

3.6 GENERAL SCIENCE (237)

In 2017, 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 centers.

CANDIDATES OVERALL PERFORMANCE

The Table below is a comparative presentation of the candidates' performance in the 2 Papers from 2012 to 2017.

Table 13: showing performance of candidates for the last 6 years

year	paper	candidature	Maximum score	Mean score	Standard deviation
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	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

From the table it can be observed that:

- i) Performance has improved in paper 1 from a mean of 9.20 in 2016 to a mean of 11.34 in 2017.
- ii) Performance in paper 2 also improved significantly from a mean of 5.65 in 2016 to a mean 8.43 in 2017.
- iii) The overall performance in the Subject has also 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

No difficult question was reported.

SECTION B: CHEMISTRY

The following questions were a challenge to most candidates.

Question 12

Describe how a sample of oil can be extracted from macadamia seeds in a Chemistry laboratory.
(2 marks)

Candidates were expected to describe using correct procedure on extraction of oil from seeds.

Weaknesses

Most candidates were unable to recall the procedure for the extraction of oil.

Expected response

Crush the seeds in a mortar using a pestle, continue crushing the seeds while adding acetone / propanone a little at a time, decant the resulting solution into an evaporating dish/basin, leave the solution in the sun for some time. Propanone evaporates because of its low boiling point. The residue liquid is the oil.

Advice to Teachers

Teachers to provide practical approach to this sub topic and carry out several practices with different substances.

Question 14

Figure 2 is an illustration of one of the methods used to prepare salts.

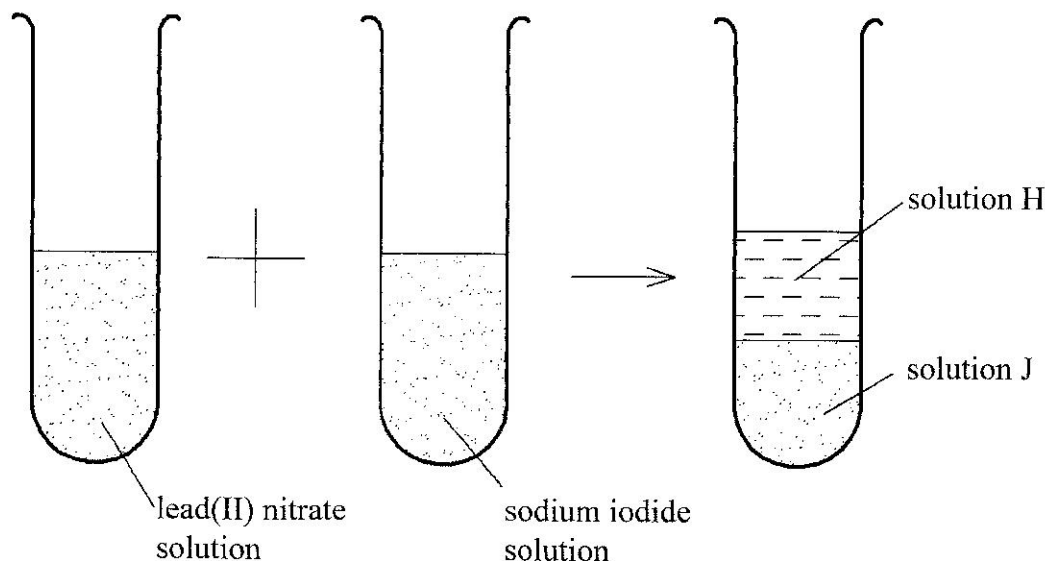


Figure 2

- (a) Name solid J. (1 mark)
- (b) Name the method of salt preparation demonstrated in Figure 2. (1 mark)

Candidates were expected to know the methods of salt preparation.

Weaknesses

Most candidates were unable to identify the method of salt preparation hence not able to get the products of this particular method.

Expected response

- (a) J-Lead(II) iodide
- (b) Precipitation / double decomposition

Advice to Teachers

Teachers to provide practical approach to salt preparation methods and write equations to assist candidates to recall the products.

Question 19:

Explain how water hardness can be removed using the ion-exchange method. (2 marks)

Candidates were expected to explain how water hardness can be removed using ion exchange.

Weaknesses

Most candidates were unable to explain how ion exchange is used to remove water hardness.

