

# **RESUME OF THE CHIEF EXAMINERS' REPORTS FOR THE SCIENCE SUBJECTS**

## **1. STANDARDS OF THE PAPERS**

All the Chief Examiners for the Science Subjects unanimously reported that the standard of the papers compared favourably with those of previous years. The Chief Examiners for Biology 2 and Integrated Science 1 reported further that the questions were drawn from a wide spectrum of the syllabus and that the questions were unambiguous.

## **2. PERFORMANCE OF CANDIDATES**

The Chief Examiners gave varying reports on the standard of performance of candidates. Some of them, including those for Animal Husbandry 1, Biology 2, Chemistry 2, Crop Husbandry & Horticulture 1, Fisheries 1, Forestry 2 and General Agriculture 2 reported that there was an improvement in the performance of candidates as compared to previous years. On the contrary, those for Crop Husbandry & Horticulture 2 and Integrated Science 1 reported that candidates' performance was poorer than that of previous year. Again, other Chief Examiners including those for Animal Husbandry 2, Biology 1, Fisheries 2, Forestry 1, Chemistry 1, General Agriculture 1, Physics 1, Physics 2 and Integrated Science 2 reported candidates' performance was average.

## **3. A SUMMARY OF CANDIDATES' STRENGTHS**

- (1) Obeying the rubrics of the paper: The subjects for which the Chief Examiners commended candidates for obeying the rubrics included Animal Husbandry 1, Animal Husbandry 2, Biology 1, Biology 2, Chemistry 1, Crop Husbandry & Horticulture 2, Forestry 1, Forestry 2, General Agriculture 2, Integrated Science 1, and Integrated Science 2.
- (2) Provision of precise answers: Some of the Chief Examiners commended candidates for providing precise answers. They included the Chief Examiners for Chemistry 1, Fisheries 1, Fisheries 2, Forestry 1, Forestry 2, General Agriculture 1 and Integrated Science 2.
- (3) Provision of well drawn diagrams: The Chief Examiner for Biology 1 commended candidates for presenting well drawn diagrams.

## **4. A SUMMARY OF CANDIDATES WEAKNESSES**

- (1) Mastery of subject matter : Majority of the Chief Examiners indicated in their reports that the responses of many candidates lacked of in-depth knowledge of the subject matter. The Chief Examiners included those for Animal Husbandry 2,

Biology 1, Chemistry 1, Crop Husbandry and Horticulture 2, Fisheries 2, General Agriculture 1, Integrated Science 1, Integrated Science, Physics 1 and Physics 2

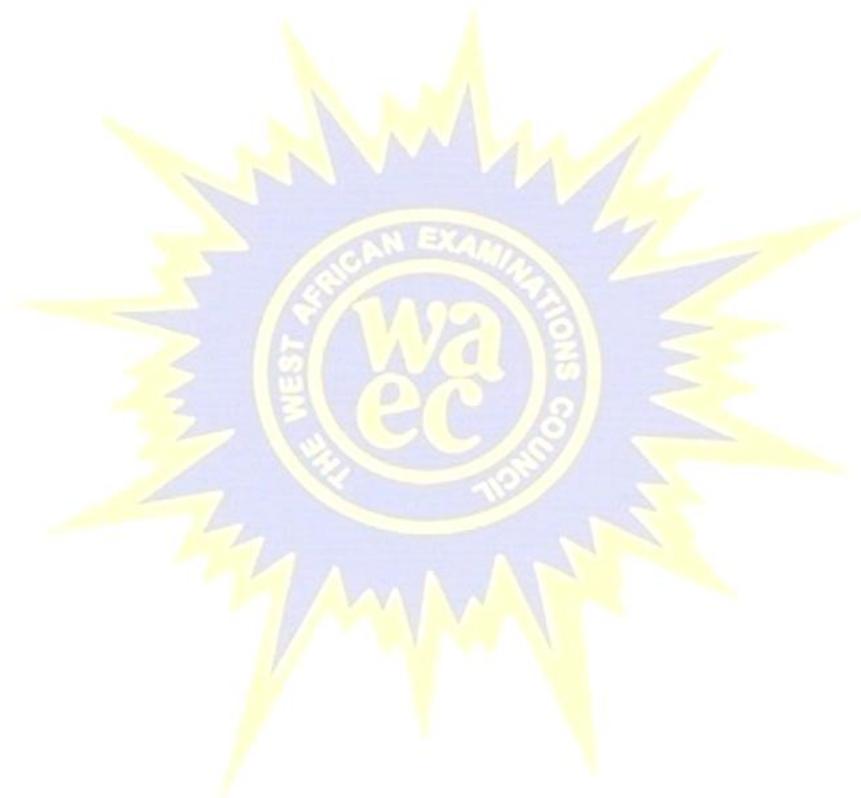
- (2) Misunderstanding of the questions: The Chief Examiners for Biology 1, Chemistry 2, Fisheries 1, Integrated Science 2 and Physics 2 reported that the responses of candidates portrayed they did not understand the questions that were set.
- (3) Wrong spelling of scientific terminologies: It was also reported by majority of the Chief Examiners that scientific terms were wrongly spelt by some candidates. The papers for which this report was made included Animal Husbandry 1, Animal Husbandry 2, Biology 1, Biology 2, Crop Husbandry & Horticulture 1, Crop Husbandry & Horticulture 2 and Integrated Science 2.
- (4) Poor expression in English Language: The Chief Examiners for Chemistry 2, Crop Husbandry & Horticulture 2, Forestry 1 and General Agriculture 2 expressed concern over poor construction of sentences by most candidates. As a result the examiners found it difficult to understand what the candidates wanted to put across.
- (5) Poor plotting of graphs: The Chief Examiner for Fisheries 1, Physics 1 and Integrated Science 2 lamented that graphs were poorly plotted by many candidates.
- (6) Failure to adhere to the convention of writing scientific names: It was noted by the Chief Examiners for Animal Husbandry 1, Biology 1, Crop Husbandry & Horticulture 1 and Integrated Science 1 that some of the candidates did not adhere to the convention of writing scientific names.
- (7) Poor handwriting of candidates: According to the Chief Examiner for Crop Husbandry & Horticulture 1 some of the candidates handwriting were so bad that they were not easily readable.

## 5. SUGGESTED REMEDIES

The following suggestions were made by the Chief Examiners to curtail the weaknesses of the candidates:

- (1) Teachers should endeavour to cover all topics in the syllabus.
- (2) Students are advised to read through examination questions carefully and understand them before they attempt to answer them.
- (3) Teachers should take their students through spelling drills regularly.

- (4) Students should read story books and take lessons in English Language more seriously.
- (5) Teachers are also advised to give more graph work to their students.
- (6) Teachers should make efforts to teach their candidates the convention of writing scientific names.
- (7) Students are advised to cultivate the habit of writing clearly



## **ANIMAL HUSBANDRY 1**

### **1. GENERAL COMMENTS**

Generally, the questions were very clear, straight to the point and compared favourably with questions of the past year. There was an improvement in the performance of the candidates.

### **2. A SUMMARY OF CANDIDATES' STRENGTHS**

The following strengths were detected in the scripts of candidates:

- (1) Majority of the candidates were able to express themselves.
- (2) Handwriting of candidates was good.

### **3. A SUMMARY OF CANDIDATES' WEAKNESSES**

The main weaknesses were that:

- (1) Many candidates could not answer questions that required explanation or sequential order of presentation.
- (2) Candidates could not spell scientific names correctly.

### **4. SUGGESTED REMEDIES**

The following remedies were suggested:

- (1) Teachers should assist students to answer questions which require explanation or presentation of orders during classes.
- (2) Candidates should learn to spell scientific names correctly.

### **5. DETAILED COMMENTS**

#### **Question 1**

- (a) **Identify each of specimens A and B.**
- (b) **Mention the husbandry practice for which specimen A is used.**
- (c) **State three ways in which the husbandry practice you mentioned in (b) is important in animal production.**
- (d) **Name two farm animals for which specimen A could be used in their production.**
- (e) **Give three circumstances under which specimen B could be used.**
- (f) **State two problems each which could be encountered in the use of specimens A and B.**

In part (a), many candidates were able to identify specimen A as ear tag but some spelt it wrongly. For specimen B, many candidates identified it as dog chain without adding the leather collar.

For part (b), some candidates wrongly stated that the husbandry practice was ear tagging instead of identification.

Answers to part (c) were also unsatisfactory. Expected answers included: for record keeping, useful in breeding, eases the process of culling; establishment of ownership etc.

Part (d) and (e) were answered satisfactorily. Candidates performed satisfactorily in part (f).

## **Question 2**

- (a) (i) Name the major nutrient supplied by each of specimens C and D.**
- (ii) State two functions of each of the major nutrients you have named in (i).**
- (iii) Mention two deficiency symptoms of the major nutrient supplied by specimen D in farm animals.**
- (iv) State one way each by which a farmer could maintain the quality of specimens C and D in storage.**
- (b) Outline the steps involved in the preparation of specimen E.**

Performance here was fair. Answers to parts (a)(i) to (a)(iii) were satisfactory. Those for (a)(iv) were not satisfactory. Some candidates lumped the two specimens together and provided a common answer, for example, keep away from rain. Expected answers included storage at appropriate moisture content and protect from pests for specimen C and protect from moisture and store in appropriate place for specimen D.

For part (b), most candidates could not give a correct sequence of steps involved in the Preparation of specimen E (Silage).

## **Question 3**

- (a) Identify specimen F.**
- (b) Name two breeds of specimen F.**
- (c) State three functions of the feathers on specimen F.**
- (d) Mention the incubation period of the eggs of specimen F.**
- (e) Give the name of the young of specimen F.**
- (f) State four causes of mortality of the young of specimen F under the traditional system of production.**
- (g) Mention three forms in which specimen F is marketed in Ghana.**

For part (a), most candidates were able to identify the specimen as Guinea Fowl except that they did not add that it was 'live'.

Many candidates could not answer part (b) satisfactorily. Expected answers included: pearl, white and lavender.

Part (c) was answered satisfactorily. Expected answers included: flight, provision of warmth, courtship etc.

Performance in parts (d), (e) and (f) was fair. For part (g), some candidates got mixed up and wrote about “how” it was marketed. Expected answers included live bird, dressed carcass, smoked, roasted, grilled, cut into pieces as kebab etc.

#### **Question 4**

- (a) Identify each of specimens H, J and K by their common and scientific names i.e. *Laucaena leucocephala*, *Parricum maximum* and *Cynodo plectrostrachyus* respectively.**
- (b) State the growth habit of each of specimens J and K.**
- (c) Give four reasons for growing specimens G and J together in a pasture.**
- (d) Mention three symptoms that could be observed in goats that consume large amounts of specimen H.**

For part (a), many candidates did not follow the rubrics of writing scientific names.

For part (b), some candidates failed to write the growth habit of the specimens correctly. The expected answers were: J - erect/bunched and K - creeping/prostrate.

Performance in part (c) was quite satisfactory. In part (d), Many candidates also gave satisfactory answers expected but some spelt diarrhoea wrongly as “diarrhea”.

## **ANIMAL HUSBANDRY 2**

### **1. GENERAL COMMENTS**

The standard of the paper was comparable to those of the previous years. The performance, however, is lower than the previous years' performance.

### **2. A SUMMARY OF CANDIDATES' STRENGTHS**

The following strengths were detected in the scripts of candidates:

- (1) Some candidates provided answers that were brief and precise.
- (2) Quite a number of candidates expressed themselves well and their writings were legible.

### **3. A SUMMARY OF CANDIDATES' WEAKNESSES**

Candidates exhibited the following weaknesses:

- (1) The majority of weaknesses related to deficiencies in the English language. There were instances of outrageous spelling mistakes.
- (2) Some candidates did not have knowledge of some questions. Either these were not covered by the teacher or they themselves failed to study those topics.
- (3) Candidates were weak in questions that demanded discussion and explanations.

### **4. SUGGESTED REMEDIES**

The following remedies were suggested:

- (1) Candidates should be encouraged to read literature that will help to improve their language.
- (2) Candidates should on their own read ahead of the teachers and even study topics that have not been covered by their teachers since syllabuses are available.
- (3) Teachers should also teach students how to answer questions that require discussion or explanation. Past questions could be used for this purpose.

### **5. DETAILED COMMENTS**

#### **Question 1**

- (a) **Mention five management practices that are carried out on piglets.**
- (b) **State five characteristics of a suitable housing facility for the intensive production of sheep.**

**(c) Describe five symptoms of protein deficiency in farm animals.**

This was a popular question. Generally, candidates performed well on this question.

