3.6 GENERAL SCIENCE - 237

In 2018, 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 CANDIDATES OVERALL PERFORMANCE

The Table below is a comparative presentation of the candidates' performance in the 2 Papers from 2013 to 2018.

Table 14 showing performance of candidates for the last 6 years

Year	Paper	Candidature	Maximum score	Mean score	Standard deviation
2013	Paper 1	1100	100	12.33	10.99
	Paper 2	1100	100	7.22	6.64
	Overall	**1100**	**200**	**19.46**	**16.92**
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**

From the table it can be observed that:

i) Performance has improved in paper 1 from a mean of 11.34 in 2017 to a mean of 12.32 in 2018

ii) Performance in paper 2 has dropped significantly from a mean of 8.43 in 2017 to a mean of 7.2 in 2018.

iii) The overall performance in the Subject has improved.

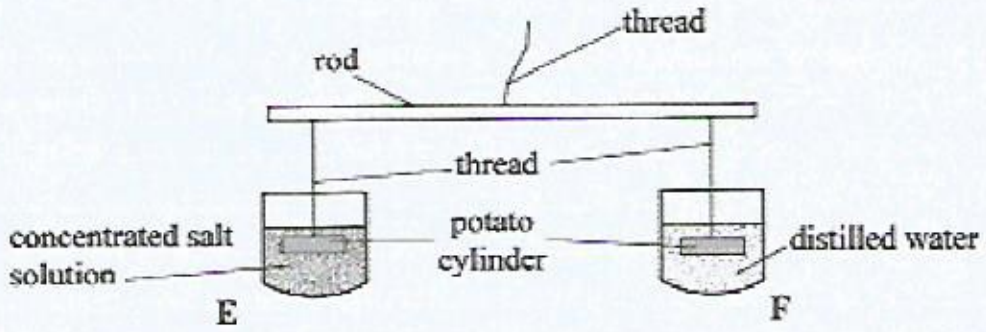
The following is a discussion on some of the questions that were poorly performed.

3.6.1 General Science Paper 1 (237/1)

SECTION A: BIOLOGY

Question 4

Two potato cylinders of equal size were obtained from the same potato tuber. The cylinders were then lowered into two beakers labelled E and F as shown below. Beaker E contained concentrated salt solution while beaker F contained distilled water. At the start of the experiment the rod was balanced until it was horizontal.



(a) Give the observation made after 25 minutes. (1 mark)

(b) Explain the observation made after 25 minutes. (3 marks)

The task required the candidates to study and interpret the experimental set up.

Weakness

Most candidates demonstrated wrong interpretation of the diagram with little grasp of the physiological processes.

Expected response

(a) The rod tilted downwards towards F.

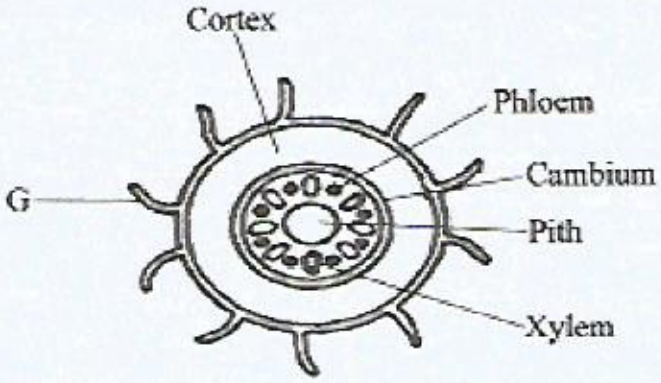
(b) Potato cylinder at F was placed in hypotonic solution; (distilled water) and it gained water by osmosis; hence became heavier; OR Potato cylinder at E was placed in hypertonic solution; lost water by osmosis; and became lighter.

Advice to teachers

Should adopt a practical orientation to enhance understanding of the physiological processes.

Question 6

The figure below represents a transverse section of a plant part.



(a) (i) Name the part of the plant from which the section was obtained. (1 mark)

(ii) Name the class of the plant from which the section was obtained. (1 mark)

(iii) Give **one** reason for your answer in (a) (ii) above. (1 mark)

(b) State the function of the part labelled **G**. (1 mark)

The candidates were expected to identify the plant section provided in the diagram and to identify some of its parts.

Weakness

Candidates were unable to correctly identify the parts of the plant given and their functions.

