# KENYA NATIONAL EXAMINATION COUNCIL
# KCSE, 2014

## GENERAL SCIENCE PAPER 1ANALYSIS

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## 3.6 GENERAL SCIENCE (237)

General science was tested for the first time in the year 2010. It is composed of 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 and non-formal centers that usually have no qualified science teachers.

### 3.6.1 CANDIDATES OVERALL PERFORMANCE

The overall performance of candidates in General science since the year 2010 is as shown in the table below.

**Table 14: Candidates overall Performance of candidates between 2010 and 2014**

| 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** |
| 2011 | **Paper 1** | 1242 | 100 | 12.84 | 10.12 |
| | **Paper 2** | 1237 | 100 | 9.68 | 7.91 |
| | **Overall** | **1245** | **200** | **22.42** | **17.29** |
| 2012 | **Paper 1** | 1285 | 100 | 13.93 | 10.61 |
| | **Paper 2** | 1285 | 100 | 9.46 | 8.92 |
| | **Overall** | **1285** | **200** | **23.34** | **18.71** |
| 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** | 1100 | 100 | 9.73 | 9.30 |
| | **Paper 2** | 1100 | 100 | 8.69 | 8.91 |
| | **Overall** | **1384** | **200** | **18.34** | **17.18** |

From the table it can be observed that:

(i) Candidature for the subject increased from 1100 in 2013 to 1384 in 2014 (25.18% increase).

(ii) The mean for paper 2 in all the years has been lower than that of paper 1. This may be due to the fact that majority of candidates taking this subject are from private/non-formal centers who may not have teachers. This makes it hard for them to cover and conceptualize concepts in forms 3 & 4 which are mainly tested in paper 2.

(iii) There was a drop in the overall mean from **19.46** in 2013 to **18.34** in 2014.

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

Questions that appeared to have given candidates a great challenge include numbers 3, 4 and 8. These questions are briefly discussed below.

### Question 3

A strip of raw pawpaw measuring 3 cm in length was immersed in a beaker of water. After 30 minutes the strip measured 3.2 cm.

(a) Explain the change in length. (2 marks)

(b) State **one** other observation that was made on the raw pawpaw strip at the end of the experiment. (1 mark)

This was a practical based question where a piece of paw paw was immersed in beaker with water and increased in length after 30 minutes. Candidates were required to explain the observation and state another observation made on the paw paw.

**Weaknesses**

Majority of candidates were not able to explain the change in length and state another observation made on the raw paw paw. This showed lack of practical approaches to teaching by teachers.

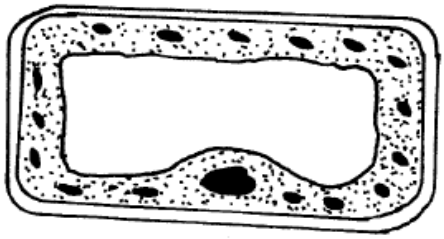
**Expected response**

(a) There was movement of water molecules from the beaker into the strip of pawpaw by osmosis; because the strip tissue fluid was hypertonic / water in the beaker was hypotonic;

(b) The strip became rigid / hard / stiff / turgid / firm; The strip bent / curved;

### Question 4

The diagram below represents a plant cell as seen under high power of the light microscope.



(a) Based on observations of the diagram, give **three** reasons why it is a plant cell. (3 marks)

(b) Name the organelle that carries out autotrophic nutrition in plants. (1 mark)

Candidates were given a diagram of a plant cell as seen under high power of the light microscope. They were supposed to give reasons based on the diagram why it is a plant cell.

**Weaknesses**

Some Candidates did not know the names of organelles in plant cells and this made them not to score when answering the question.