- (a) This question did not pose a problem to candidates as they were able to provide correct answers like provision of creep feed, fresh, clean water, heat, iron dextran; other correct answers are removal of mucus from the nose, cutting of navel and milk teeth, castration, identification etc.
- (b) Several candidates were able to state the characteristics of a suitable housing facility for the intensive production of sheep. For example, it should be spacious, dry, well-ventilated, properly oriented, and have a strong floor and a conducive temperature. Candidates who did not understand the question stated the benefits of good housing in sheep production.
- (c) This sub-question was quite problematic to candidates. Although a number of candidates were able to mention the symptoms of protein deficiency in farm animals, they could not describe the symptoms. As a result, they lost valuable marks. For instance, a candidate who stated stunted growth as a symptom must go further to indicate that the animals do not reach the expected weight and height at a specific time.

**Question 2**

- (a) Name five breeds of rabbits found in Ghana.**
- (b) State three advantages and three disadvantages of selection as a method of animal improvement.**
- (c) Explain each of the following terms as used in animal nutrition:**
  - (i) diet;**
  - (ii) feedstuff;**
  - (iii) feed conversion efficiency.**

This was a popular question but candidates' performance was sub-standard.

- (a) It was a straight forward question. Many candidates were able to provide the correct answer. A few, however, named breeds of pigs and other farm animals. Spelling mistakes were quite common.
- (b) A poorly answered sub-question. Some candidates failed to zero in on selection but rather concentrated their attention on animal improvement and the various types of animal improvement. The advantages included: selection of animals with undesirable traits, selection of only the best naturally available breeds and the reduction in the spread of diseases. The disadvantages included the following: it is tedious and time-consuming, it

requires expertise, it brings about the exclusion of some desirable parental traits, etc.

- (c) Candidates generally had difficulty explaining the terms diet, feedstuff and feed conversion efficiency. In some cases, gave explanation for balanced diet, ration etc. It should also be noted that feed conversion efficiency is different from the process of digestion. Feed conversion efficiency is simply a unit of feed consumed in kilogram that is used to produce a unit weight (kg) of product. Diet is a combination of feedstuff containing the necessary nutrients given to animals to meet their nutritional needs and feedstuff are materials containing required nutrients used for animal feed. It is important that teachers emphasize the definition of technical terms for candidates to appreciate their importance.

### **Question 3**

- (a) **Name four forage crops common in Ghana.**  
(b) **Outline four ways of preventing cannibalism in poultry production.**  
(c) **Explain four conditions necessary of obtaining wholesome milk from cattle.**

This question was fairly popular but poorly answered.

- (a) Candidates mentioned a variety of plants as forage crops including ornamental plants. (e.g. lawn grasses). It appears that candidates' knowledge of forage crops was poor. Candidates are advised to avoid writing scientific names unless they are sure of the rules governing their use. Common forage crops included: guide grass, elephant grass and giant grass.
- (b) Candidates merely stated the ways of preventing cannibalism in poultry, but failed to outline. Some of them gave the causes of cannibalism. Candidates could have scored higher marks if they had indicated how the various approaches/method help to prevent cannibalism.
- (c) On the whole, this sub-question was very poorly answered. Candidates did not seem to know the meaning of wholesome milk. Consequently, they mentioned the conditions that favour milk production and milking. Some of the correct answers were:
- (i) use of clean equipment to prevent contamination of milk;
  - (ii) clean storage equipment to prevent deterioration of milk;
  - (iii) maintenance of hygienic working environment to prevent contamination;
  - (iv) cleaning/disinfecting the udder to get rid of filth and pathogens;
  - (iv) use of healthy animals to prevent the spread of zoonotic diseases.

### **Question 4**

- (a) State five ways in which parasites are of economic importance in animal production.**
- (b) Enumerate five functions of blood in farm animals.**
- (c) Discuss five factors that could account for low egg production in**

This question was also popular with candidates. It was fairly well answered.

- (a) Candidates had difficulty with the term 'economic importance' and this affected the kind of responses they provided. Parasites are of economic importance in the following ways: they increase the cost of production; they reduce the total yield of animal products; they reduce the market value of animals; they cause damage to the skin etc
- (b) The question on the functions of blood in farm animals was well handled. Answers involving transport of materials must indicate where the material was transported from and to where, for example, transport of carbon dioxide from the tissues to the lungs.
- (c) In a number of cases, answers provided did not address the question of low egg production, for example, health status. Again, many candidates failed to discuss what farmers should do, for examples, disease and pest control and provision of a well balanced feed. Some of the correct answers are inadequate feed and water supply, inadequate lighting (not lightening) system, old birds, non-laying/poor breeds, noise/disturbance.

### **Question 5**

- (a) Define each of the following terms as used in animal improvement:**
  - (i) breeding;**
  - (ii) meiosis;**
  - (iii) mitosis.**
- (b) Give three reasons for promoting snail farming in West Africa.**
- (c) Explain four ways in which the culling of layers is important in a deep litter poultry house.**

This question was quite popular with candidates. Their performance was generally average.

- (a) Candidates could not define breeding, meiosis and mitosis scientifically. More work has to be done in the schools to upgrade the knowledge of students in these areas.
- (b) Candidates on the whole were able to give reasons why snail farming should be promoted in West Africa, for example, source of food/meat/income/employment/foreign exchange.
- (c) Many candidates had difficulty explaining the ways in which culling of layers is important in a deep litter poultry house. They provided the correct answers such as reduction in feed wastage and cost of production, egg pecking and prevention of overcrowding etc. but since they were not able to explain these points, they lost marks.

### **Question 6**

- (a) **Define the term zero grazing.**
- (b) **Explain two ways each in which the following factors affect the quality of stored feed:**
- (i) **storage temperature;**
  - (ii) **water content of feed.**
- (c) **Discuss five problems hindering beef cattle production in West Africa.**

This question was popular but it was poorly answered particularly.

- (a) The term zero grazing was defined in various ways but the important point candidates should note are that the animals do not directly graze the pasture but the forage is cut and fed to the animal as fresh forage/silage. Such animals are usually confined.
- (b) This sub-question was poorly answered since candidates only highlighted on the effects of storage temperature and water content on the quality of stored feed without indicating the level of temperature or water content. In some other instances, candidates only stated that high temperature affects the nutritional level etc. of the feed. How it occurs or the nature of the effect was not mentioned. Some correct answers are:
- (i) low temperature could encourage mouldiness;
  - (ii) high temperature could lead to deterioration of feed quality;
  - (iii) high water content could result in mouldiness and also reduce shelf life etc.
- (c) Many candidates were able to state the problems but could not discuss them. It appears that candidates generally lacked the skill to discuss points mentioned and teachers should be advised to address this weakness.

Some of the correct answers expected from candidates were:

- unavailability of feed throughout the year
- cattle theft
- sources of water mostly dry out during the dry season
- inadequate capital/credit facilities
- incidence of pests and diseases etc.

# **BIOLOGY 1**

## **1. GENERAL COMMENTS**

The standard of the paper was comparable with those of previous years.  
The performance of the candidates was average when compared to previous years.

## **2. A SUMMARY OF CANDIDATES' STRENGTHS**

The following strengths were detected in the scripts of candidates.

- (1) Improvement in quality of drawing.
- (2) Presentation in tabular form of answers to questions which required differences.
- (3) Handwritings of candidates were legible.

## **3. A SUMMARY OF CANDIDATES' WEAKNESSES**

Candidates exhibited the following weaknesses:

- (1) Poor spelling of scientific terms.
- (2) Reports on experiments were poorly presented.
- (3) Inability to relate structures of organisms to their functions.
- (4) Inability to understand the demands of the questions.

## **4. SUGGESTED REMEDIES**

The following remedies were suggested:

- (1) Students should be given a lot exercises and assignments and in marking, teachers should emphasize on spelling of the scientific terms.
- (2) The scientific method should be explained and students should be given the opportunity to applied them and present reports for them to acquire competence.
- (3) Teachers should teach their students on the use of appropriate adjectives to describe structures and how these structures relate to their functions.
- (4) Teachers must give a lot of assignments involving past examination questions so that candidates would be abreast with how examination questions are structured.

## **5. DETAILED COMMENTS**

### **Question 1**

*Study carefully specimens A and B and use them to answer Question 1 (a) to 1 (c).*

- (a)
  - (i) Name the orders to which specimens A and B belong.
  - (ii) State two observable features each characteristic of the orders of specimens A and B.
- (b)
  - (i) Explain briefly how the limbs of specimen A adapt the organism to

- its mode of life.**
- (ii) **Making a drawing 8 - 10cm long of the lateral view of the hind limb of specimen A and label fully.**
- (c) **In a tabular form, state five observable differences between specimens A and B.**
- (a) Quite a number of candidates answered this sub-question correctly because they observed the convention to spell orders with capital letters. However, a few candidates found it difficult to apply this taxonomic requirement. A number of candidates were not able to identify. For Order Coleoptera, many candidates were able to state hardened forewings or elytra and rostrum.
- (b) This sub-question was poorly answered by a many candidates. They were expected to observe that the enlarged or muscular hind limbs adapt the organism for hopping and short forelimbs for landing and absorption of shocks. Majority of the candidates were able to draw the hind limbs showing the correct outline, but failed to label the parts correctly. They failed to observe the details of the spines on the limbs but rather represented them as spines.
- (c) The differences between the specimens were tabulated as required but candidates could not identify equivalent structures between grasshopper and grain weevil which differed in some aspects. For example, long antennae and short antennae in grasshopper and grain weevil respectively, and the triangular head and the elongated head in grasshopper and grain weevil respectively.

## **Question 2**

***Carry out the following experiment and record your observable differences between specimens A and B.***

- (a) (i) **Add a few drops of specimen F to specimens C, D and E and record your observations.**
- (ii) **Put 2 cm<sup>3</sup> of specimen E in a test tube with 2 cm<sup>3</sup> of water and shake. Add a few drops of Sudan III solution to specimen E. Record your observations, inference and results.**
- (b) (i) **Suggest the type of food substances found in specimens C and E.**
- (ii) **Identify specimen F with reasons.**
- (iii) **What is the aim of the experiment?**
- (c) **List:**
- (i) **three sources each;**
- (ii) **two uses; of the food substances found in specimen E.**
- (a) Many candidates were unable to present their report on the food test in the appropriate format. There should be a report on the test performed, the observation made and the

inference drawn for each of specimens C, D and E in tabular form. There were mixed up of the specimens so candidates lost substantial marks.

- (b) Based on the results of the food tests, candidates were expected to indicate that specimen C contained starch and lipid. Most candidates stated correctly that specimens C and E contained starch. They identified correctly Specimen F as iodine solution. However, some of them wrote “iodine” instead of “iodine solution” and lost marks, They also stated correctly that specimen reacts with starch to give the blue-black colour. Stating the aim of the experiment was difficult for most candidates. They were expected to state that the aim of the experiment was to determine the food substances present in specimen C, D and E.
- (c) This sub-question was poorly answered by most candidates. They were expected to give examples each of the sources of starch and lipids which were the contents of specimen E and not of specimen C. They were also expected to give the uses of specimen E and not specimen C. The uses of specimen E included: source of energy/ heat; food reserve; insulation; synthesis of cell membrane; protection of vital organ in the body.

### **Question 3**

*Study carefully specimens K, L, M, N, P and Q and use them to answer Question 3 (a) to 3 (d).*

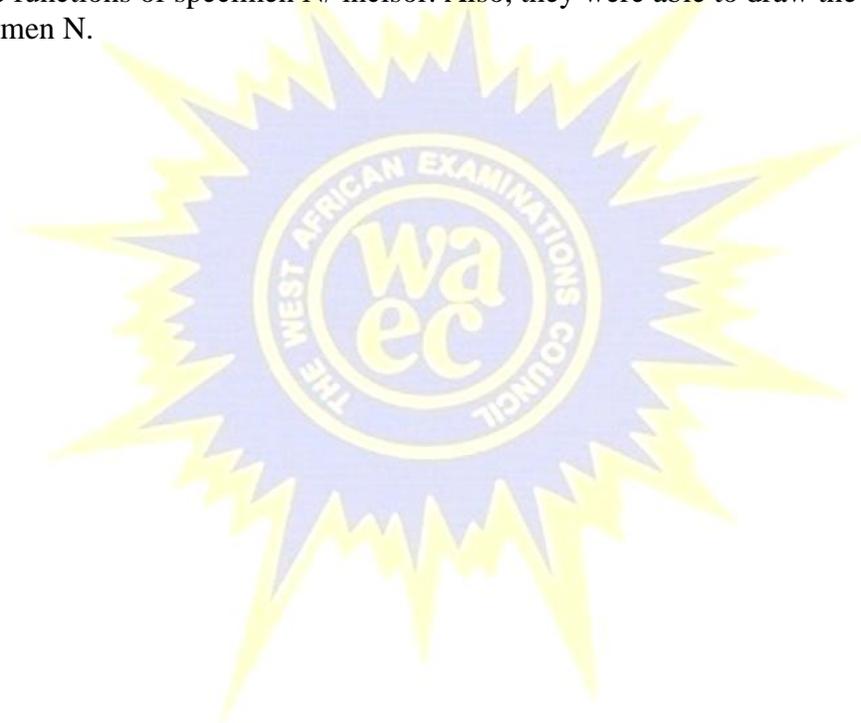
- (a) **Arrange specimens K, L, M, N P and Q in the order in which they are found in mammal.**
- (b) **Name the specimens used for absorption of:**
- food;**
  - water.**
- (c) (i) **Name two specimens which are not directly involved in chemical digestion of food in a mammal.**
- (ii) **Describe adaptive features of specimen L and N which enable them to perform their functions.**
- (d) (i) **State two functions of specimen N in the body of a mammal.**
- (ii) **Make a drawing 8 - 10 cm of the lateral view of specimen N and label fully.**

- (a) The sub-question was poorly answered by the most candidates. The expected order of arrangement of specimens was according to the sequence of the digestion process along the alimentary canal:

N(Incisor)→ M(Tongue)→Q(Stomach)→P(Liver)→L(Small intestine)→K(Large intestine)

Many of the candidates placed wrongly the liver before the stomach.

