Name **one** other method which can be used to prepare insoluble salts. (1 mark)

(b) Give **one** industrial use of sodium carbonate salt. (1 mark)

Candidates were expected to know the methods of salt preparation and uses of salts.

Weaknesses

Most candidates were unable to identify the methods of preparing insoluble salts.

Expected response

(a) (i) Double decomposition/Precipitation

(ii) Direct synthesis

(b) Softening of hard water, Manufacture of glass.

Advice to Teachers

Teachers to emphasize on different methods of preparing the insoluble salts. Practical demonstrations are encouraged for good mastery of this concept.

Question 19

(a) Name the chemical family of the elements *Helium*, *Neon* and *Argon*. (1 mark)

(b) Elements **V**, **X**, **Y** and **Z** belong to the same group in the periodic table. **Table 3** gives information about the elements. Use it to answer the questions that follow. The letters do **not** represent the actual symbol of the elements.

Table 3

Element	Atomic radii (nm)	Melting point (°C)
V	0.152	180
X	0.186	98
Y	0.231	64
Z	0.244	39

Explain the trend in:

(i) atomic radii (1 mark)

(ii) melting point (1 mark)

Candidates were expected to have general knowledge of chemical families and to be able to give specific physical properties of the chemical families.

Weaknesses

Most candidates were unable to name specific chemical family and to explain the trend of the physical properties of the chemical family.

Expected response

(a) Noble gases

(b) (i) Atomic radii increase down the group due to increase in the number of energy levels.

(ii) Melting point decreases down the group, the forces of attraction between atoms weakens hence decrease in melting point.

Advice to Teachers

Teachers encourage the candidates on knowing the four chemical families of the periodic table and to remember their physical properties.

SECTION C: PHYSICS

Majority of the candidates lack the basic ability to comprehend correctly the simple tasks given in this section. This demonstrates lack of mastery of the content of the syllabus.

The following questions were pointed out as some of the most challenging to the candidates.

Question 27

A student observed that dust particles illuminated by a beam of light in a room moved in a constant random motion. Explain this observation. (2 marks)

Weaknesses

Most of the candidates did not mention the cause of random motion hence could not give the correct explaination.

Expected response
The dust particles are bombarded/knocked/hit by invisible air molecules which are in constant random motion.

Question 30

Figure 7 shows a uniform plank of length 2 m and a weight of 75 N. It is pivoted at a distance y cm from one end and balanced by a weight of 50 N.

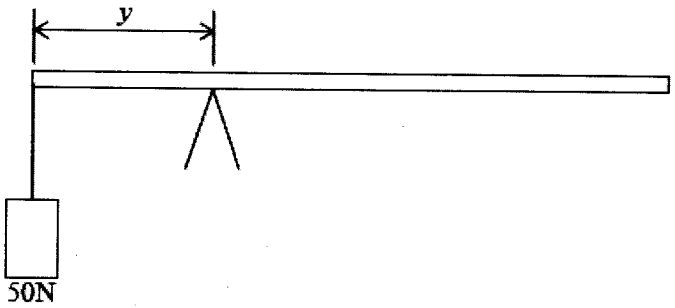


Figure 7

Determine the value of y. (3 marks)

Weaknesses

Most candidates failed to apply the principle of moments appropriately. They could not identify the 1 m mark, a point where the weight of the planks acts from.

