9.0 GENERAL SCIENCE (237)

General science was tested for the first time in the year 2010. It had two theory papers, Paper one and 237/1 and paper two 237/2. Each paper had three sections A, B and C. Section A had biology questions with 34 marks, section B had Chemistry questions with 33 and section C had physics questions with 33 marks. Each of the papers was marked out of 100.

9.1 CANDIDATES OVERALL PERFORMANCE

The overall performance of candidates in general science in the year 2010 was as shown in the table below.

Table 15: **Candidates' Performance in General Science**

Year	Paper	Candidature	Maximum score	Mean score	Standard deviation
2010	**Paper 1**	1211	100	13.77	25.44
	Paper 2	1211	100	11.97	08.87
	Overall	**1211**	**200**	**25.44**	**16.94**

From the table it can be observed that:
9.1.1   The candidature of general science was very low.
9.1.2   The performance in both papers of general science was very poor.

The following is a discussion of some of the questions that candidates had difficulties in responding to.

9.2 PAPER 1 (237/1)

9.2.1 SECTION A: BIOLOGY
No difficult questions were reported in Paper 1.

9.2.2 SECTION B: CHEMISTRY
In the paper 1 Chemistry section question that challenged most candidates were question numbers **16,18** and **19**. They are discussed below.

Question 16

The table below gives information about atoms of H, J, K, L and M. Use it to answer the questions that follow:

Atom	Number of Protons	Number of electrons	Number of neutrons
H	5	5	6
J	8	8	10
K	10	10	12
L	8	8	8
M	12	12	12

(a)   Select an atom:

(i)   of an element in group 8 of the periodic table;   (1 mark)

(ii)   whose mass is 11.   (1 mark)

(b)   Select atoms which represent isotopes of an element. Give a reason.   (2 marks)

Candidates were required to identify elements given in a periodic table.

Weaknesses

Most candidates did not identify **group 8** elements and isotopes from the elements given

Expected Responses

(a)   (i)   K

        (ii)   H

(b)   J and L; have the same atomic numbers but different atomic masses.

Question 18

The table below gives information about substances N, P, Q and R.

Substance	Melting point (°C)	Boiling point (°C)	Electrical conductivity when		
			Solid state	Molten state	Dissolved in water
N	-115	-85	Poor	Poor	Good
P	801	1467	Poor	Good	Good
Q	98	890	Good	Good	Good
R	-117	78.5	Poor	Poor	Poor

(a)   Select a substance that is likely to be hydrogen chloride.   (1 mark)

(b)   Which letter represents a substance that is likely to have:

(i)   metallic bonding;   (1 mark)

(ii)   ionic bonding?   (1 mark)

Candidates were required to identify substances with metallic and ionic bonding.

Weaknesses

Candidates did not know characteristics of substances with metallic and ionic bonding.

Expected Responses

(a)   N

(b)   (i)   Q

        (ii)   P

Question 19

The diagram below represents a set up that was used to show the effect of an electric current on aqueous Copper (II) Sulphate using carbon electrodes.
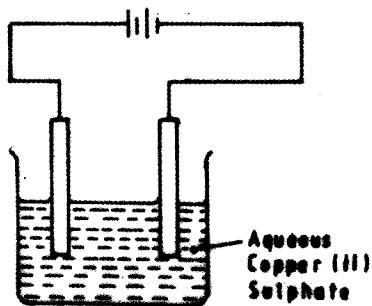
(a)   On the diagram, label the cathode.   (1 mark)

(b)   State and explain the observation made at the anode.   (2 marks)

Candidates were required to label cathode and explain observations made on anode.

Weaknesses

Candidates confusing cathode with anode and were unable to explain what happens during electrolysis.

Expected Responses

(a)   See the diagram. (electrone on the left side).

(b)   The anode becomes smaller.

        This is because it dissolves.

9.2.3   SECTION C: PHYSICS

In the physics section of paper 1 candidates had difficulties in questions 25, 27, 30 and 34.

Question25

A uniform metre rule pivoted at the 30 cm mark, was balanced by a weight of 2 N suspended from the 5 cm mark. Determine the mass of the metre rule. (take g = 10N/kg)   (3 marks)

Weaknesses

Candidates were unable to locate the position of centre of gravity for the ruler and apply the principle of moments.
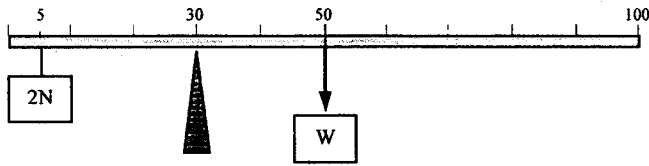
Expected response

Figure 1

Question27

A bimetallic strip is made by riveting together two strips of different metals E and F. When hot, the strip is straight as shown in **figure 1a**. When it is allowed to cool to room temperature, the strip bends as shown in **figure 1b**.
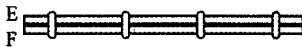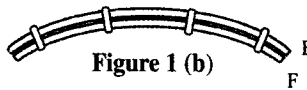

Figure 1 (a)

Figure 1 (b)

Explain the cause of the bending.   (2 marks)

Weaknesses

Candidates responded as if the bi-metallic strip was expanding after heating rather that contracting when cooling. This was a clear indication of inability to apply the acquired knowledge to a different situation.