- (b) Majority of the candidates answered correctly this sub-question.
- (c) The first part of this sub-question was well answered by most candidates as they mentioned correctly the specimens not directly involved in chemical digestion. However, the second part was poorly answered. For specimen L, candidates were expected to identify the villi as the specific structure which is adapted to the absorption of digested food. They were to note that the villi are numerous to increase the surface area for quick absorption. The villi have thin walls for easy diffusion of nutrients. They have rich supply of blood vessels for quick absorption. For specimen N, candidates were expected to state the hard outer covering prevents it from breaking when chewing food. The chisel-shaped facilitates cutting and biting of vegetation and the long root deeply anchors the tooth in the jaw bone.
- (d) This sub-question was well answered by majority of the candidates. They were able to state the functions of specimen N/ incisor. Also, they were able to draw the lateral view of specimen N.



## **BIOLOGY 2**

### **1. GENERAL COMMENTS**

The standard of the paper compared favourably with those of previous years. However, the performance of candidates was better than those of previous years.

### **2. A SUMMARY OF CANDIDATES' STRENGTHS**

The following strengths were detected in the scripts of candidates.

- (1) Most candidates displayed some improvement in expressing themselves well in the English Language.
- (2) Candidates provided answers of each question on fresh page.
- (3) Candidates showed mastery of matching corresponding points in a tabular form.
- (4) The handwriting of candidates was on the whole legible and must be kept up.

### **3. A SUMMARY OF CANDIDATES' WEAKNESSES**

Candidates exhibited the following weaknesses:

- (1) Few candidates failed to adhere to the rubrics regarding biological drawings.
- (2) Scientific terms were wrongly spelt by many candidates.
- (3) Few candidates showed lack of knowledge with regards to questions bothering on description.

### **4. SUGGESTED REMEDIES**

The following remedies were suggested:

- (1) Students should read all instructions of the paper and follow them to the letter.
- (2) Tutors should take their students through spelling drills with respect to scientific terms.
- (3) Tutors should encourage their students to work sufficient tutorials and assignments on how to provide concise and accurate answers.
- (4) Tutors should ensure that candidates know and understand the rubrics of the subject.

### **5. DETAILED COMMENTS**

#### **Question 1**

- (a) (i) **What is an endocrine gland?**

- (ii) **Name three endocrine glands that are associated with reproduction in human males.**
  - (iii) **Name one hormone produced by each of the glands named in (a) (ii) above.**
  - (iv) **State two general characteristics of hormones.**
- (b) (i) **What is the autonomic nervous system (ANS)?**  
(ii) **Name the two types of nerves that form the ANS.**
- (c) **State:**  
(i) **the type of actions that are controlled by the ANS;**  
(ii) **three examples of such actions.**

- (a) This sub-question was fairly answered by many candidates. They were able to define the endocrine gland. However, they could not name the endocrine glands that are associated with reproduction in human males and the hormones produced by each as included : testes /-testosterone; adrenal glands – androgens; anterior pituitary gland - follicle stimulating hormone (FSH) / luteinizing hormone (LH)/ interstitial cells/interstitial cell stimulating hormone (ICSH). Few candidates could not state the general characteristics of hormones and the expected answers were:
- only small amounts of hormones are needed to bring about effect;
  - only small amounts of hormones are needed to bring about effect;
  - hormones are produced in one part of the body and transported to another part/ target organ to effect its reaction;
  - hormones are organic compounds/ chemical substances/protein in nature;
  - specific in action.
- (b) Few candidates could not define the autonomic nervous system(ANS) as peripheral/ motor nerves which carry impulses from the central nervous system / brain and spinal cord to the internal organs/ internal environment/ involuntary muscles/ effectors/ glands; controls involuntary actions. They identified autonomic nervous system as the system that controls involuntary actions without involving the central nervous system, internal organ and involuntary muscles. Also, they were unable to mention the two types of nerves of autonomic nervous system which are the sympathetic nerves and the parasympathetic nerves.
- (c) This sub-question was poorly answered by most candidates. They gave both voluntary and involuntary actions in their answers. The type of actions that are controlled by the autonomic nervous system are involuntary actions. Examples of such actions included: heartbeat, yawning, peristalsis, breathing, blinking of the eye, sweating, sneezing, dilation and constriction of the pupil, relaxation and constriction of the bladder, and secretion of saliva/tears.

## **Question 2**

- (a) (i) **In a tabular form, state three structural differences between a cell wall and a cell membrane.**

- (ii) State one function each of a cell wall and a cell membrane.
- (b) What is an organelle?
- (c) Describe the structure of the following organelles and state one function of each:

- (i) Mitochondrion;  
 (ii) Endoplasmic reticulum;  
 (iii) Chloroplast.

- (a) Most candidates failed to state the structural differences between a cell wall and a cell membrane, instead candidates were stating the functional differences. It must be noted that the question requires that the differences in structure should be provided in a table form as shown below:

Structural differences between cell wall and cell membrane

Cell wall	Cell membrane
- Rigid	- Flexible
- Made of cellulose	- Made of protein and lipid/ Photosynthesis
- Permeable	- Partially/semi-permeable
- Thick	- Thin
- Cells separated by middle lamella	- Continuous layer

Candidates were able to state the functions each of a cell wall and a cell membrane.

- (b) Majority of the candidates were able to define the term organelle.
- (c) Few candidates were able to describe the structure of the listed organelles and their corresponding functions. The expected answers included:
- (i) Mitochondria: it is sausage-shaped/spindle -shaped and surrounded by a double membrane layer; the inner membrane is folded to form partitions/cristae which projects into the inside/ matrix of the mitochondrion; they contain enzymes/DNA. Its function is to carry out cellular respiration/ production of ATP/ energy in the cell.

- (i) Endoplasmic reticulum(ER): is a system of membrane-lined sacs that form channels through the cytoplasm; its membrane is continuous with the nuclear membrane; there are two types of ER namely the rough and the smooth ER; ribosomes are found on the surface of the rough ER. Its function is to pack and transport proteins and lipids from one part of the cell to another.
- (ii) Chloroplast: is found in cells of green plants/ plant-like protists and it is oval/ disc/ egg-shaped and is surrounded by a double membrane; it contains membranous structure called thylakoids lying in the stroma; it contains the green pigment called chlorophyll; its function is to manufacture food/ photosynthesize.

### Question 3

- (a) **Name the four major components of an ecosystem.**
  - (b) **Explain briefly the interactions among the major components of an ecosystem.**
  - (c)
    - (i) **Classify the following organisms into producers, primary ecosystem, secondary consumers and decomposers: Bacterium, Frog, Grasshopper, Groundnut plant, Hawk and Rhizopus.**
    - (ii) **Use any four organisms listed in (c) (i) above to construct a food chain.**
- (a) This sub-question was poorly answered by most candidates. It must be noted that the major components of an ecosystem are only two, i.e. biotic / living things and abiotic/ non-living things. Candidates were able to state the methods of determining food chains in a community, but they failed to describe the methods that they stated. For instance, Direct Observation method is by observing the organisms feed on different organisms using the naked eyes/binoculars/cameras. Examination of Gut / Stomach contents Method – organisms are dissected and contents of their gut examined to identify food Ingested, etc.
- (b) Many candidates failed to provide correct answer to this question. In explaining briefly the interactions among the major components of an ecosystem, it must be noted that green plants use /absorb carbon dioxide in the presence of sunlight and water and mineral salts from the soil to produce carbohydrates/food which is fed upon by animals/ herbivores. Carbon dioxide is released during respiration for plants to take in / manufacture their food/photosynthesize; decomposers/micro-organisms breakdown dead plants/ animals / other organisms to release nutrients into the soil; these nutrients are absorbed by plants for the manufacture of their food and they give out oxygen during photosynthesis which is used up by animals for respiration.
- (c) Majority of the candidates were able to classify the organisms listed into producers, primary consumers, secondary consumers and decomposers and subsequently constructed a food chain with the list of the organisms.

#### **Question 4**

- (a) What is evolution?**
- (b) Explain how each of the following evidence support the theory of evolution:**
  - (i) fossil records;**
  - (ii) embryology.**
- (c) (i) Describe the structure of DNA.**
  - (ii) State three structural differences between DNA and RNA.**

- (a) Most candidates described evolution only as a gradual change from simple form to complex form, leaving out others like the long period of geographical time, the change occurs resulting in origin of new species and disappearance of others.
- (b) This sub-question was poorly answered by many candidates. Few of them knew that fossils are preserved remains of organisms which lived several years ago. Fewer still could explain how these remains support the theory of evolution. Candidates were expected to mention similarities among structures of fossils and those of present forms, as well as the use of radioactive dating techniques to establish relationship between present and extinct organisms. Very few candidates knew what embryology was, that is, study of the development of fertilized eggs of various vertebrates with emphasis on structural similarities to indicate that the organisms do have common origin. Examples of similar structures such as gill slits, heart chambers should have been mentioned to earn marks.
- (c) A good number of candidates described DNA structure fairly well, mentioning various molecules, sugar, phosphate and nitrogen bases of purines and pyrimidines.

#### **Question 5**

- (a) What is pollination?**
- (b) Make a diagram 8 - 10cm long of a named insect pollinated flower and label fully.**
- (c) Describe how pollination occurs in the flower named in (b) above.**

- (a) Majority of the candidates were able to define the term pollination as the transfer of pollen grains from the anther of a flower to the stigma of the same flower of the same species.
- (b) Most candidates poorly drew the diagrams. They presented longitudinal section diagrams and labelled them as pawpaw or mango or *Hibiscus* meaning that they never studied the flowers listed in the syllabus. It is important for candidates to note that pawpaw, hibiscus and mango flowers they named never appear in the syllabus.
- (c) However, description of the process of pollination was poorly done by them. An insect-pollinated flower must necessarily have brightly coloured petals, sweet scent and nectar to attract the agent. Many candidates failed to mention these features and hence lost marks. Movement of the insect on the flower resulting in dusting its body with pollen

grains must be described to score marks. Many candidates failed to do, instead, they described the process leading to fertilization which the question did not demand.

### **Question 6**

- (a) (i) **What is a drug?**
- (ii) **Explain the term drug abuse.**
- (iii) **List four drugs that are common abused.**
- (b) (i) **State five ways in which excessive alcohol consumption is harmful to humans.**
- (ii) **List five effects of cigarette smoke on humans.**

- (a) This sub-question was fairly answered by majority of candidates. They must note that drug abuse involves deliberate use of drugs not for medical purpose and hence not endorsed by any prescription. They are used to influence behavior. The abused drugs were listed correctly generally.
- (b) The harmful effects of excessive alcohol and cigarette smoke were mixed up generally by most candidates. For example, lungs are negatively affected by cigarette smoke and not by alcohol. Negative effects of cigarette smoke is mainly on lungs and respiratory apparatus. It is important for candidates to be specific about the harmful effects of alcohol. For example, many candidates simply stated 'alcohol affects the heart or liver or stomach'. The specific harmful effect should have been: heart may enlarge; liver may be destroyed resulting in cirrhosis; stomach may develop ulcer.

# **CHEMISTRY 1**

## **PRACTICAL**

### 1. **GENERAL COMMENTS**

The standard of each of the alternatives (A, B and C) compared favourably with those of previous years. The performance of the candidates was below average when compared to previous year.

### 2. **A SUMMARY OF CANDIDATES' STRENGTHS**

The following strengths were detected in the scripts of candidates.

- (1) Improvement in using consistent titres to calculate average titres.
- (2) Correct units were attached to titres in most cases.
- (3) Burette readings were recorded to the two decimal places as required.
- (4) Appreciable performance for quantitative analysis. Concepts for the various steps in the calculation were well handled by most of the candidates.
- (5) Generally, the performance in question 3 appeared to be significantly better than those of the previous years. An indication that more effort is being made by teachers to cover the entire syllabus.