Expected response

Sum of clockwise moment = sum of anticlockwise moment

$F_1d_1 = f_2d_2$

$50 \times y = 75(1-y)$ ✓

$50y = 75 - 75y$ ✓

$$y = \frac{75}{125}$$
$$= 0.6m$$

Question 33

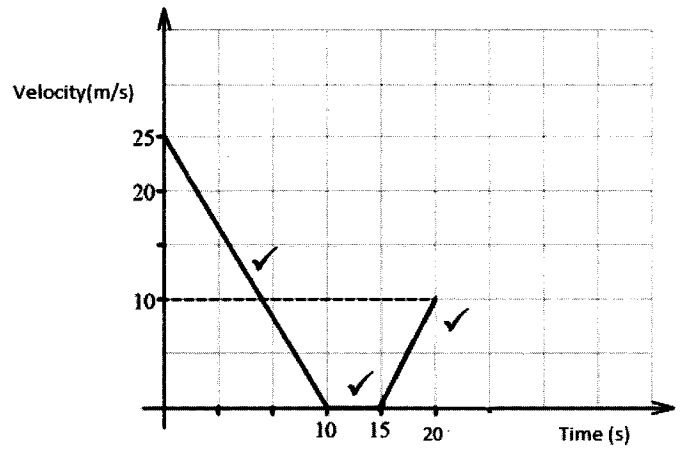
A train moving at a velocity of 25 ms^{-1} decelerates uniformly and comes to rest in 10 seconds. It then starts moving again after 5 seconds and accelerates uniformly to a velocity of 10 ms^{-1} in 5 seconds. Sketch a velocity – time graph for the motion of the train within this period. (3 marks)

The candidates were expected to sketch a velocity – time graph for the motion.

Weaknesses

Most candidates could not interpret the information given to come up with the graphical representation of the motion.

Expected response



3.6.3 General Science Paper 2 (237)

SECTION A: BIOLOGY

Question 2

Explain what is meant by each of the following terms:

(a) Sexual reproduction (1 mark)
(b) Gestation (1 mark)

Weakness

Candidates employed the use of non-scientific language to explain the processes.

Expected response

a) The production of an offspring as a result of the fusion of a male and a female gamete;

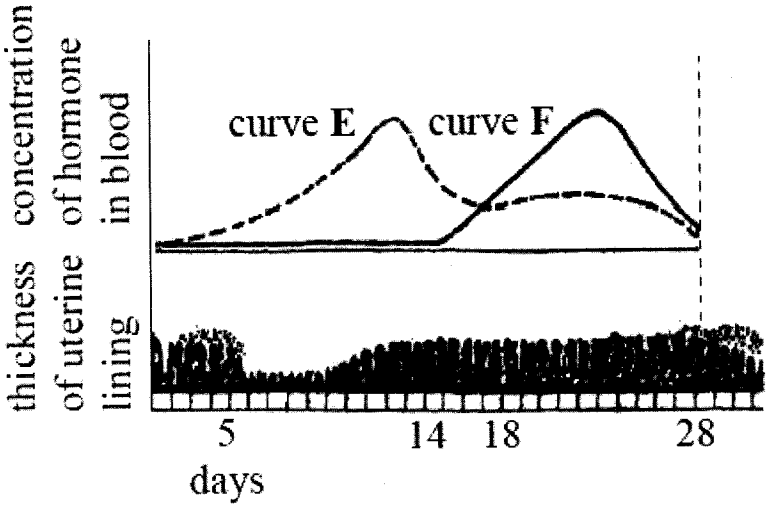
b) Is the duration between fertilization and birth;

Advice to teachers

Teachers to put more emphasis on key terms when explaining biological processes.

Question 3

The diagram below illustrates the hormonal changes that occur during the menstrual cycle.



(a) Name the hormone represented by the curve labelled **F** (1 mark)

(b) Explain the effect of the hormone labelled **E** on the lining of the uterus. (1 mark)

(c) Name the hormone whose concentration increases on the 14th day of the menstrual cycle. (1 mark)

(d) A female human being expects ovulation to occur on the 14th day of her menstrual cycle.

Give a reason why she is likely to conceive if she had sex few days before and after the 14th day (1 mark)

Weakness

Candidates are unable to interpret the graph as regards identity of the hormones and how their levels relate to the uterine wall thickness during menstrual cycle.

Expected response

a) Progesterone; **RJ wrong spelling;**

b) Repair and healing of the endometrium/ uterine wall;

c) Luteinizing hormone (L.H); **Rj abbreviations;**

d) Sperms/ova remain viable in the female reproductive system for 1- 3 days.