Expected response

F. contracts more than E hence becomes shorter than E.

Question 30

A thin copper wire was stretched by loading it with increasing forces and the extension in millimeters measured. The results obtained are shown in the table below.

Force (N)	0	5	10	15	20	25
Extension (mm)	0	0.6	1.2	L	2.4	4.2

(a)   Determine the value of L in the table.   (1 mark)

(b)   State with a reason what is observed on the length of the wire when all the weights are removed.   (2 marks)

Weaknesses

Most candidates knew the observation but were not able to state the reason for the observation when all the weights are removed

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Expected response

(a)   L = 1.8 mm

(b)   Wire will be <u>longer</u> √¹ than the original length because the force had exceeded the
       elastic limit.
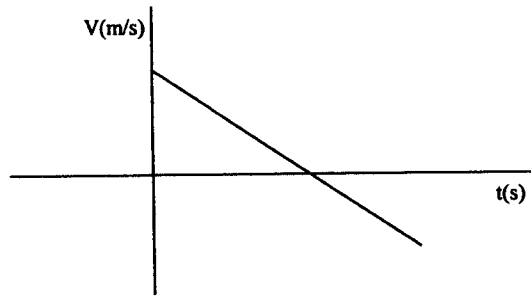

Figure 2

√¹ V starts at a point drops down to zero and to negative.
√¹ straight line of negative gradient.

Question 34

(a)   **Figure 8**, shows a light tennis ball attached to two identical metal bars. Mark with X
       the approximate position of the centre of gravity of the set up.   (1 mark)
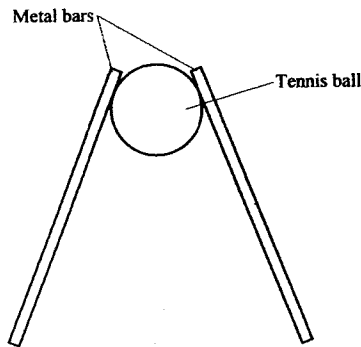

Figure 8

(b)   A certain model of a lorry has its centre of gravity 1.5 m above the ground. State how
       the model can be improved to increase its stability with the centre of gravity remaining
       at the same height.   (1 mark)

Weaknesses

Most candidates lacked knowledge of stability and were not able to express themselves.
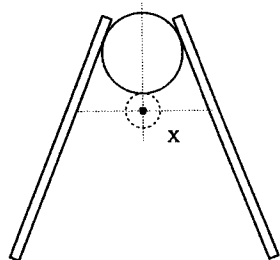
Expected response

Figure 3

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9.3 PAPER 2 (237/2)

9.3.1 SECTION A: BIOLOGY
Question 1

(a) State one survival value of positive phototropism

Weakness

Most candidates were unable to link positive phototropism to exposure of the shoot to light.

Expected response

Enables a plant to expose its shoot/leaves to light (for photosynthesis);

Advice to teachers

Learners should be made to understand the survival value of each of the tropic responses in plants.

Question 2

(b) Explain how the following adaptations reduce transpiration in xerophytes:
        (i) sunken stomata;
        (ii) thick cuticle.

Weakness

Most candidates were unable to relate the structural adaptations to reduced transpiration rates.

Expected Responses

(b)   (i)   Accumulates moisture in the sub-stomatal air spaces leading to reduced diffusion gradient;
       (ii)   Increases the diffusion distance;

Advice to teachers

Learners should be taken through the physical adaptations of xerophytes and how each of the adaptations enables them to survive in their habitat.

Question 7

(b) In a family of four children, the father has blood group A while the mother has blood group B. One of the children has blood group O. State the genotypes of the following:
        (i) Father;
        (ii) Mother;
        (iii) Child with blood group O.
Most candidates could not come up the correct genotypes

Expected Responses

        (i) AO
        (ii) BO
   (iii) OO

Advice to teachers

Learners should be properly taken through the process of genetic inheritance using flow diagrams or Punnet Square methods.

9.3.2   SECTION B: CHEMISTRY

In paper 2 Chemistry section, the questions that were most challenging to candidates were numbers 12, 13, 15 and 20 which are discussed below.