Expected the results

(a) (i) Root;

(ii) Monocotyledon;

(iii) Vascular bundles arranged as a ring; and xylem alternates with phloem; presence of pith.

(b) Absorption of water and mineral salts

Advice to teachers

Should assist learners to differentiate between roots and stem sections. These should be complemented by microscopy work.

SECTION B: CHEMISTRY

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

Question 13

A student used the set up in **figure 2** to investigate electrical conductivity of lead(II) bromide.

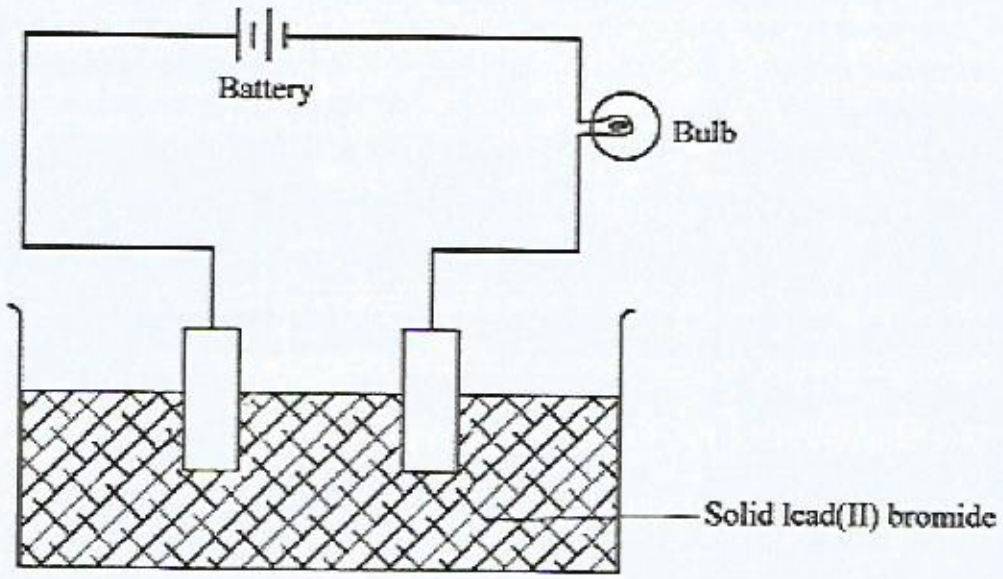


Figure 2

(a) When the switch was closed, the bulb did not light. Explain. (1 mark)

(b) What improvement can be done to the set-up for the bulb to light? (1 mark)

Candidates were expected to know the electrolysis process of binary electrolytes.

Weaknesses

Most candidates were unable to identify that solid lead (II) bromide only conducts electricity in molten state due to presence of mobile free ions.

Expected response

(a) The ions in Lead (II) Bromide solid are immobile and therefore unable to conduct an electric current.

(b) Heat the Lead (II) Bromide to make the ions mobile.

Advice to Teachers

Teachers to emphasize on different types of electrolytes and reasons for their conduction of electricity. Simple illustrations of such set up is necessary for candidates to recall the binary electrolytes.

Question 16:
Describe how the pH of a soil sample is determined. (2 marks)

Candidates were expected to describe using correct procedure how the pH of a soil is determined.

Weaknesses
Most candidates were unable to show the importance of universal indicator in the determination of the pH.

Expected response
- Add water to the soil sample and shake to dissolve. (½ mark)
- Filter to remove insoluble particles and impurities. (½ mark)
- Transfer about 5ml of the solution to a beaker and add universal indicator. (½ mark)
- Compare its colour to the pH chart provided. (½ mark)

Advice to Teachers
Teachers to provide practical approach and carry out several practices with the learners.

SECTION C: PHYSICS

Physics section has remained to be the most challenging section of 237/1. Many candidates lack the basic ability to comprehend correctly the simple tasks normally given in this section. This demonstrate their lack of mastery of the content in the syllabus. The candidates are advised to source for private tutors to help them go through the content of the syllabus. They can also utilize the past KCSE papers to help them prepare for their exams.

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

Question 23
The volume of a pieceof metal is 7.5 cm3. Given that its mass is 85.5 g, determine its density.
(3 marks)

Candidates were expected to calculate the density of the metal by simply recalling that density is given by $\frac{mass}{volume}$.

Weaknesses
Most of the candidates could not recall the basic formula of finding density in solids hence left this question blank or used wrong formulae.