Advice to teachers

Teachers to explain process-using diagrams to re enforce concepts and understanding.

SECTION B: CHEMISTRY

The following questions challenged the candidates:

Question 14:

(a) Draw a labelled diagram to show extraction of sulphur by Frasch process. (3 marks)

(b) (i) Explain why the volume of concentrated sulphuric(VI) acid increases when it is left in an open beaker for three days. (1 mark)

(ii) State **one** use of concentrated sulphuric (VI) acid that depends on the property described in 14(b)(i). (1 mark)

Candidates were expected to:

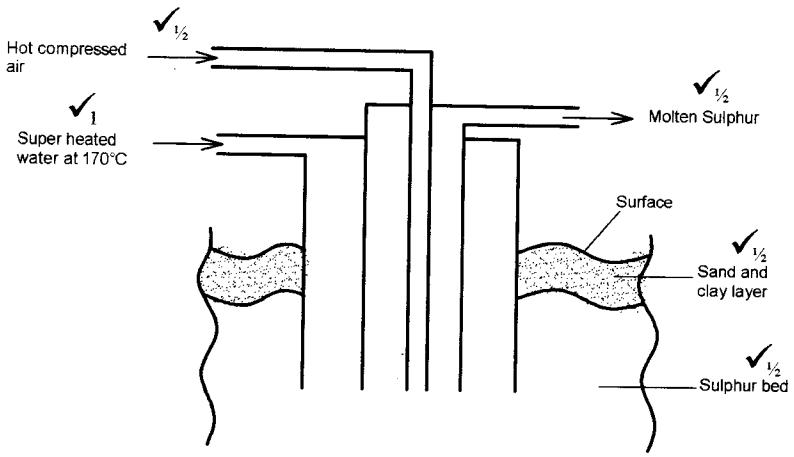
- Draw the Frasch process diagram.
- Explain a chemical property and use of sulphuric (VI) acid.

Weaknesses

Most candidates were unable to draw the Frasch diagram correctly and explaining the property of the acid hence challenges on giving the use of the same acid.

Expected response

(a)



b) (i) Concentrated sulphuric (VI) acid is hygroscopic hence absorbs water from the atmosphere thereby increasing the volume

(ii) Used as a drying agent

Advice to Teachers

Teachers to use models while teaching Frasch process and to help students to have a mastery of chemical properties of the sulphuric acid and to relate them to the uses of the acid.

Question 18

18. (a) Two new metals Caburam (Cb) and Laboran (Lb) have just been discovered. The ore of Caburam, Caburam Chloride has the formula CbCl and that of Laboran, Laboran oxide has the formula LbO. Their relative positions in the reactivity series are:
Na > Mg > Al > Cb > C > Zn > Lb >Fe
Name a suitable method of extracting:
(i) Caburam (1 mark)
(ii) Laboran (1 mark)

(b) Draw a diagram to represent a set-up that can be used to extract caburam from its ore. (3 marks)

Candidates were expected to demonstrate clear understanding of metal extractions using the reactivity series background.

Weaknesses

Most candidates were unable to identify methods of extraction depending on the reactivity series.

Expected response

a) (i) Electrolysis
(ii) Reduction

b) A diagram of electrolytic cell with molten CbCl as an electrolyte and inert electrodes.

Advice to Teachers

Teachers to use reactivity series to teach metal extraction and the methods of extraction of metals.

SECTION C: PHYSICS

Question 22

Figure 5 shows a ray of light moving from water to kerosene.