Question 12

In a laboratory experiment, hexane was heated and passed over strongly heated pieces of broken pot, as shown in the diagram below.
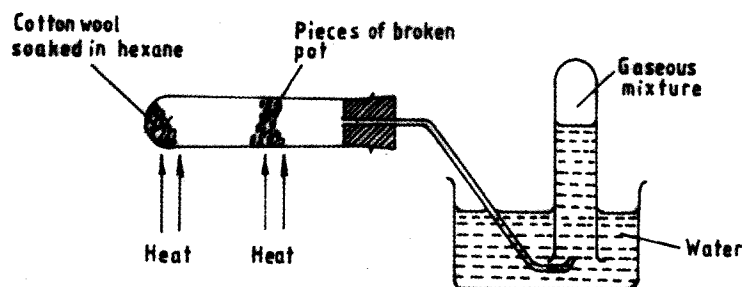
(a)   Name the type of reaction which occurred in the heated boiling tube.   (1 mark)

(b)   Why are the pieces of broken pot used?   (1 mark)

(c)   One of the products in the gaseous mixture is propane. Draw and name the other
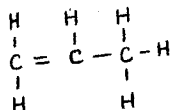   product in the mixture.   (2 marks)

Candidates required to state products formed when hexane decomposes on heating.

Weaknesses

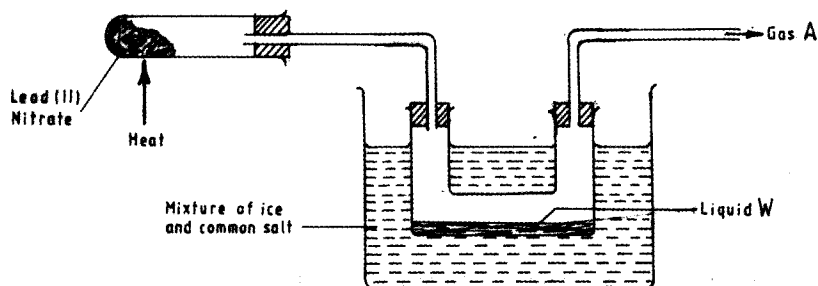Lack of knowledge on naming of organic compounds and their structures.

Expected Responses

(a)   Cracking;

(b)   Acting as a catalyst;

(c)   Propene

Question 13

(a)   Explain why nitrogen (IV) Oxide causes pollution to the environment.   (2 marks)

(b)   The figure below represents the set up that was used to prepare nitrogen (IV) Oxide.

(i)   Write a chemical equation for the above reaction that gives nitrogen (IV) Oxide.
                                                                                     (1 mark)

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(ii)   What is the role of the mixture of ice and common salt?   (1 mark)

Candidates required to state products formed when lead (ii) nitrate decomposes and write chemical reaction.

Weaknesses
Low knowledge on formation of acid rain and effect of heat on substances.

Expected Responses
(a)   It forms acid rain;
   • Acid rain kills organism/corrodes
   • Metallic structures;

(b)   (i)   Oxygen;
        (ii)   to separate NO_2 from Oxygen;

QUESTION 15

(a)   What is meant by molar heat of formation of a substance?   (1 mark)

(b)   In the industrial production of ammonia, hydrogen and nitrogen react as shown in the equation below:
        $3H_{2(g)} + N_{2(g)} \rightleftharpoons 2NH_{3(g)}$; $\Delta H = -92.4$ kj.
(i)   What is the molar heat of formation of ammonia in kilojoules?   (1 mark)

(ii)   Explain the effect of increasing the temperature of the reaction, on the yield of ammonia.   (2 marks)

Candidates required to understand heat of formation of substances and how equilibrium is affected.

Weaknesses
Candidates did not understand how change in temperature affects equilibrium of a reaction.

Expected Responses
(a)   The heat change when one mole of a substance is formed from its constituent elements at standard conditions;

(b)   (i)   -46.2 KJ/mole;
        (ii)   -the yield of ammonia will reduce;
                -increase in temperature favours the reverse reaction which is the formation of hydrogen and nitrogen. (This is because reaction for formation of ammonia is exothermic);

Question 20

(a)   Aluminium metal is extracted from its oxide by the electrolytic method while
        iron is extracted by reduction method using carbon. Arrange the elements, aluminium,
        iron and carbon in the order of reactivity starting with the most reactive.   (2 marks)

(b)   During the extraction of aluminium by electrolysis, the mass of the anode decreases.
        Give a reason.   (1 mark)

(c)   Give **one** reason why aluminium is used in making sauce pans.   (1 mark)

Candidates required to arrange elements in order of reactivity based on their methods of extraction.

Weaknesses

Candidates had no enough understanding of the methods used for metal extraction and how this can be used to arrange them in order of their reactivity.