### 3. **A SUMMARY OF CANDIDATES' WEAKNESSES**

Candidates exhibited the following weaknesses:

- (1) Refusing to adhere strictly to the instructions by some candidates. This led to such students performing and recording tests that were not demanded by the question.
- (2) In the quantitative analysis, many candidates either refused to follow the instructions or did not know how to record tests and observations. For instance, many candidates did not indicate the state of the substance to which reagents were being added.
- (3) Poor grammatical expression and spelling errors led to loss of marks.

### 4. **SUGGESTED REMEDIES**

The following remedies were suggested:

- (1) Students should be taken through a lot of practical exercises with emphasis on qualitative analysis.
- (2) Teachers should make time to mark the exercises and draw their attention to essential points.

- (3) Students should be reminded that recording tests and observations is equally important as mastering of practical skills. They should be mindful that the examiner is not in the laboratory with them.
- (4) Teachers should also assist students in improving upon their language competence.

## 5. DETAILED COMMENTS

### ALTERNATIVE A

#### Question 1

A is a solution containing 2.45g H<sub>2</sub>SO<sub>4</sub> per 250 cm<sup>3</sup> of solution.

B is a solution containing Na<sub>2</sub>CO<sub>3</sub>.

- (a) Put A into the burette and titrate it against 20.0cm<sup>3</sup> is 25.0cm<sup>3</sup> portions of B using methyl orange as indicator. Repeat the titration to obtain consistent titre values. Tabulate your results and calculate the average volume of A used. The equation for the reaction is:



- (b) From your results and the information given, calculate the:
- concentration of A in mol dm<sup>-3</sup>;
  - number of moles of H<sub>2</sub>SO<sub>4</sub> in the average titre;
  - number of moles of Na<sub>2</sub>CO<sub>3</sub> in the volume of B pipetted;
  - concentration of B in g dm<sup>-3</sup>.
- [H = 1.0, C = 12.0, O = 16.0, Na = 23.0, S = 32.0]

In part (a), most candidates read their burettes to two decimal places as expected. Arithmetical errors were minimal and an appreciable number of candidates attached correct units to the titre values. The concept of using consistent titres for averaging seemed to have gone down well with a lot of the candidates.

Many candidates understood the concept and evaluated value right, but had problems with units and significant figures. In part(b) (ii), many candidates failed to realise that is was the same as the value in above. This is because one mole of H<sub>2</sub>SO<sub>4</sub> is equivalent to one mole of Na<sub>2</sub>CO<sub>3</sub>. Even for the few who had the answer, they first calculated the concentration of B in mol dm<sup>-3</sup> before finding the moles in 25cm<sup>3</sup> of B as required. Teachers should take note and assist students to understand the concept used in the scheme. In part (b) (iv), again, most of the candidates could not derive the concentration of B in g dm<sup>-3</sup> from the moles in volume of B pipetted as calculated at (iii). Instead, they went through the usual longer method of determining concentration of B in g dm<sup>-3</sup>. An indication of candidates not appreciating fully what was involved.

#### Question 2

**C contains two cations and one anion. Perform the following exercises on C. Record your observations and identify any gas(es) evolved. State the conclusions you draw from the result of each test.**

- (a) Put all of C in a beaker and add about 10cm<sup>3</sup> of distilled water. Stir well and filter if necessary to obtain a clear solution.**
- (b) To about 2 cm<sup>3</sup> portion of the clear solution, add NaOH<sub>(aq)</sub> in drops and then in excess. Warm the resulting mixture.**
- (c) To another 2cm<sup>3</sup> portion of the clear solution, add few drops of BaCl<sub>2(aq)</sub> followed by excess dilute HCl.**
- (d) To another 2cm<sup>3</sup> portion of the clear solution, add few drops of potassium hexacyanoferrate (II) solution (K<sub>4</sub>Fe (CN)<sub>6</sub>).**

Many candidates did not give any indication as to whether they added distilled water as required. Similarly, many candidates did not indicate whether they warmed the resulting mixture. A significant number of candidates did not adhere strictly to instructions. Instead of adding BaCl<sub>2(aq)</sub> followed by excess dilute HCl, they reversed the order.

For C<sub>(aq)</sub> + K<sub>4</sub> [Fe(CN)<sub>6</sub>] activity, many candidates gave the observation as blue-black precipitate instead of blue-black colouration.

### **Question 3**

- (a) Name one gas that can be collected by each of the following methods:**
  - (i) downward delivery.**
  - (ii) downward displacement of air.**
  - (iii) collection over water.**
- (b) Explain briefly why anhydrous copper (II) tetraoxosulphate (VI) is used to test for water.**
- (c) State four precautions that must be taken in order to obtain accurate results during acid-base titration.**

Many candidates used formulae instead of names and accordingly lost the marks. Surprisingly, names of such common gases were wrongly spelt by some candidates. All the same, candidates in general, demonstrated an appreciable understanding of concept regarding method of collection of gases.

Many of the candidates were able to explain why anhydrous copper (II) tetraoxosulphate (VI) was used to test for water. Apart from the poor usage of the English language, many candidates were able to state the precautions taken during acid-base titration.

## **ALTERNATIVE B**

### **Question 1**

**D is a solution containing 5.00 g per dm<sup>3</sup> of Y<sub>2</sub>SO<sub>4</sub>.**

**E is a solution containing 0.025 mole NaOH in 250cm<sup>3</sup> of solution.**

- (a) **Put D into the burette and titrate it against 20.0cm<sup>3</sup> or 25.0cm<sup>3</sup> portion of E using methyl orange as indicator. Repeat the titration to obtain consistent titre values. Tabulate your results and calculate the average volume of D used. The equation for the reaction involved in the titration is**  
$$Y_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2HYO$$
- (b) **From your results and the information given, calculate the:**
- concentration of Y<sub>2</sub>SO<sub>4</sub> in solution D in mol dm<sup>-3</sup>;**
  - molar mass of Y<sub>2</sub>SO<sub>4</sub>;**
  - relative atomic mass of Y;**
  - percentage by mass of Y in Y<sub>2</sub>SO<sub>4</sub>. [O = 16.0, S = 32.0].**

In part (a), most candidates read their burettes to two decimal places as expected. Arithmetical errors were minimal and an appreciable number of candidates attached correct units to the titre values. The concept of using consistent titres for averaging seemed to have gone down well with a lot of the candidates. Except for the significant figures, many candidates handled this question well. A few candidates however used the amount of NaOH in 250 cm<sup>3</sup> directly in the mole ratio without first calculating its concentration in mol dm<sup>-3</sup>.

For part (b), most candidates were able to calculate the molar mass of Y<sub>2</sub>SO<sub>4</sub>. A few however omitted the unit and some also gave wrong units. They were also able to calculate the relative atomic mass of Y but mistakenly attached units. In the expression % of Y =  $\frac{C}{b} \times 100$  where C represents relative atomic mass and b, molar mass of Y<sub>2</sub>SO<sub>4</sub>. However, many candidates failed to multiply the relative atomic mass by 2.

## **Question 2**

**M and N are two aqueous solution. Carry out the following exercises on M and N. Record your observations and identify any gas(es) evolved. State the conclusion you drawn from the result of each test.**

- (a) (i) **To about 2cm<sup>3</sup> portion of M, add NaOH<sub>(aq)</sub> in drops until in excess. Warm the mixture.**
- (ii) **To another 2cm<sup>3</sup> portion of M, add HCl<sub>(aq)</sub> followed by BaCl<sub>2(aq)</sub>.**
- (b) (i) **To about 2cm<sup>3</sup> portion of N, add NH<sub>3(aq)</sub> in drops and then in excess.**
- (ii) **To another 2cm<sup>3</sup> portion of N, add AgNO<sub>3(aq)</sub> followed by HNO<sub>3(aq)</sub>.**

For M + NaOH<sub>(aq)</sub> activity a sizeable number of candidates did not indicate whether or not they warmed the mixture.

For M + HCl(aq) + BaCl<sub>2(aq)</sub> activity, many candidates reversed the order.

Even many of those who followed the instructions did not state any observation when they added dilute HCl. At that point, the observation should have been “no visible reaction”.

For  $N + NH_{3(aq)}$  in drops then in excess and  $N + AgNO_{3(aq)} + HNO_{3(aq)}$ , they were properly handled. Many of the candidates made correct observation with corresponding inference.

### Question 3

- (a) Describe briefly one chemical test that could be used to differentiate between:
- glucose and cellulose;
  - fructose and starch.
- (b) An organic liquid W when heated with methanol in the presence of an inorganic compound X forms a pleasant smelling substance Z. Identify W, X and Z.
- (c)  $150\text{cm}^3$  of  $0.25\text{ mol dm}^{-3}$  KOH is diluted to  $0.15\text{ moldm}^{-3}$ . Calculate the volume of water added to the original solution to dilute it.

Differentiating between fructose and starch in (a) was correctly handled by the candidates.

Performance was encouraging in part (b). Quite a number of the candidates were able to identify W, X and Z.

In part (c), candidates demonstrated an appreciable knowledge of the application of the Dilution Law. Unfortunately, many could not calculate the volume of water added to the original solution. Clearly, a problem of English language envisaged. They could not understand what the question demanded. Hence, left the answer as  $250\text{cm}^3$  which represented the new volume.

### ALTERNATIVE C

#### Question 1

G is  $0.0904\text{ mol dm}^{-3}$  HCl.

H contains  $12.0\text{ g}$  of impure  $\text{NaHCO}_3$  per  $\text{dm}^3$  of solution.

- (a) Put G into the burette and titrate it against  $20.0\text{cm}^3$  or  $25.0\text{cm}^3$  portions of H using methyl orange as indicator.  
Repeat the titration to obtain consistent titre values. Tabulate your results and calculate the average volume of G used.  
The equation of reaction involved is  
$$\text{NaHCO}_3(\text{aq}) + \text{HCl}(\text{aq}) \rightarrow \text{NaCl}_{(\text{aq})} + \text{CO}_{2(\text{g})} + \text{H}_2\text{O}(\text{l}).$$
- (b) From your result and the information provided, calculate the:
- concentration of solution H in  $\text{mol dm}^{-3}$ .
  - concentration of solution H in  $\text{g dm}^{-3}$ .
- (c) (i) Calculate the percentage impurity in  $\text{NaHCO}_3$ .

- (ii) **What mass of NaCl would be formed when 25cm<sup>3</sup> of solution H is neutralized?**

**[H = 1.0, C = 12.0, O = 16.0, Na = 23.0, Cl = 35.5]**

In part (b), calculation was a bit more straight forward. Apart from significant figures many scored all the points.

In calculating concentration of H in gdm<sup>-3</sup> - there was no difficulty with the concept. Marks lost were due to few cases of arithmetic error and incorrect significant figures.

For part (c) (i) several candidates calculated percentage purity instead of percentage impurity. In some cases, it was clear they did not know how to calculate the percentage impurity. In part (c) (ii) many candidates did not understand what the question demand and were apparently confused. In the relation, Mass of NaCl =  $a \times 58.5 \times 0.025$  where  $a$  represents concentration of H in mol dm<sup>-3</sup>, many used the conc. of  $a$  (0.0904 mol dm<sup>-3</sup>) in place of  $a$ .

## **Question 2**

**J is a sample of a salt.**

**Carry out the following exercises on J. Record your observations and identify any gas(es) evolved. State the conclusion you draw from the result of each test.**

- (a) **Put half of J in a test tube and heat strongly. Allow the residue to cool.**
- (b) **Put the second half of J in a test tube and add about 5cm<sup>3</sup> of distilled water. Shake thoroughly and divide the resulting solution into three portions.**
- (i) **To the first portion, add dilute NaOH in drops and then in excess.**
- (ii) **To the second portion, add dilute NH<sub>3</sub>(aq) in drops and then in excess.**
- (iii) **To the third portion, add few drops of dilute HCl. Heat the mixture to boiling and then allow to cool.**

Many candidates wrongly spelt the 'crackling sound'. Additionally, many also did not comment on the residue, that is, residue was reddish-brown when hot and yellow when cold. As a result they could not draw the inference i.e. 'Residue is PbO'.

For J(s) + water activity, many of the candidates did not give an indication as to whether they performed this exercise.

For J<sub>(aq)</sub> + NaOH action, many candidates did not also indicate the state of J. As a result, they lost marks where it was not clear that they dissolved J as required.

For J(aq) + NH<sub>3(aq)</sub> activity in drops, a few recorded "white gelatinous ppt" instead of "white ppt".

In J<sub>(aq)</sub> + HCl<sub>(aq)</sub> + heat exercise, candidates' performance was encouraging. Observation as well as inference were correct in most cases.