Expected response

$$\text{Density} = \sqrt{\frac{mass}{volume}}\sqrt{}$$

$$= \frac{85.5}{7.5}$$

$$= 11.4 gcm^{-3}\sqrt{}$$

Question 24

Figure 5 shows a capillary tube dipped into a beaker half full of water.

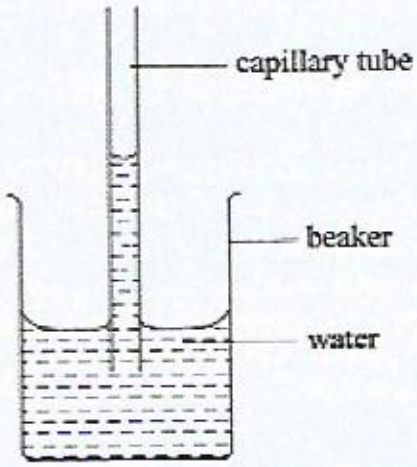


Figure 5

Explain why the level of water in the capillary tube is higher than the level in the beaker.

(2 marks)

Candidates were expected to explain the rise in terms of adhesive and cohesive force by bringing out the fact that adhesive forces are stronger.

Weaknesses

Most candidates did not understand the difference between adhesive and cohesive forces. The use of comparative such as higher/greater were completely ignored by all candidates hence were unable to correctly explain the observation.

Expected response

Adhesive forces between glass and water molecules are **greater/higher** than cohesive forces between water molecules therefore **adhesive forces pull water up** the capillary tube.

Question 25

Figure 6 shows a can full of water. Three holes A, B and C on the side of the can are sealed with plasticine.

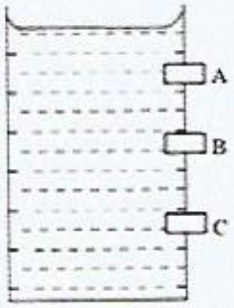


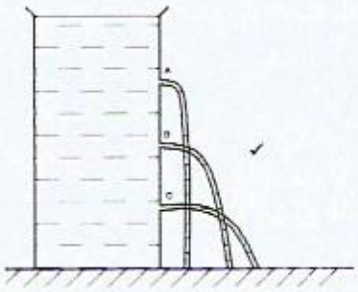
Figure 6

(a) On the figure, sketch the paths of water as it flows from the holes A, B and C when the plasticine is removed. (1 mark)
(b) Explain the answer in (a) (2 marks)

The candidates were expected to explain the relationship between depth and pressure.

Weaknesses
Most candidates could not give the correct observation and explanation. They failed to understand that pressure in fluids increases with depth.

Expected response
(a)



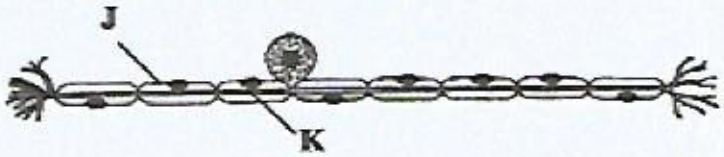
Pressure is **greatest/highest/most at C** and therefore the jet is longest or Pressure is **least/lowest at A** and therefore the jet is shortest. **I.e. Pressure increases with depth**

3.6.2 General Science Paper 2 (237/2)

SECTION A: BIOLOGY

Question 9 appeared to have challenged most candidates.

Question 9
The diagram below shows a nerve cell



(a) (i) **Identify the nerve cell.** **(1 mark)**

(ii) **Give a reason for your answer in (a) (i) above.** **(1 mark)**

(b) **State the function of the part labelled.**

J **(1 mark)**

K **(1 mark)**

The candidates were expected to identify the nerve cell illustrated and give functions of its parts.

Weaknesses
The candidates seemed to have a poor mastery of the different types of nerve cells and therefore were not able to identify the cell.
Expected responses:
(a) (i) Sensory neuron.
(ii) Has a centrally positioned cell body.
(b) J-Insulates the axon to speed up impulse transmission.
K- Transmits impulses away from the cell body to other neurons.

Advice to teachers:

Should use correct diagrams and illustrations emphasizing on key features and terms.

SECTION B: CHEMISTRY

The following questions challenged the candidates:

Question 11:

Compound **J** reacts with one mole of chlorine gas to form **one** product **K**, whose molecular formula is $C_3H_6Cl_2$.