Expected Responses

(a)   Aluminium, Carbon, Iron.   (2 marks
        (if order is wrong but carbon is in the middle (1 mark)
(b)   Oxygen produced at the anode reacts with the anode, thus depleting it;
(c)   Aluminium is a good conductor of heat;

9.3.3   SECTION C: PHYSICS

Question25

Figure 3 shows a power supply passing current through two resistors connected in series.
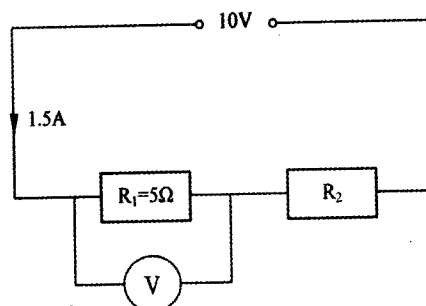

Figure 3

(a)   Calculate the potential difference V across R_1.   (2 marks)

(b)   Determine the resistance R_2.   (2 marks)

Weaknesses

Most candidates were not able to calculate the potential difference across R_1 and hence determine the resistance of R_2.

Expected response

(a) $V = IR$
        $= 1.5 \times 5$
        $= 7.5V$

(b) $V = 10 - 7.5$
        $= 2.5V$ (1)
        $R = \dfrac{2.5}{1.5} = 1.67$ ohms

Question 30

Figure 4 shows the image I of the object O produced by a converging lens.

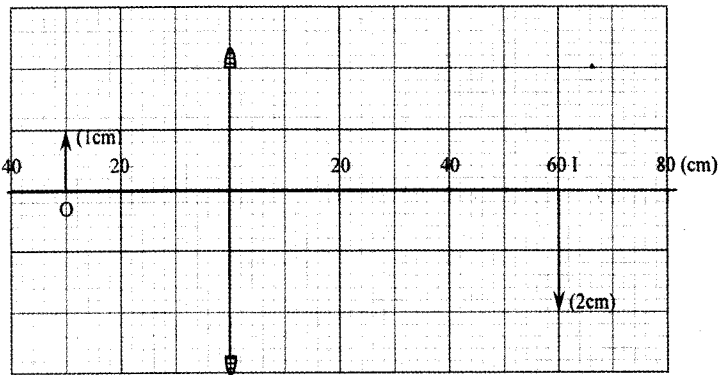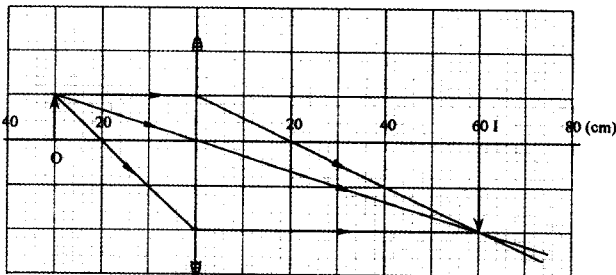**Figure 4**

(a) On the figure, construct a ray diagram to show how the image is formed. (2 marks)

(b) Use the ray diagram to determine the focal length of the lens. (1 mark)

Weaknesses

Candidates were unable to construct ray diagrams to show the image formed and hence determine the focal length of the lens. Most candidates drew lines instead of rays.

Expected response

Question 34

A room uses five bulbs for lighting. Each bulb is rated 240V, 60W. Determine the energy in kWh consumed by the bulbs in 6 hours. (3 marks)

Weaknesses

Candidates were not able to calculate the total energy consumed by the five bulbs. Many had no idea of the formula to be applied.

Expected response

Energy $= P \times t$ (1)

$\qquad = 60 \times 10^{-3} \times 5 \times 6$

$\qquad = 1.8 \, Kwh$ (1)

Advice to teachers

Emphasis should be made on:

* Drawing ray diagrams with arrows to indicate the direction.
* Application of knowledge in different situations.
* Mastery of formulae in all topics.
* Proper mastery of content by giving practice.

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9.4 GENERAL ADVICE TO TEACHERS

9.4.1 The whole syllabus should be effectively covered during instruction because examination items will be sampled from the entire syllabus.

9.4.2 The teacher/school should acquire the relevant reference materials and assist candidates to obtain and use the recommended textbooks.

9.4.3 The use of textbooks by teachers should always be guided by the syllabus. The specific objectives stipulated in the syllabus should be correctly interpreted to ensure the topics in question are taught adequately and effectively.

9.4.4 A variety of teaching methods and resources should be utilised by teachers to ensure that the content is effectively delivered during instruction.

9.4.5 Resource persons/guest speakers and field visits should be arranged and used in areas where the teacher and the school lack the resources to teach the topic/lesson effectively.

9.4.6 All the suggested practical activities in the syllabus should be carried out to prepare candidates adequately for questions that require application of psychomotor skills acquired during instruction.