Expected response

Ion-exchange process:

Hard water is passed through a column filled with a complex sodium compound (sodium permuttit) / ion exchanger. The Ca^{2+} and Mg^{2+} ions in the hard water are precipitated and remains in the column while the sodium ions from the column comes out with the water hence becoming soft.

Advice to Teachers

Teachers to explain vividly the various methods of water softening and their differences in terms of advantages and disadvantages over each other method.

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 26

Two students A and B are taking milk using a straw. A is standing on top of a high mountain while B stands at the foot of the mountain. State with a reason which student takes the milk more easily.
(2 marks)

Candidates were expected to show knowledge of the difference in atmospheric pressure at different altitudes.

Weaknesses

Most candidates were unable to identify the student who was able to suck the milk more easily and hence state the reason why the sucking was aided by atmospheric pressure.

Expected response

A
Atmospheric pressure is higher at the foot of the mountain hence the milk gets into the straw much more easily.

Question 29

Figure 7 shows an immersion heater being used to heat water in a jug and a thermometer placed in the water with its bulb below the heating coil.

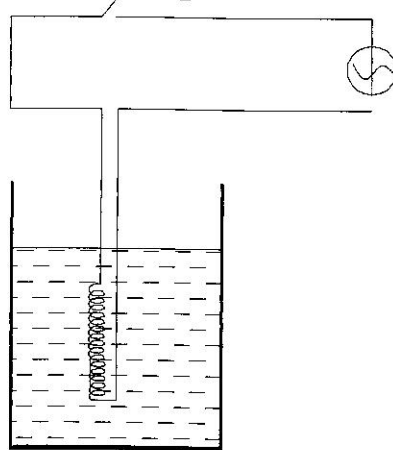


Figure 7

Candidates were expected to explain how water at the bottom of the container doesn't get hot as soon as the water above starts boiling.

Weaknesses

Most students were not able to explain the difference in temperature to the convectional currents.

Expected response

Water above the coil was heated by convection currents; while below the coil water is heated by conduction but water is a poor conductor of heat.

Question 30

A uniform plank of wood of length 5 m is pivoted at its centre. A girl of mass 32 kg sits at one end of the plank. Determine how far from the pivot a boy of mass 40 kg should sit in order to balance the plank. (3 marks)

Candidates were required determine how far from a pivot a boy should sit so as to balance the system.

Weaknesses

Most candidates lacked knowledge on the principle of moments

Expected response

Sum of clockwise moments = sum of anticlockwise moments.

$$40x = 32 \times 2.5$$

$$x = \frac{32 \times 2.5}{40}$$

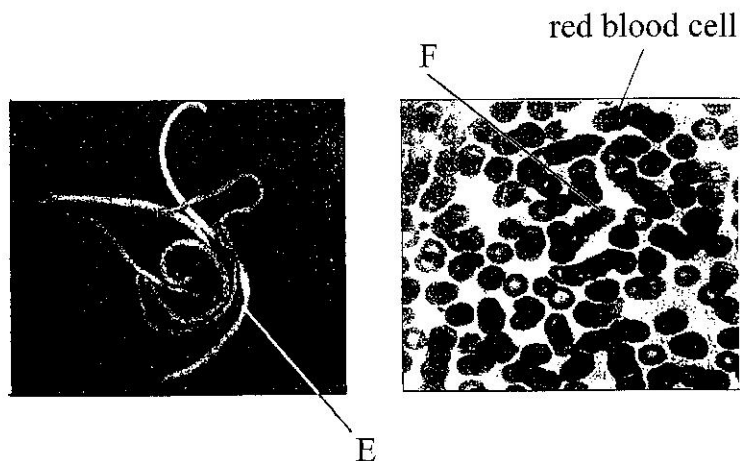
$$= 2.0\text{m}$$

SECTION A: BIOLOGY

Question 1 appeared to have challenged most candidates.

Question 1

The photographs below show two types of parasites.



- (a) (i) Identify the parasite labelled **E** and **F**.
- E** (1 mark)
- F** (1 mark)
- (ii) Name **one** living organism which can host the two parasites. (1 mark)
- (b) Give **three** adaptations of the parasite labelled **E** to its mode of life. (3 marks)

Weaknesses

Most candidates demonstrated lack of comprehension and hence weak interpretation of the diagrams presented. Most of them could not for instance, relate the occurrence of *Plasmodium spp* in the human Red blood cells as illustrated in the diagrams. As a result, the parasites were not accurately identified.