## **Question 3**

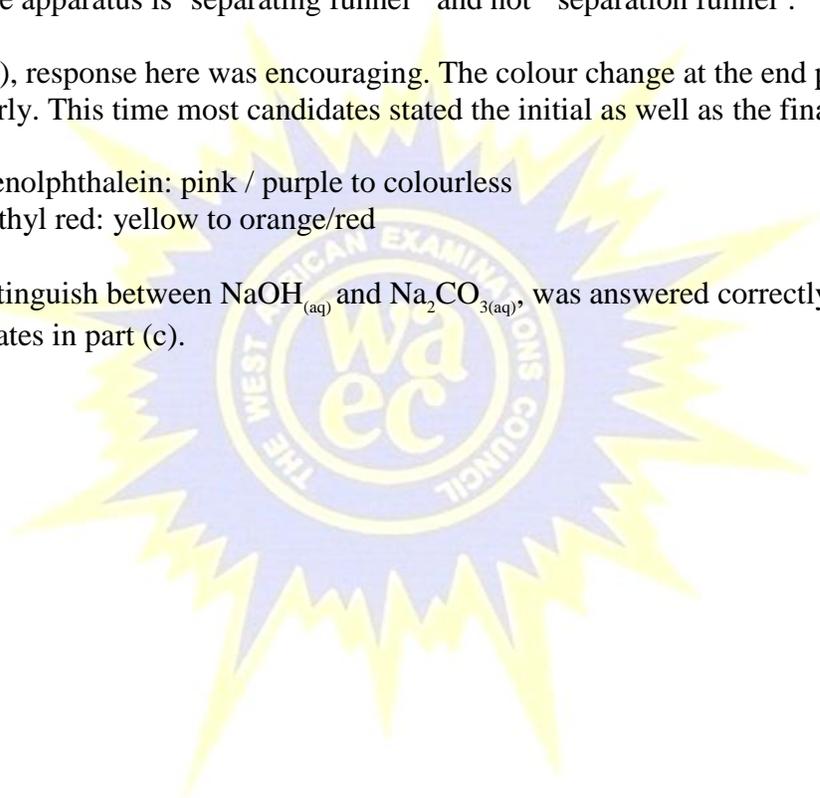
- (a) Name the pieces of apparatus that could be used to:
- separate a mixture of palm oil and water;
  - isolate a precipitate of aluminium hydroxide from an aqueous solution of potassium chloride.
  - transfer  $15.00\text{cm}^3$  of ethanoic acid from a beaker to a conical flask.
- (b) What would be the colour change at the end point in the titration of HCl and NaOH using the following indicators?
- phenolphthalein;
  - methyl red.
- (c) State one chemical test to distinguish between  $\text{NaOH}(\text{aq})$  and  $\text{NaCO}_{3(\text{aq})}$ .

In part (a), the problem of English language surfaced again. It must also be noted that the name of the apparatus is 'separating funnel' and not 'separation funnel'.

For part (b), response here was encouraging. The colour change at the end point was stated clearly. This time most candidates stated the initial as well as the final colour, that is:

- phenolphthalein: pink / purple to colourless
- methyl red: yellow to orange/red

Test to distinguish between  $\text{NaOH}_{(\text{aq})}$  and  $\text{Na}_2\text{CO}_{3(\text{aq})}$ , was answered correctly by most of the candidates in part (c).



## **CHEMISTRY 2**

### **1. GENERAL COMMENTS**

The general standard of the paper compared favourably with those of previous years. Performance of the candidates was average and not significantly different from those of previous year.

### **2. A SUMMARY OF CANDIDATES' STRENGTHS**

The following strengths were detected in the scripts of candidates.

- (1) Candidates ability to handle questions involving calculations was quite encouraging.
- (2) Candidates also showed better understanding of questions in physical chemistry as answers to such questions were brief and concise.
- (3) Majority of the candidates spaced their responses well and answered new question on a fresh page.

### **3. A SUMMARY OF CANDIDATES' WEAKNESSES**

Candidates exhibited the following weaknesses:

- (1) Some of the candidates were confused with a term fission as applied to covalent bonding and radioactivity. Energy profile diagram was poorly constructed.
- (2) Candidates inability to spell technical and scientific words.
- (3) There were still problems in handling questions in organic and inorganic chemistry.
- (4) Poor grammatical constructions led to loss of marks for many of the candidates.

### **4. SUGGESTED REMEDIES**

The following remedies were suggested:

- (1) Teachers must take students through spelling drills most especially on scientific terms.
- (2) Teachers must impress upon their students that some term like fusion and fission have different meaning when applied in different topics.

- (3) Teachers must ensure that students do a lot of test on organic and inorganic chemistry question.
- (4) There is the need for teachers to teach organic and inorganic chemistry early enough during the course so that students will have enough time to do a lot of practice.

## 5. DETAILED COMMENTS

### Question 1

- (a) Write the electron configuration for each of the following ions and element:
  - (i)  ${}_{13}\text{Al}^{3+}$ ;
  - (ii)  ${}_{16}\text{S}^{2-}$ ;
  - (iii)  ${}_{24}\text{Cr}$ .
- (b)
  - (i) State three chemical properties of Group VII elements.
  - (ii) Name the hydrides of the first two elements of Group VII.
  - (iii) What is the common name given to the Group VII elements?
- (c)
  - (i) What is the nature of each of the following radiations?
    - ( ) Alpha;
    - ( ) Beta;
    - ( ) Gamma.
  - (ii) State two factors that determine the stability of a nuclide.
- (d)
  - (i) Explain briefly each of the following terms:
    - ( ) homolytic fission;
    - ( ) heterolytic fission;
    - ( ) free radicals.
  - (ii) State two characteristics of homologous series.

In part (a), most candidates could write electron configuration for  $\text{Al}^{3+}$  and  $\text{S}^{2-}$  but not for Cr in terms of the s.p.d notation.

In part (b) (i) most candidates indicated physical properties of Group(VII) elements instead of their chemical properties. In part (ii), candidates gave the names of the halides instead of the hydrides of the first two Group VII elements. However in (III) they could give the common name of the Group VII elements as halogens.

For part (c) (i), alpha radiation was described as helium atom by many candidates but beta and gamma radiations were correctly specified.

In part (d), the terms in this section were poorly explained by most candidates. However, the characteristics of homologous series were wrongly stated by them.

## Question 2

- (a) Define each of the following terms:
- closed system;
  - endothermic reaction;
  - heat of neutralization.
- (b) (i) Draw and label an energy profile diagram for an endothermic reaction indicating the catalyzed path.
- (ii) Explain briefly how a catalyst affects a reaction.
- (c) (i) Define enthalpy of combustion.
- (ii) State why the enthalpy of combustion is always negative.
- (iii) Name the type of energy changes that occurs in each of the following reactions:
- ( )  $I_{2(s)} \rightarrow I_{2(g)}$ ;
- ( )  $Cl_{2(g)} \rightarrow Cl_{(g)}$ ;
- ( )  $Cl_{(g)} + e^- \rightarrow Cl^-_{(g)}$ .
- (d) Potassium, hydrogen gas and potassium hydride exhibit different types of bonds.
- Copy and complete the following table.

<i>Substance</i>	<i>Type of bond</i>	<i>Units which make up the substance</i>
<i>K</i>		
<i>H<sub>2</sub></i>		
<i>KH</i>		

In part (a) (i), most candidates defined “closed system” using exchange of heat/energy only without mentioning anything about “matter”. In part (ii), endothermic reaction was well defined by most candidates. For (iii), neutralization reaction was also defined as reaction between one mole of acid and one mole of a base instead of one mole of H<sup>+</sup> from acid and one mole of OH<sup>-</sup> from a base.

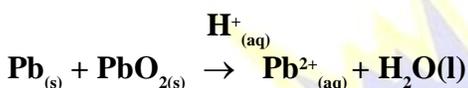
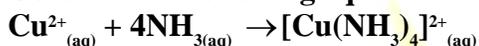
In part (b) (i), the energy profile diagram was poorly drawn by majority of the candidates. The sides of the curve were drawn too parallel to the y-axis and in most cases, the axes were not labelled. In (ii), most candidates could show that a catalyst provides a new reaction pathway with lower activation energy.

In part (c), enthalpy of combustion was well defined by most candidates and they were able to explain why it is always negative. Also, they could give the types of energy changes associated with the reaction in ( ) and ( ), however, the term “dissociation” was used instead of “atomization”.

In part (d), majority of the candidates could specify the type of bonds present in the substances listed but could not describe the units that make them up. They lacked understanding of bonding and structure lattice of molecules.

### **Question 3**

- (a) (i) What is an amphoteric oxide?  
 (ii) Write chemical equations to show that aluminium oxide is amphoteric.
- (b) Write a balanced chemical equation for the reaction of dilute hydrochloric acid with each of the following substances:  
 (i) Zinc metal;  
 (ii) Zinc trioxocarbonate (IV).
- (c) Consider the following equations:



- (i) Which of the equation is  
 ( ) a redox reaction? Give a reason for your answer.  
 ( ) an acid-base reaction according to Lewis concept? Give a reason for your answer.
- (ii) In the case of the redox reaction chosen in (c) (i) ( ) above, write a balanced half equation for:  
 ( ) oxidation;  
 ( ) reduction.
- (iii) Give a practical application of the redox reaction chosen in (c) (i) ( ) above.
- (d) A solution has a pOH of 4.5. Calculate the:  
 (i) pH;  
 (ii) number of hydrogen ions present in 300cm<sup>3</sup> of the solution.  
 NA = 6.02 x 10<sup>23</sup> particles mol<sup>-1</sup>]

In part (a), many candidates performed well on this sub-sub-question as they explained correctly the term amphoteric oxide. Also, they could write out the equation of the reaction of Al<sub>2</sub>O<sub>3</sub> with an acid but majority could not write out its reaction with a base.

For part (b), balanced chemical equation for the reaction of dil.HCl with Zn<sub>(s)</sub> and ZnCO<sub>3(g)</sub> were well written out.

In part (c), most of the candidates were able to specify the tangible reactions which of the listed equations was a redox reaction and which was an acid-base reaction. They were able to write out the balanced oxidation and reduction half equation. However, they could not give the practical application of the redox reaction chosen.

For part (d), pH of the solution was well calculated by many candidates and the number of hydrogen ions present in the solution correctly determined by them.

#### **Question 4**

- (a) (i) Explain briefly each of the following terms:  
 ( ) polymer;  
 ( ) polymerization.
- (ii) Give two examples each of the following polymers.  
 ( ) natural polymer;  
 ( ) synthetic polymer.
- (b) Give the reagents and conditions needed for each of the following conversions.
- (i)  $\text{CH}_3\text{CH}=\text{CH}_2 \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- (ii)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{-OH} \rightarrow \text{CH}_3\text{CH}_2\text{C} \begin{array}{l} \text{// O} \\ \text{--- OH} \end{array}$
- (iii)  $\text{CH}_3\text{CH}_2\text{C} \begin{array}{l} \text{// O} \\ \text{--- OH} \end{array} \rightarrow \text{CH}_3\text{CH}_2\text{C} \begin{array}{l} \text{// O} \\ \text{--- O---CH}_3 \end{array}$
- (c) An organic compound is known to be unsaturated and monocarboxylic acid. In an experiment, 1.39g of the compound required 20.0 cm<sup>3</sup> of 0.25 mol dm<sup>-3</sup> NaOH for complete reaction. When 0.417g of the compound was hydrogenated, 100.8cm<sup>3</sup> of hydrogen measured at s.t.p was required. Calculate the:
- (i) molar mass of the compound;  
 (ii) number of C = C bonds in a molecule of the compound. [Vm = 22.4dm<sup>3</sup>]

In part (a) (i), the terms of natural and synthetic polymers were well explained by majority of the candidates.

For part (b), the conditions under which the conversions listed took place were correctly given by most candidates but only a few candidates could specify the reagents.

For part (c), most candidates could not write out the general equation for reaction but could reveal the mole ratio to be 1:1 since acid was monocarboxylic. They were then able to handle the calculation very well.

#### **Question 5**

- (a) (i) Define each of the following terms:  
 ( ) rate of reaction;

- ( ) rate constant;  
 ( ) rate-determining step.
- (ii) State two factors that determine the rate of a reaction.
- (b) The following table shows the results obtained for the reaction:  $P + Q \rightarrow R + S$ .

<i>Experiment</i>	<i>Initial conc. of</i>	<i>Initial conc. of</i>	<i>Initial rate</i>
	<b>P</b> (mol dm <sup>-3</sup> )	<b>Q</b> (mol dm <sup>-3</sup> )	(mol dm <sup>-3</sup> s <sup>-1</sup> )
1	0.01	0.02	<i>x</i>
2	<i>y</i>	0.02	0.0010
3	0.01	<i>Z</i>	0.0020

If the rate =  $125 [P]^3 [Q]^2$ , calculate the

- (i) values of *x*, *y* and *z*;  
 (ii) overall order of the reaction.
- (c) (i) Arrange the following compounds in order of increasing solubility. MgCl<sub>2</sub>, NaCl, AlCl<sub>3</sub>.  
 Give reasons for your answer.  
 (ii) Explain briefly why an aqueous solution of iron (II) tetraoxosulphate (VI) turns brown on standing.

In part (a), many candidates defined correctly the terms and stated the factors affecting rate of reaction.