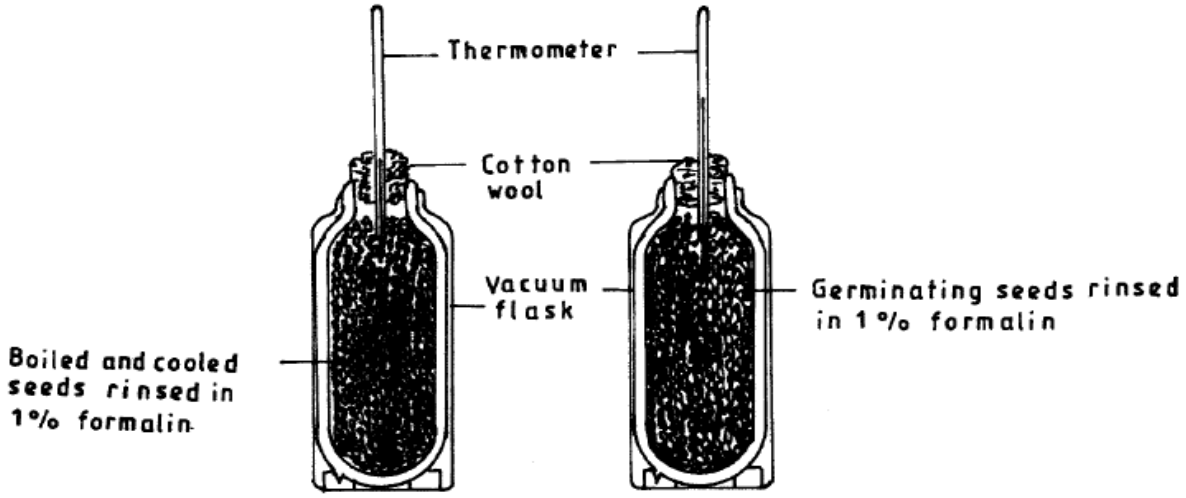
**Expected response**

(a) Peripheral nucleus; Large central vacuole;
Cell wall present; Has regular shape ; chloroplast present

(b) Chloroplast;

**Question 8**

(a) The diagrams below represents an experimental set-up that was used to investigate the process of respiration.




(i) State the aim of the investigation. (1 mark)

(ii) State the purpose of rinsing the seeds in 1% formalin. (1 mark)

(b) Name **two** end products of digestion of a meal consisting of boiled rice and beans without oil. (2 marks)

This was also a practical based question on respiration. From the set-ups given on the diagrams, candidates were supposed to state the aim of investigation and the purpose of rinsing the seeds in formalin. There was also a question on the end products of digestion.

**Weaknesses**

Most candidates were not able to answer the question correctly. They showed lack of exposure to practicals in respiration and critical thinking.

**Expected response**

(a) (i) To find out if heat if produced by germinating seeds; as they respire.

(ii) To kill bacteria that would respire producing heat;

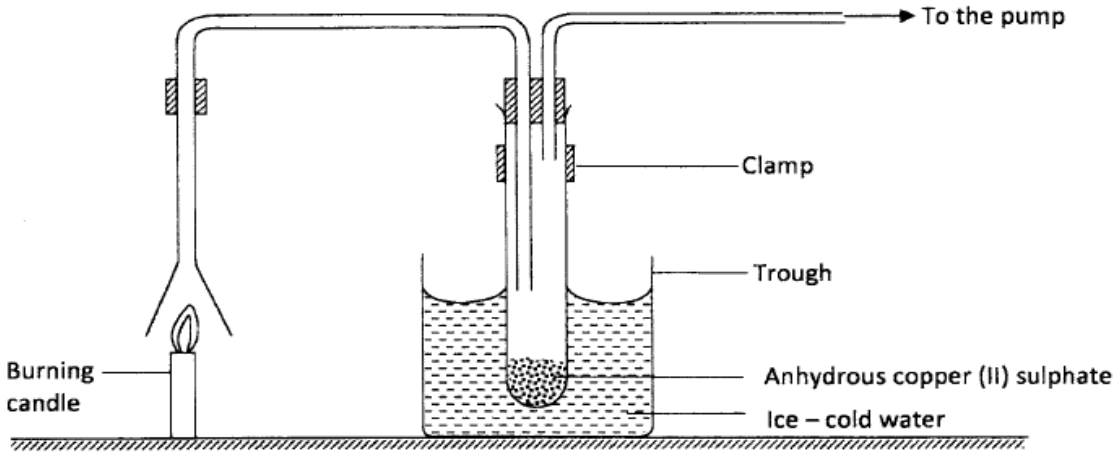
(b) Glucose; Amino acids;

**SECTION B: CHEMISTRY**

The following questions were a challenge to the candidates: number 11, 15, 16, 18 and 20.

**Question 11**

An experiment was set up to investigate the products of a burning candle as shown in the diagram below.




(a) (i) State an observation made on the anhydrous copper (II) sulphate. (1 mark)

(ii) Explain the observation made in a(i) above. (1 mark)

(b) What effect does the other product of burning candle have on the environment? (1 mark)

Candidates were required to state and explain the observation on anhydrous copper (II) sulphate and the effect of the other product other than water of burning a hydrocarbon on the environment.

**Weaknesses**

Candidates were unable to state and explain the effect of water on anhydrous copper (II) sulphate. Majority of the candidates were unable to identify the products of a burning candle hence they could not state and explain the observation on anhydrous copper (II) sulphate.

**Expected response**

(a) (i) White anydrous copper (II) Sulphate turns blue

(ii) Anhydrous copper (II) Sulphate combines with the water produced to form blue hydrated copper (II) Sulphate. / anhydrous Copper (II) Sulphate becomes hydrated.

(b) It causes global warming / greenhouse effect.

**Advice to Teachers**
Teachers should adopt practical approach to teaching when dealing with confirmatory tests for water.

**Question 16**

(a) Hard water is healthy for drinking. Explain. (1 mark)

(b) Explain how ion-exchange is used to remove hardness in water. (2 marks)

Candidates were required to explain why hard water is healthy for drinking and how ion-exchange is used to remove hardness in water.