Expected response

- (a)
- (i) E – Roundworms/*Ascaris spp*;
 F – *Plasmodium ovale*/*Plasmodium vivax*;
- (ii) Human beings;
- (b)
- Thick and hard protective covering to resist digestion by enzymes;
 - Covered by mucus to resist digestion by the host enzymes;
 - Can respire anaerobically to survive in the oxygen-deficient intestines;

- Eggs are enclosed/covered by hard shells to resist digestion in the intestines and harsh external environment;
- Has two hosts to increase survival chances;

Teaching and learning Biology needs to emphasize exposure to a range of practical activities, projects and illustrations, especially through Information and Communication Technology.

SECTION B: CHEMISTRY

The following questions challenged the candidates:

Question 15:

Calculate the mass of 0.35 moles of calcium hydrogen carbonate. (2 marks)
(Ca = 40 ; H = 1.0 ; C = 12.0 ; O = 16.0)

Candidates were expected to apply the formula for calculating number of moles in a compound.

Weaknesses

Most candidates were unable to recall the formula for working out this mole concept.

Expected response

R. Formula $\text{Ca}(\text{HCO}_3)_2$

R.F.M. = (40+2+24+96) = 162

Mass of $\text{Ca}(\text{HCO}_3)_2 = (0.35 \times 162)$
= 56.7g

Question 18

In the manufacture of sulphuric(VI) acid, sulphur(VI) oxide is absorbed in concentrated sulphuric acid and the product diluted with soft water.

- Name the product that is diluted. (1 mark)
- Write an equation for the reaction between sulphur(VI) oxide and concentrated sulphuric(VI) acid. (1 mark)
- Concentrated sulphuric(VI) acid was added to a beaker containing sugar crystals. Explain the observations made. (1 mark)

Candidates were expected to demonstrate clear understanding of how sulphuric(VI) acid is industrially manufactured.

Weaknesses

Most candidates were unable to follow the processes involved during manufacturing of the acid.

Expected response

a) Oleum

b) $SO_{2(g)} + H_2SO_{4(l)} \rightleftharpoons H_2S_2O_7(l)$

c) The sugar turned brown then a black mass is formed because conc. H_2SO_4 dehydrates /removes the elements of water from sugar.

SECTION C: PHYSICS

Question 25

Explain how a glass rod acquires a positive charge when rubbed with silk cloth. (2 marks)

Candidates were expected explain how a glass rod acquires charge from a silk cloth upon rubbing.

Weaknesses

Candidates failed to demonstrate knowledge on how charges are made to move from glass to cloth. Some thought positive charges move.

Expected response

On rubbing the glass loses some electrons to the cloth, it therefore gets a net positive charge.

Question 29

State the energy changes that take place as the electrons travel to the anode for the production of X-rays in an X-ray tube. (3 marks)

Candidates were expected to state the energy changes that take place as electrons travel to the anode for the production of X-rays in an X-ray tube..

Weaknesses

Most candidates lacked knowledge of the production of X-rays. They were not able to state the energy changes for the moving electrons.

Expected response

Electrical energy(electric field) → Kinetic energy (of electrons) → heat and x-rays

Question 32

State **three** advantages of using a Cathode Ray Oscilloscope as a voltmeter instead of a moving coil meter. (3 marks)

Candidates were required to state the advantages of using a CRO to measure voltages over the moving coil meter.

Weaknesses

Most candidates did not show understanding of the functioning of the CRO.

- Can measure both alternating and direct voltages
- Responds instantaneously unlike ordinary meter
- Does not affect the circuit due to its high resistance
- Can measure large voltages without getting damaged.

Advice to Teachers

Emphasis should be made on

- ❑ Application of knowledge in different situations.
- ❑ Proper mastery of content by giving practice.
- ❑ Though this is general science, teachers should strive to let students do experiments and if this is not possible, carry out demonstrations with them.
- ❑ Teachers should strive to ensure that the students grasp the concepts being taught by using creative approaches in presentation of content in class.

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.