In part (b), values of *x*, *y* and *z* perfectly calculated by majority of the candidates. Also, they were able to deduce the overall order

For part (c), most candidates were able to arranged the order of increasing solubility of compound given. However, they could not assign reasons to the particular order they gave. Also, most candidates indicated that FeSO<sub>4</sub> would oxidize instead of isolated Fe<sup>2+</sup> in the compound would oxidize into Fe<sup>3+</sup>.

### Question 6

- (a) Explain briefly why a given mass of sodium hydroxide pellets cannot be used to prepare a standard solution.
- (b) (i) List two chemicals used in the laboratory preparation of hydrogen chloride gas.  
 (ii) Write a balanced equation for the laboratory preparation of hydrogen chloride gas.  
 (iii) Mention a chemical that can be used to dry the gas in (b) (i).  
 (iv) Name the method of collection of the gas. Give a reason for your answer.

- (v) **List two physical properties of hydrogen chloride gas.**
- (c) (i) **State Dalton's law of partial pressures.**  
(ii) **A mixture of gases with total pressure of  $120\text{ k Nm}^{-2}$  consists of 0.175 moles of hydrogen, 0.067 moles of nitrogen and 0.025 moles of oxygen at  $25^\circ\text{C}$ . Calculate the**
- ( ) **total volume of the gaseous mixture;**  
( ) **partial pressure of hydrogen in the mixture.**  
**[ $R = 8.314\text{ Jk}^{-1}\text{ mol}^{-1}$ ]**
- (d) (i) **Give two reasons why real gases deviate from ideal behaviour.**  
(ii) **List the two conditions under which a real gas would behave ideally.**

For part (a), only a few candidates could base their arguments on the deliquescent nature of NaOH.

In part (b), chemical required to prepare were correctly given by most candidates, balanced equation was well written but the drying agent was given as  $\text{H}_2\text{SO}_4$  instead of concentrated  $\text{H}_2\text{SO}_4$ . Majority of the candidates showed the mode of collection as downward delivery because the gas is denser than air. The physical properties of the gas were correctly given.

In part (c), many candidates were able to state the Dalton's law was correctly stated and the calculation was correctly done by them.

In part (d), most candidates could show only real gases deviate from ideal behaviour but failed to show that high temperature and low pressure were the conditions under which real gases behave ideally.

## **CROP HUSBANDRY AND HORTICULTURE 1**

### **1. GENERAL COMMENTS**

The paper is of good standard and comparable to the previous years. However, candidates' performance was average.

### **2. A SUMMARY OF CANDIDATES' STRENGTHS**

The main strength detected in the scripts of candidates was that candidates gave precise and concise answers.

### **3. A SUMMARY OF CANDIDATES' WEAKNESSES**

Candidates exhibited the following weaknesses:

- (1) Candidates gave wrong spellings of words.
- (2) They did not follow rules of writing scientific names.

### **4. SUGGESTED REMEDIES**

The following remedies were suggested:

- (1) Candidates should note the correct spellings of words.
- (2) They should also note the rubrics of writing scientific names.

### **5. DETAILED COMMENTS**

#### **Question 1**

- (a)
  - (i) **Identify each of specimens A and B.**
  - (ii) **Name the families of the crops from which each of specimens A and B were obtained.**
- (b)
  - (i) **Name two varieties of each of the crops from which each of specimens A and B were obtained.**
  - (ii) **State two methods of propagating the crop from which specimen A was obtained.**
- (c) **State two methods of harvesting specimen B.**
- (d) **Mention three pests of specimen B.**

For part (a)(i), most candidates identified specimen A as orange or sweet orange instead of sweet orange fruit. For the specimen B, most candidates were able to identify it as oil palm fruit, but in some cases, some wrote palm nut which is wrong. For part (a)(ii), the expected answers are, specimen A belongs to the family Rutaceae and B belongs to the family Palmae. A lot of candidates could not get these answers correct.

In part (b)(i), candidates wrote only two of the varieties but they were not able to write the full names of the varieties. They wrote Valencia instead of Late Valencia and Washington instead of Washington Navel. No candidate wrote Mediterranean sweet, Waterlake and Red blood orange. For part (b)(ii), some candidates were able to write only one method of propagating specimen A, that is, by seeds and a few wrote both seeds and budding or grafting.

In part (c), many candidates scored zero because they were not able to state two methods of harvesting specimen B (oil palm fruit). Some stated that it is harvested by hand or allow the fruits to fall to the ground and picked. There are three main methods of harvesting: chisel method, the pole - knife method and cutlass or machet method.

In part (d), candidates could not mention three pests of specimen B. Most candidates wrote 'squirrel' whereas some also added rodents to squirrel only to score one mark. The expected answers included: mites, monkey, birds/crow, termites, black ants and rodents/squirrel.

## **Question 2**

- (a) (i) Identify specimen C.**
- (ii) Name the group of fertilizers to which specimen C belongs.**
- (b) Mention three benefits that could be derived when specimen C is applied to the soil.**
- (c) State three problems associated with the use of specimen C in crop production.**
- (d) Give four methods of applying specimen D to the soil.**
- (e) State one effect of the continuous use of specimen D on agricultural soil.**
- (f) Name two other fertilizers that could be used in place of specimen D in crop production.**

Performance in part (a) was satisfactory. Identification was good and the group of fertilizers to which specimen C belongs was correctly named organic fertilizer. Part (b) was also answered satisfactorily.

Good answers such as rich in plant nutrients, improves soil aeration, regulates soil pH, improves soil structure, etc. were given. Part (c) was not answered satisfactorily. The expected answers included bulky/difficult to

transport, nutrient level not known/not specific, has to be applied in large quantity, can damage plant if not well decomposed. Part (d) was answered satisfactorily. The answers included: broadcasting, band placement, side dressing, ring application, seed placement. top dressing. Performance in parts (e) and (f) was also satisfactory.

### **Question 3**

- (a) Identify each of specimens E, F, G and H by their common names.**
- (b) State one horticultural use of each of specimens F, G and H.**
- (c) Give four characteristics of specimen E that makes it suitable for lawn establishment.**
- (d) Give four characteristics of a soil suitable for growing specimen E.**

In part (a), the expected answers were: E (Bahama grass), F (*Bryophyllum*), G (Neem/Nim branch) and H (croton). Some candidates identified specimen E as Mahama grass and Neem / Nim as Neem tree and some candidates were rather using botanical names, which were wrongly written. But the question clearly stated that they should identify the specimens by their common names.

Performance in part (b) too was unsatisfactory. Specimen F is used as a bedding plant, G as avenue tree or tree for parking area or used to provide shade and H is used as a hedging plant.

Part (c) of the question was well answered by most candidates.

For part (d), candidates were able to give less than the number of characteristics required. Answers expected included: fertile/rich in nutrients, free from weed seeds, free from pests, free from diseases, well drained.

### **Question 4**

- (a) Name four varieties of specimen J grown in Ghana.**
- (b) Mention three planting materials of specimen J.**
- (c) Identify specimen K.**
- (d) Briefly describe how specimen K is operated.**
- (e) State three precautionary measures that should be taken when using specimen K.**

Quite a good number of candidates answered part (a) satisfactorily. However, some candidates wrote botanical names and most of them got the names wrong.

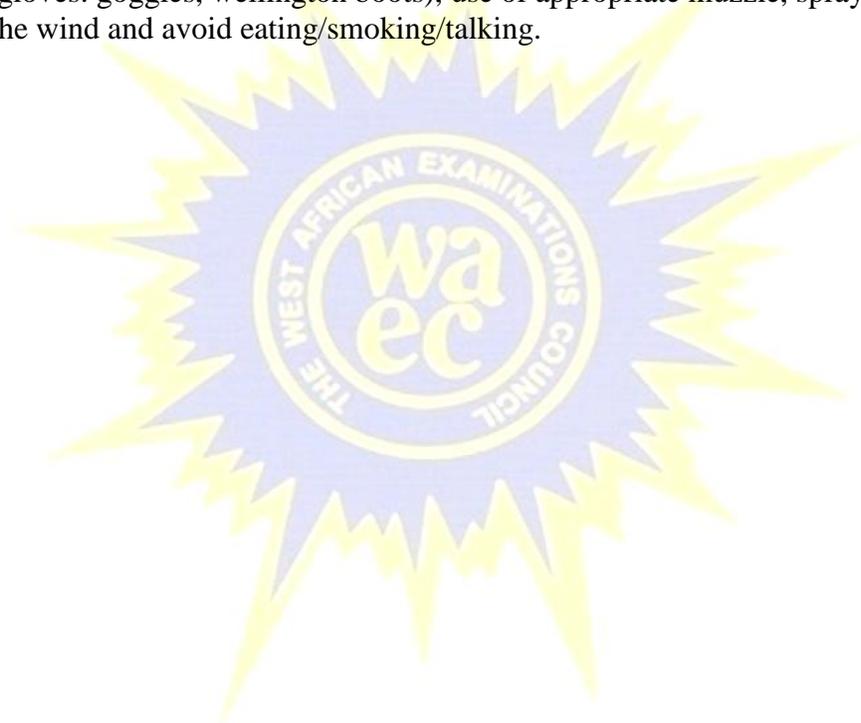
For part (b), many candidates were able to mention one or two materials out of three as required. Planting materials of J (yam) included sett, minisett, whole yam/seed yam, microsett. Instead of seed yam, many candidates wrote seed, which means a different thing from seed yam.

In part (c), Specimen K was identified as Knapsack sprayer by almost all candidates but a few of them made spelling mistakes.

Part (d) actually exposed candidates for their lack of practical field experience. The points raised were not in sequence. For example, candidates pouring the chemical into empty tank before adding water or filling the specimen before adding chemical and then straight to pumping.

The operation should be as follows: Some water is put in the tank, chemical to be used is measured and put into the tank with some water. Water is topped up to required level to mix the chemical, Specimen is put behind the back of operator, the lever is used to pump out the solution through the opened muzzle.

For part (e), just a few candidates were able to answer it satisfactorily. Some candidates wrote about maintenance of a knapsack sprayer. Expected answers included: wearing of protective clothing (hand gloves, goggles, wellington boots), use of appropriate muzzle, spraying should not be against the wind and avoid eating/smoking/talking.



## **CROP HUSBANDRY AND HORTICULTURE 2**

### **1. GENERAL COMMENTS**

Generally, the standard of the paper compared favourably with previous ones. Candidates' performance was average.

### **2. A SUMMARY OF CANDIDATES' STRENGTHS**

The following strengths were detected in the scripts of candidates.

- (1) Candidates attempted the required number of questions.
- (2) Candidates did not beat about the bush and that is commendable.

### **3. A SUMMARY OF CANDIDATES' WEAKNESSES**

Candidates exhibited the following weaknesses:

- (1) Some of the candidates gave phrases and one word answers to questions which demanded discussion or explanation.
- (2) Others used the self-invented short hand to answer questions. This is unacceptable and should be discouraged.
- (3) Spelling of some words was a problem to many. For instance 'stalk' was written 'stock'; 'whole' as 'hole', 'through' for 'true'.

### **4. SUGGESTED REMEDIES**

The following remedies were suggested:

- (1) Students should be taught that being brief does not mean writing meaningless phrases in answer to questions.
- (2) Students should desist from using short hand in writing their answers in examinations.
- (3) Students should read a lot of story books in order to improve upon their mastery of the English language and acquire vocabulary to enable them answer questions correctly.

### **5. DETAILED COMMENTS**

### **Question 1**

- (a) State six objectives of a crop improvement programme.**
- (b) Describe the steps involved in preparing bunches of banana for export.**
- (c) Describe each of the following processes in rice production:**
  - (i) threshing;**
  - (ii) parboiling.**

Part (a) was correctly answered by majority of the candidates who chose to answer question one.

Part (b) was poorly answered. The required answer was a description of the steps from harvesting to storage in readiness for export. i.e. stage of harvesting, transport to cleaning benches, cleaning, sorting, treatment with fungicide etc.

The performance of most candidates in part(c) was poor. It is important for them to note that threshing is the separation of the grains from the dried panicle. This is achieved by putting the dried panicle in sack or heap and hitting it with sticks to separate the grains from the chaff or by using the thresher. Parboiling involves soaking paddy in cold water for 1-2 days or in hot water at about 70°C for 3 to 5 hours. After which the paddy is dried. The paddy may be partially cooked for 10minutes or steamed for 15-60 minutes and then dried. The process ensures that nutrients are preserved in the grain and also reduce grain breakage during milling.

### **Question 2**

- (a) Give four reasons why vegetative propagation is important in raising ornamental plants.**
- (b) Explain three ways by which ornamental plants help to reduce road accidents.**
- (c) Discuss each of the following management practices used in the maintenance of lawns:**
  - (i) aeration;**
  - (ii) mowing.**

This question was very popular with most of the candidates responded appropriately to it.

### **Question 3**

- (a) What is a plant disease?**
- (b) Mention four non-pathogenic causes of disease on crop plants.**
- (c) Explain four effects of diseases on crops.**
- (d) State six characteristics of a good soil for crop production.**

Many candidates were not able to explain what plant disease was. A plant disease is a departure from the normal state of health which is presented by marked symptoms.