(a) Draw the structure of compound **J**. (1 mark)

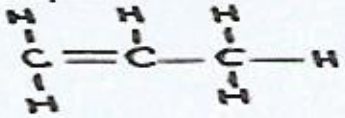
(b) Name compound **K.** (1 mark)

(c) What type of reaction occurs between compound **J** and chlorine gas. (1 mark)

Candidates were expected to:
- Draw the structure of an organic compound.
- Name the organic compound
- State the type of organic

Weaknesses
Most candidates were unable to draw the bonds correctly hence challenges on naming of the organic compound.

Expected response

a) 

b) 1, 2 dichloropropane

c) Addition reaction

Advice to Teachers
Teachers to use models while teaching this topic.

Question 15

The atomic number of element E is 13. Given that, 17.25 g of E reacted completely with 11.5 dm^3 of oxygen at 25 °C. Determine the relative atomic mass of E. (Molar gas volume = 24 dm^3)

(3 marks)

Candidates were expected to demonstrate clear understanding of the mole concept about molar gas volume

Weaknesses

Most candidates were unable to write the equation for the reaction. This hindered the calculations for the moles of element E.

Expected response

$4E_{(s)} + 3O_{2(g)} \rightarrow 2A_2O_{3(s)}$

Moles of Oxygen $= \left(\frac{11.5}{24}\right) = 0.4791$ ✓1

Moles of E $= \left(\frac{4}{3} \times 0.4791\right) = 0.6388$ ✓1

R.A.M. of E $= \left(\frac{17.25}{0.6388}\right)$ ✓1/2

$= 27.00$ ✓1/2

OR

$11.5dm^3 = 17.25g$

$72\ dm^3 = ?$

$\left(72 \times \frac{17.25}{11.5}\right)$ ✓1 $= 108g$ ✓1/2

$4A = 108$ ✓1/2

$A = \frac{108}{4}$ ✓1/2 $= 27$ ✓1/2

Advice to Teachers

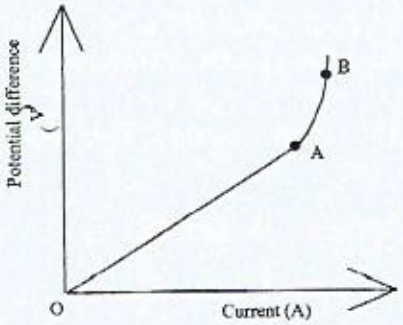
Teachers to use chemical equations in showing the mole ratios and thus calculations involving molar gas volumes.

SECTION C: PHYSICS

Question 25

(a) Define the potential difference between two points X and Y. (1mark)

(b) Figure 5 is a graph of potential difference against current obtained in an experiment to study Ohm's law.



(i) Explain section OA of the graph (2 marks)

(ii) State the reason for the change in the shape of the graph in section AB. (1 mark)

Candidates were expected to do the following; define potential difference in terms of work done in moving a charge through circuit, draw the relationship between the straight line and ohms law and relate the factors affecting resistance to the shape of the graph.

Weaknesses

All the candidates could not define potential difference in terms of work done in moving a unit charge. They could not connect the graph to ohms law and to factors affecting resistance.

Expected response

(a) The work done in moving a unit charge from point X to point Y.

(b) (i) Voltage is directly proportional to current/ Graph is straight and therefore Ohm's law is obeyed.

(ii) The temperature of the lamp is changing or cross sectional area is decreasing or length is increasing.

Question 27

A student observed that when part of a ruler is immersed in water in a beaker, the ruler appears bent. Explain this observation. (2 marks)

Candidates were expected to state how refraction of light occurs.

Weaknesses

Candidates were unable to understand that change in velocity is what produces refraction

Expected response

Due to refraction of light; velocity of light changes at the interface.

Question 29

A domestic consumer uses five 100 W bulbs for four hours daily. Given that the bill is Ksh. 900 in a 30 day month, determine the cost per Kilowatt-Hour of electrical energy. (3 marks)

Candidates were required to determine the cost per unit of the electrical energy consumed.

Weaknesses

Most candidates could not work backwards from the total cost in order to obtain cost of electrical energy per unit.

Expected response

900 = no. of units x rate

$$\text{Rate} = \frac{900}{\frac{5\times100\times4\times30}{1000}}$$

= sh. 15.00 per kWh

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.