**Weaknesses**
Candidates were unable to explain how ion - exchange is used to remove water hardness. Majority of the candidates could explain others methods of removing water hardness such as use of chemicals and boiling.

**Expected response**

(a) It provides calcium and magnesium ions used by animals in formation of strong bones, teeth and shells.

(b) Hard water is passed through a column packed with a compound of sodium permuttit which exchanges $Ca^{2+}$ and $Mg^{2+}$ ions for $Na^{+}$ ions.

**Advice to Teachers**
Teachers should explicitly explain the advantages of hard water and the various methods of removing water hardness.

**Question 19**

(a) What is meant by the term "**ionization energy**"? (1 mark)

(b) Study the following table and use it to answer the questions that follow. The letters do not represent the actual symbols of the elements.

| Element | P | Q | R | S | T | U | V | W |
|---|---|---|---|---|---|---|---|---|
| Electronic configuration | 2.8.1 | 2.8.2 | 2.8.3 | 2.8.4 | 2.8.5 | 2.8.6 | 2.8.7 | 2.8.8 |
| 1st ionization energy (kJ $mol^{-1}$) | 494 | 736 | 576 | 787 | 1017 | 1000 | 1255 | 1519 |

(i) From the table, ionization energies increase generally from element P to element W. Explain. (2 marks)

(ii) What types of oxides are formed by elements:

(I) R .....($\frac{1}{2}$ mark)

(II) U .....($\frac{1}{2}$ mark)

Candidates were required to define **ionization energy** and to explain why ionization energy increases generally across a period. They were also to name the types of oxides formed by some given elements.

**Weaknesses**

Candidates were unable to give clear definition and the increase in ionization energy across period three elements.

**Expected response**

(a) Ionization energy is the minimum energy required to completely remove the outermost electron from an atom in the gaseous state. (w.t.t.e)

(b) (i) The atomic size decrease from P to W because of increase in the effective nuclear charge hence the removal of the outermost electron across the period requires more energy as the atomic size decreases.

(ii) (I) R - Amphoteric oxide

(II) U - Acidic oxide

**Question 21**

(a) Identify the types of bonds in carbon (II) oxide molecule. (1 mark)

(b) Explain why graphite is used as a lubricant. (2 marks)

Candidates were required to identify the types of bonds in a carbon (II) oxide molecule and to explain why graphite is used as a lubricant.

**Weaknesses**

Candidates were unable to identify the types of bonds correctly and to give a clear explanation why graphite is used as a lubricant.

**Expected response**

(a)
- Covalent bonds
- Coordinate / dative bond

(b) Graphite exist in hexagonal layers which are held together by weak van der waals forces of attraction. These layers slip/slide over each other when compressed hence this makes it a good lubricant.

**SECTION C: PHYSICS**

Like in the previous years, candidates find the Physics section very challenging. Many candidates don't attempt this section at all. They are advised to utilize the past reports to enhance their knowledge in Physics. The following are some of the questions that were found most challenging.

**Question 24**

An object is found to have a weight of 12.5 N at a place where the acceleration due to gravity is 10 $ms^{-2}$. Determine the mass of the object. (3 marks)

Candidates were expected to determine the mass of an object given its weight at a place where $g = 10ms^{-1}$.

**Weaknesses**

Most candidates were unable to determine the mass and lacked knowledge of the formula for weight.

**Expected response**

$W = mg$

$12.5 = m \times 10$

$m = 1.25\ kg$

**Question 29**

**Figure 2** shows a uniform metre rule pivoted at the 20 cm mark and balanced by a weight of 4.5 N.

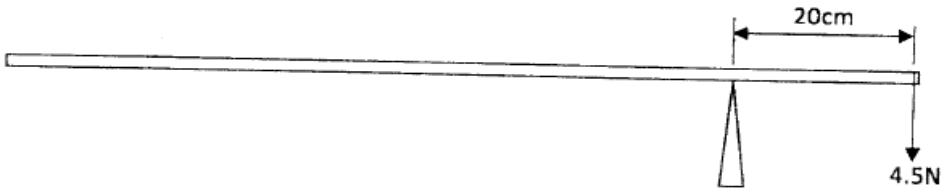



Figure 2

Determine the weight of the rule. (3 marks)

Candidates were expected to determine the weight of a meter rule using the principle of moments.

**Weaknesses**

Most candidates failed to realize that the weight of the meter rule was the force acting at its center of gravity, 50 cm since the rule was uniform. They did not apply the principle sum of clockwise moments is equal to the sum of anti-clockwise moments.

**Expected response**

Sum of anticlockwise moments = Sum of clockwise moments/$F_1d_1 = F_2d_2$

Let weight of rule be $x$ ;

$$x \times 30 = 20 \times 4.5 \ ;$$

$$x = \frac{20 \times 4.5}{30}$$

$$= 3 \text{ N}$$

**NB. Most of the candidates' responses lacked an understanding of the principles of physics.**