Part (b) were not answered satisfactorily by most candidates. They must note the non-pathogenic causes of plant diseases are nutrient deficiency, unfavourable climatic conditions, excess salt and other chemicals in the soil causing toxicity and hormonal disorder.

Part(c) and (d) were answered satisfactorily by many of the candidates.

#### **Question 4**

**Discuss the effects of each of the following factors on the growth and yield of crops:**

- (a) biotic factors;**
- (b) high rainfall;**
- (c) soil temperature;**
- (d) relative humidity.**

Only few candidates attempted this question. Performance was not very good especially in sub-questions (a), (c) and (d). Expected answers for part (a) included:

- weeds as biotic factor compete with crops for nutrients etc thus affecting growth and yield;.
- Some cause decomposition of organic matter;
- Some are pathogenic and cause disease in plants;
- Some help in pollination of crops.

For part (c), the expected answers included the following:

- soil temperature affects activities of soil organisms involved in decomposition of organic matter;
- low temperature impedes mineral uptake;
- high soil temperature may increase evaporation of water'

For part (d), the expected answers included:

- influence the development of fungi on plants;
- affects the drying of produce hence its yield;
- affects evapo-transpiration.

#### **Question 5**

**Discuss the production of onions under each of the following headings:**

- (a) sowing;**
- (b) water requirement;**
- (c) harvesting;**
- (d) pests and diseases.**

This question was answered by few candidates and the performance was not satisfactory on the whole.

Part (a) was poorly handled by the candidates.

Part (b) was answered quite satisfactorily.

For part (c), under weed control, many candidates wrongly stated the use of cutlass instead of hand picking, use of hoe/hand fork.

In part (d), only a few of them could describe the method of harvesting onion. It should be noted that onions could also be harvested as spring onions when the leaves are still green.

### **Question 6**

- (a) Define the term training as used in citrus production.**
- (b) Explain three advantages of training in citrus production.**
- (c) Describe two symptoms of gummosis in citrus.**
- (d) State three ways of controlling gummosis in citrus.**
- (e) Mention four industrial uses of citrus.**

Part(a) was poorly answered by most candidates. They must note that training in citrus production is guiding the plants to grow in a certain direction and shape.

For part (b), most candidates could not explain the advantages of training in citrus production. The expected answers included: the facilitation of harvesting, preventing seedlings from branching too early, preventing wobbling and breakage of young seedlings, promoting air circulation and penetration of light rays and exposing the leaves for better and proper photosynthetic activities.

For part (c), many candidates could not give the symptoms of gummosis in citrus. The symptoms included: yellowing of leaves, exudation of gum from cracks on the plant, bark becoming water-soaked at the soil level, formation of callus on attacked places and peeling off of the bark as it dries up.

Ways of controlling gummosis in part (d) was difficult for most candidates. Expected answers included: using resistant root stock, ensuring good drainage on the farm, avoiding wounds on the plants and by removing the bark and treating with fungicide.

Part (e) was well answered by most candidates.

## **FISHERIES 1**

### **1. GENERAL COMMENTS**

The standard of the paper was at par with those of previous years. The performance of candidates was better than that of previous years.

### **2. A SUMMARY OF CANDIDATES' STRENGTHS**

The following strengths were detected in the scripts of candidates.

- (1) Answers by candidates were placed mostly in a logical order.
- (2) All candidates began new questions on a fresh page.

### **3. A SUMMARY OF CANDIDATES' WEAKNESSES**

Candidates exhibited the following weaknesses:

- (1) Candidates answered questions from the background of aquaculture.
- (2) Poor usage of English Language.

### **4. SUGGESTED REMEDIES**

The following remedies were suggested:

- (1) The students should be taught in such a way as to allow them know that aquaculture is just a part of the subject.
- (2) Students should improve upon their use of English Language.

### **5. DETAILED COMMENTS**

#### **Question 1**

**A fish pond was stocked with equal number of male tilapia and African catfish. The pond was fertilized and the fish were fed with wheat bran and groundnut peels for five months.**

**The numbers and total weight of tilapia in the pond were determined monthly. The results obtained are presented in the table below.**

**Number and total weight of tilapia in fish pond.**

<b>Time (months)</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
----------------------	----------	----------	----------	----------	----------	----------

<b>Number of tilapia in pond</b>	<b>500</b>	<b>400</b>	<b>300</b>	<b>200</b>	<b>100</b>	<b>70</b>
<b>Total weight of tilapia in pond (kg)</b>	<b>25</b>	<b>28</b>	<b>33</b>	<b>40</b>	<b>50</b>	<b>60</b>

- (a) **Present the data in a suitable graphical form.**  
(b) **Describe the graph you have drawn in (a).**  
(c) **Explain the results obtained.**  
(d) **What precautions could be taken to minimise the decreasing numbers of tilapia in the pond?**

This question was very poorly answered.

(a) Graph

- some candidates divided the figures for the numbers of tilapia and weight of tilapia by 5, and used the results in drawing the graph. However, no indication of this was given on the axes of the graph.
- some candidates plotted number of tilapia on the x-axis and weight of tilapia on y-axis, instead of both of them on the y-axis with time on the x-axis.
- most candidates used the same symbols for both lines on the graph.

(b) Description of graph

- Almost all candidates did not describe the graph. They rather analysed the data graph in the table. For avoidance of doubt, graphs rise (sharply, gently) or decline (sharply, steeply).

(c) Explanation of results

- Candidates failed to understand the theme of the question. The question clearly shows that the total weight of the tilapia in the pond as well as the number of tilapia showed changes with time. The number of tilapia reduced as a result of predation by the catfish, which is a common phenomenon or polyculture.

- (d) In stating precautions, candidates were to show how to minimise predation. Instead, most proposed other activities such as feeding, improving oxygen concentration and even preventing diseases.

## Question 2

- (a) **Identify each of specimens A and B.**  
(b) **State two uses of specimen A in the fishing industry.**  
(c) **Name one item that could be used in place of specimen A.**  
(d) **Name two types of fishing crafts on which specimen A could be used.**  
(e) **Draw and label the fishing gear which could be made from specimen B.**  
(f) **Describe how the fishing gear you have drawn in (e) is used in catching fish.**  
(g) **Name two other items used in the fishery industry which could be made from specimen B.**

- (a) The identification of specimens oar and palm frond were satisfactory.
- (b) The use of the oar was stated only as paddling. Another use not mentioned was 'stopping/braking'.
- (c) Candidates mostly mentioned 'outboard motor' a few mentioned 'sail'.
- (d) Candidates mostly mentioned 'canoe' since they were asked to name two (2). They could have added "planked" canoe, "dug-out" canoe, "dinghy", and so on.
- (e) The expected drawing was of the conical fish trap. Even though many drew it, the drawings were very poor. Some drew ordinary baskets, including shopping baskets with handles.
- (f) The use of the trap was poorly described. Some candidates just stated that the trap placed in water and the fish removed. Some made a poor attempt at describing how an ordinary basket is used to catch fish.
- (g) Satisfactory answers were provided for this sub-question.

### **Question 3**

- (a)
  - (i) **Identify each of specimens C and D by their common names.**
  - (ii) **Describe the shape of the tail of each of specimens C and D.**
  - (iii) **Draw the tail fin of each of specimens C and D.**
  - (iv) **Determine the standard length and total length of each of specimens C and D.**
- (b)
  - (i) **Identify each of specimens E and F.**
  - (ii) **State three relationship between specimen E and F.**
  - (iii) **Describe the relationship which could exist between a live fish and each of specimens E and F.**
  - (iv) **Describe the effects that each of specimens E and F could have on the flesh of a dead fish.**
- (a)
  - (i) Satisfactory answers were provided. This is tilapia and sardinella respectively.
  - (ii) Some candidates described the forked tail as a V-shaped tail.
  - (iii) Simple drawings of the tail fins could not be made. All sorts of shapes were drawn, including heterocercal tail .
  - (iv) Most candidates' answers of standard length and total length fell within the figures provided by the supervisors. Interestingly, many stated exactly the lengths by the supervisors.
- (b)
  - (i) The identification of housefly and maggot were correctly done.
  - (ii) Answers were generally satisfactory.
  - (iii) Most candidates did not understand "live fish". They indicated that the housefly

- lays eggs on the live fish to cause spoilage.
- (iv) Answers for this sub-question were not systematic. Some stated that the housefly lays the maggot on the dead fish. Others stated that the housefly feeds on the dead fish to cause spoilage. The sequence should have been: Housefly lays eggs on the dead fish; the eggs develop into maggots; the maggot feeds on the fish flesh; ultimately causes spoilage.

## **FISHERIES 2**

### **1. GENERAL COMMENTS**

The standard of the paper compared favourably with that of the previous years. Candidates' performance was slightly better than that of the previous years.

### **2. A SUMMARY OF CANDIDATES' STRENGTHS**

The main strengths of the candidates were that:

- (1) Candidates numbered their answers clearly.
- (2) Handwriting of many candidates was legible.

### **3. A SUMMARY OF CANDIDATES' WEAKNESSES**

Candidates exhibited the following weaknesses:

- (1) Students should be taught how to answer questions which require explanation, description or discussion of issues.
- (2) Teacher should teach their students to understand some key terms such as concept, evolution, parameters and fisheries.

### **4. SUGGESTED REMEDIES**

The following remedies were suggested:

- (1) Students must study more diligently and pay attention to details when reading.
- (2) Students should endeavour to understand some key terms when studying.

### **5. DETAILED COMMENTS**

#### **Question 1**

- (a) **List four criteria for selecting a site for a fish pond.**
- (b) **Explain the concept of evolution in fishes.**
- (c) **Discuss four strategies used in fisheries management.**

- (a) Some candidates provided five instead of four criteria for selecting a site for fish pond. This was a waste of time.

- (b) Candidates could not handle this question. It was clear that the topic was not studied.
- (d) The majority of candidates wrongly wrote about management of fish ponds instead of fisheries management. A very good knowledge of fisheries management and fish pond management will be an advantage. Additionally, the strategies were not discussed as directed by the question.

**Question 2**

- (a) **Name four water quality parameters used in fisheries.**
  - (b) **List six major products of fish.**
  - (c) **Explain why each of the following fishery practices is harmful:**
    - (i) **use of small meshes;**
    - (ii) **use of explosives;**
    - (iii) **use of poisons;**
    - (iv) **use of light in fishing;**
    - (v) **blockage of migratory routes.**
- (a) Answers such as lagoons, fresh water, sea and dams are ridiculous as names of water quality parameters. The problems could be with the word “parameters” which they could probably not comprehend. Expected answers included temperature and pH.
- (b) The list of major fish products were given by some of them as frozen fish: calcium, vitamins and minerals. These are wrong and suggests lack of knowledge of fish processing. Those who attempted the question did not bring up fish products such as fish chunks, fillets and flakes.
- (c) In (i) to (iv), candidates missed the import of the question; that is why these are harmful fishery practices.
- (i) Candidates did not state why use of small meshes is harmful. They only stated that it catches juveniles, but why catching of juveniles is harmful is not mentioned.
  - (ii) The usual answer was that the use of explosives kills all fishes. The effect/result of killing all fish was not mentioned as well as the effect of the explosives on the aquatic habitat.
  - (iii) Poisons affect/kill all life forms in an aquatic habitat, when fishes are concerned, poisons also affect/kill persons who eat the fish. Candidates did not consider this last point.
  - (iv) They failed to explain that the fishes were attracted by the light, that is they gathered near the light. This makes it very easy to catch/harvest the fish and leads to over exploitation of the water body.
  - (vi) The question is not only about blockage of routes or channels in water bodies. It is about migratory routes. These are routes followed by fish that are to spawn. The blockage affects the spawning activities of these

fishes and leads to the depletion of these stocks as there is little or no stock renewal or replacement by new generation of fishes.

### **Question 3**

- (a) Mention three sources of pollution in a fish pond.**
- (b) Distinguish between a food chain and a food web in a fish habitat.**
- (c) Explain three effects of competition on fish population.**
- (d) Describe four management practices carried out by farmers to increase fish yield.**

- (a) This was poorly answered. Some candidates stated that overstocking a fish pond with fingerlings pollute a fish pond.
- (b) This question was very poorly attempted most candidates. They must note that food chain is the feeding relationship between organisms in which energy passes from plant to a fish and to other fishes without a break in the sequence of feeding. Food web is a feeding relationship consisting several interconnecting food chains.
- (c) This sub-question was poorly answered by most candidates. The key words “effects of competition” were ignored by them. For example, they wrote about competition for food, but not the effect or the result of competition for food as demanded by the question. This must be a clear example of the situation where the candidates were not reading the question well.
- (d) Majority of the candidates failed to describe four management practices carried out by farmers to increase yield practices. They only stated the management practices. This is once again an issue of failure to read and understand the questions well before starting to answer them.