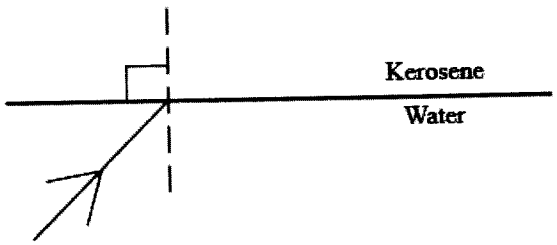


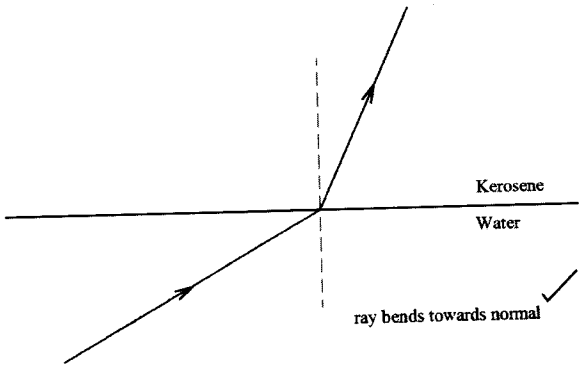
Figure 5

Given that kerosene is optically denser than water, complete the figure to show the path of the ray in kerosene. (1 mark)

Weaknesses

Majority of the candidates could not sketch the ray in kerosene. This shows lack of understanding of optical density and refraction.

Expected response



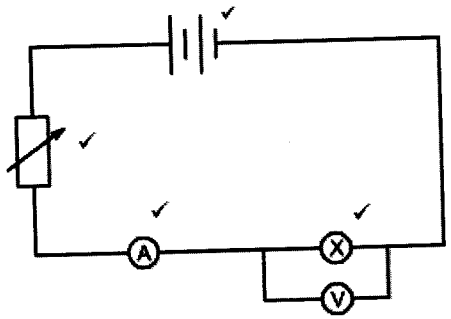
Question 28

Draw a circuit diagram using circuit symbols to show how a variable resistor, a bulb, 2 dry cells in series, an ammeter and a voltmeter may be connected in order to determine whether the bulb obey's Ohm's law. (4 marks)

Weaknesses

Candidates were unable to recall the correct circuit symbols for all the devices provided therefore could not draw the circuit.

Expected response



Question 29

Figure 8 shows a heater used to heat some water initially at 20 °C.

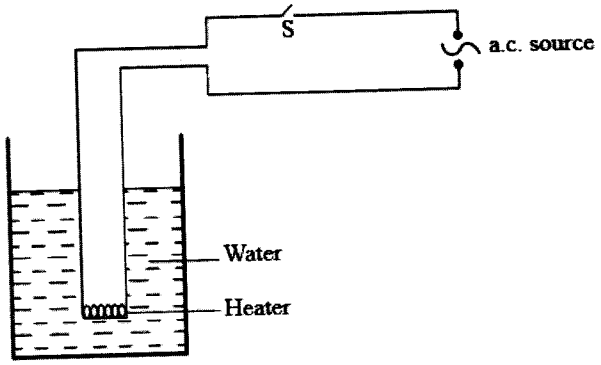


Figure 8

State two factors that determine the time taken for the water to boil. (2 marks)

Weaknesses

Majority of the candidates could not see the connection between the diagram and the factors affecting the heating effect of electric current.

Expected response

- The amount of water.
- The power rating of the heater/amount of current/voltage/resistance/amount of heat

  Pressure of the surrounding.

Question 31

(a) Define the term "doping". (1mark)

(b) Draw the circuit symbol of a junction diode. (1 mark)

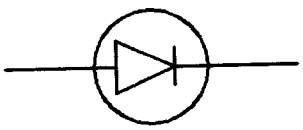
Weaknesses

All the candidates were not able to define doping and draw the circuit symbol of a junction diode. Candidates showed lack of knowledge on what a junction diode and even how it looks like.

Expected response

(a) The process of adding impurities to a semiconductor in order to increase its conductivity.

(b)



NB: This subject is mostly done by private candidates and non-formal centers that in most cases have no access to qualified science teachers continuously. This poses a challenge in preparing these candidates for national examinations.