### **Question 4**

- (a) State three principles of fish preservation.**
- (b) Enumerate ten income generating activities in the fishery industry.**
- (c) Discuss the effects of the following conditions on fish population:**
  - (i) turbidity;**
  - (ii) upwelling;**
  - (iii) nutrient availability.**

- (a) The difficulty shown here was that candidates could not discern principles of fish preservation from the methods of fish preservation. Most of the answers were on the methods of fish preservation.

- (b) Most candidates gave answers in such a manner which called upon the examiner to infer the income generating activities concerned. An example is fishing net repairer puts the burden on the examiner to infer what the activities is as far as income generation is concerned.
- (c) This once again is an example of not providing the answers as required by the question. Upwelling is not the movement of water current or body from one place to another. It is the movement of bottom layers of water to the top and the top layers sinking to replace the bottom layers. Candidates also failed to discuss the other points.

### **Question 5**

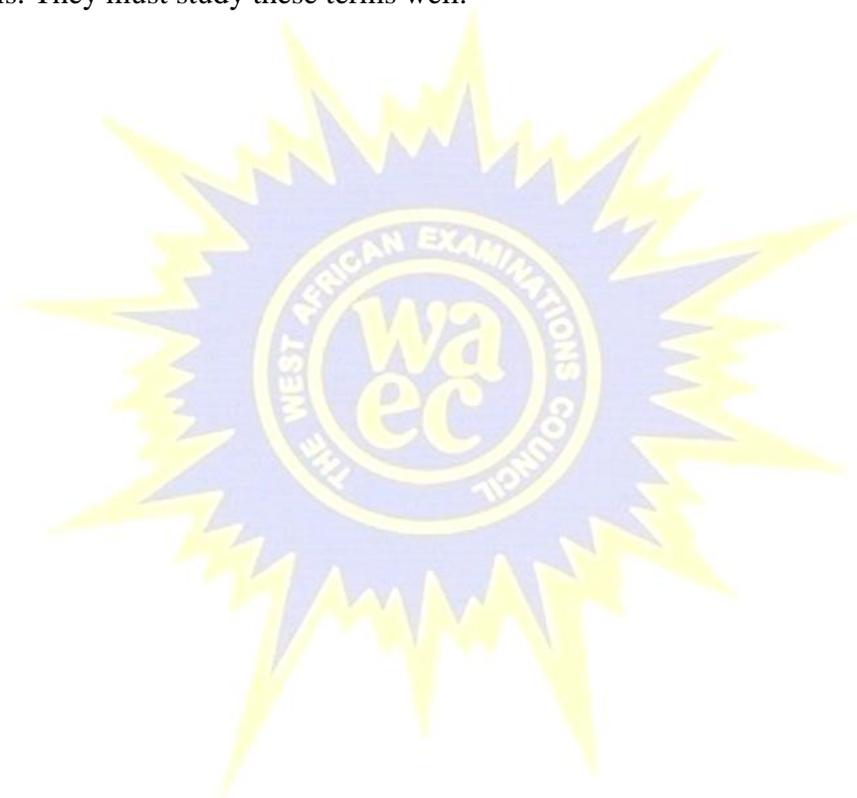
- (a) Name three diseases of fish.**
- (b) List four materials needed for the construction of a gill net.**
- (c) Name five freshwater fishes common in Ghana.**
- (d) Describe the process of stocking a fish pond with fingerlings.**

- (a) The sub-question was poorly answered by most candidates. It clearly showed that they did not pay attention to fish diseases.
- (b) It was common to find wood in the list of materials for the construction of a gill net. This was wrong.
- (c) This sub-question was misunderstood by most candidates. Answers such as shrimps, crabs and oysters were provided. These were not fishes even though they were regarded as fishery products. Secondly, it must be stressed that fishes such as tuna, salmon and herrings are marine and not fresh water. Mudfish and catfish are one and the same answer, and not two different answers.
- (d) Stocking of fish pond did not pose a problem to candidates. The only concern was that they took a lot of details for granted and did not describe these. For example. most of them said that the temperature of the water in the fish transport container must be the same as that of the pond water, but did not go ahead to describe how this can be done practically.

### **Question 6**

- (a) List four natural foods that could be found in a fish pond.**
- (b) State four differences between a bony fish and a cartilaginous fish.**
- (c) Explain the following fishery terms:**
  - (i) spawning;**
  - (ii) gravid;**
  - (iii) fry;**
  - (iv) fingerling.**

- (a) Some candidates listed wheat bran and corn chaff as natural food in a fish pond. These are not.
- (b) This difficulty occurs almost every year. In giving out the differences between two things, it is not sufficient to say that A has an operculum and B does not have. The situation in B must also be clearly stated before one can score. The situation in B is that B has fill slits. Another example is that A has a skeleton and B does not have. One will only score if one states what is the situation in B. That is, B has cartilaginous skeleton.
- (c) The responses of most candidates to this sub-question portrayed that they were not familiar with the list of fishery terms: spawning, gravid, fry and fingerlings. They seem to have heard of fingerlings but the explanations show that technically, they do not know what it is. They must study these terms well.



## **FORESTRY 1**

### **1. GENERAL COMMENTS**

The standard of the paper compared favourably with that of the previous year. Candidates' performance was average.

### **2. A SUMMARY OF CANDIDATES' STRENGTHS**

The following strengths were detected in the scripts of candidates:

- (1) Candidates gave concise answers.
- (2) Candidates attempted all the questions and followed the rubrics of the paper.

### **3. A SUMMARY OF CANDIDATES' WEAKNESSES**

Candidates' weaknesses identified include:

- (1) Failure of candidates to follow the rubrics of spelling scientific names.
- (2) Writing part of the questions before providing answers.
- (3) Poor construction of sentences.

### **4. SUGGESTED REMEDIES**

The suggested remedies are as follows:

- (1) Students should follow the rubrics of writing scientific names.
- (2) Students should avoid copying questions before answering them.
- (3) Students should endeavour to improve on their grammar.

### **5. DETAILED COMMENTS**

#### **Question 1**

- (a) **Identify each of specimens A and B.**
- (b) **Name the habitat of each of specimens A and B.**
- (c) **State four ways in which specimen A is of economic importance.**
- (d) **State three ways in which specimen B is important to forest soils.**
- (e) **Name the trophic level in the food chain to which specimen B belongs.**
- (f) **State three ways of controlling specimen A.**

Many candidates were able to answer parts (a) and (b) satisfactorily. Performance in part (c) was not satisfactory. Expected answers included:

- defoliates plants;
- serves as food to some organisms;
- increased cost of production through its control.
- Performance in part (d) was average. Expected answers included:
- helps in decomposition of organic matter;
- burrowing activities help in aeration of soil
- mix up soil/ bring up nutrients from below to the top.

Parts (e) and (f) were answered satisfactorily.

### **Question 2**

- (a) Identify each of specimens C, D and E.**
- (b) State two uses of each of specimens C, D and E.**
- (c) State one way of maintaining each of specimens C and D.**
- (d) State two precautions to be taken when using each of specimens C and E.**

Performance in part (a) was satisfactory though some candidates made spelling mistakes. Performance in parts (b) and (c) were generally satisfactory. Candidates' performance in part (d) was average. Especially for precautions when using Specimen E, many candidates could not provide the required answers. Expected answers included:

- should have enough fuel in it;
- should be kept away from the body;
- should be used where there is no obstacle.

### **Question 3**

- (a) State three observable differences between specimens F and G.**
- (b) Give three reasons why pruning should be carried out on a plantation of specimen F.**
- (c) Mention three uses of each of specimens F and H.**

Performance in part (a) was not very good. Expected answers included the following:

Specimen F	Specimen G
- Has simple leaves	- Has compound pinnate leaves
- Leaf surface rough	- Leaf surface smooth
- Smooth margin	- Serrated margin

- Leathery leaf	- Leaf not leathery
- Large leaf blade	- Small leaf blade

Parts (b) and (c) were answered satisfactorily.

#### **Question 4**

- (a) Identify specimen J.**
- (b) Identify each of specimens K and L by the common and scientific names.**
- (c) Name one source of each of specimens J and K.**
- (d) Give four uses of specimen J.**
- (e) Give two uses of specimen K.**
- (f) State two ways of preserving specimen L.**

Performance in part (a) was satisfactory. In part (b), many candidates could identify the specimens but some failed to write the scientific names correctly. Specimen K was fruit of black pepper (*Piper guineensis*) and Specimen L was fruit of wild pepper (*Capsicum frutescens*).

Performance in part (c) was satisfactory. Some candidates could not give the required number of answers to part (d). Expected answers included: manufacture of candles, chewing gums/food, cosmetics, crayons and ink, textiles, polishing and cleaning compounds etc

Performance in parts (e) and (f) was satisfactory.

## **FORESTRY 2**

### **1. GENERAL COMMENTS**

This year's paper had comparable standard to that of the previous years. The performance of candidates, however, was better compared to previous years.

### **2. A SUMMARY OF CANDIDATES' STRENGTHS**

The following strengths were detected in the scripts of candidates:

- (1) Answers were mostly straight to the point.
- (2) There was much improvement in the usage of forestry terms to answer the questions.
- (3) Candidates particularly showed some improvement in the use of the English language and this should be encouraged.

### **3. A SUMMARY OF CANDIDATES' WEAKNESSES**

Candidates exhibited the following weaknesses:

- (1) Candidates continued to exhibit weakness in the numbering of questions.
- (2) Poor handwriting, cancellation and poor paragraphing were seen.

### **4. SUGGESTED REMEDIES**

The following remedies were suggested:

- (1) Students should read instructions (rubrics) well and understand them before answering questions.
- (2) Students should endeavour to write legibly.

### **5. DETAILED COMMENTS**

#### **Question 1**

- (a) **Describe each of the following systems of harvesting trees:**
  - (i) **selective cutting;**
  - (ii) **clear cutting.**
- (b) **Name four tools used in felling trees.**
- (c) **Explain five effects of improper felling operations on forestry.**

This question was answered by many candidates. Parts a(i) and (ii) were generally well-answered. Part (b) was answered satisfactorily. Answers given to part (c) were also good.

## **Question 2**

- (a) State four major functions of a forest reserve.**
- (b) State five measures used in regulating wildlife exploitation.**
- (c) Explain the term game cropping as used in wildlife management.**
- (d) State three advantages of game cropping.**

This question was answered by majority of candidates. Performance in part (a) was satisfactory. Answers to part (b) were unsatisfactory. Answers like the following should have been given:

- Restriction on hunting/prohibition of poaching;
- Night hunting is not allowed;
- Domestication of some wild animals;
- Legislations;
- Close season;
- Education and;
- Restocking.

Few candidates were able to answer part (c) correctly as the situation where over-populated wildlife species are intentionally killed to reduce their population. The killing is controlled by the wildlife management authorities.

## **Question 3**

- (a) What is a seed?**
- (b) Give five reasons why seeds are nursed before transplanting on the field.**
- (c) Name two members of the honey bee colony.**
- (d) Outline the steps involved in the processing of beeswax.**

Answers given to part (a) were completely wrong. A seed is a fertilized ovule of plants. Only few candidates were able to give correct answers to part (b). Expected answers included:

- prevention of seeds from being wasted or washed away;
- advantage to survive over seeds planted at stake;
- reduction of pest and disease infestation;
- selection of healthy seedlings for field planting;
- bring about uniformity of growth;
- enhancement of germination of some seeds.

Part (c) was satisfactorily answered by majority of the candidates.  
Part (d) was poorly answered. The answers were to be sequential.

#### **Question 4**

- (a) Describe the main features of the communal land tenure system.**
- (b) Explain three advantages of the communal land tenure system.**
- (c) Explain three disadvantages of the communal land tenure system.**

This question was answered satisfactorily by majority of the candidates.

#### **Question 5**

- (a) What are invasive plant species?**
- (b) Name three terrestrial and two aquatic invasive plant species.**
- (c) Discuss the importance of forests under each of the following headings:**
  - (i) recreational values;**
  - (ii) cultural values.**

Majority of candidates who attempted this question scored very low marks. The expected answer for the part (a) is that, they are plants which have been introduced or are not native to an area and have grown out of control and taken over the place from plants originally growing there.

Many candidates were unable to give the expected answers to part (b). The expected answers include *Chromolaena odorata* (Siam weed or Acheampong weed), pulp mulberry, neem and *Leucaena leucocephala* for terrestrial invasive plants and water hyacinth, kariba weed, water lettuce and *Mimosa pigra* for aquatic invasive plants. Again, most candidates could not give satisfactory answers to part (c). Expected answers to part (c)(i) included the following:

- wild animals like monkeys attract crowds at public places;
- people visit national parks to recreate themselves;
- men often group under trees to play draft;
- games like 'oware' are made from wood.

Expected answers to part (c)(iii) included the following:

- some animals are used as totem symbols;
- skins are used in making drums;
- the Coat-of-Arms of Ghana has eagles on it.

#### **Question 6**

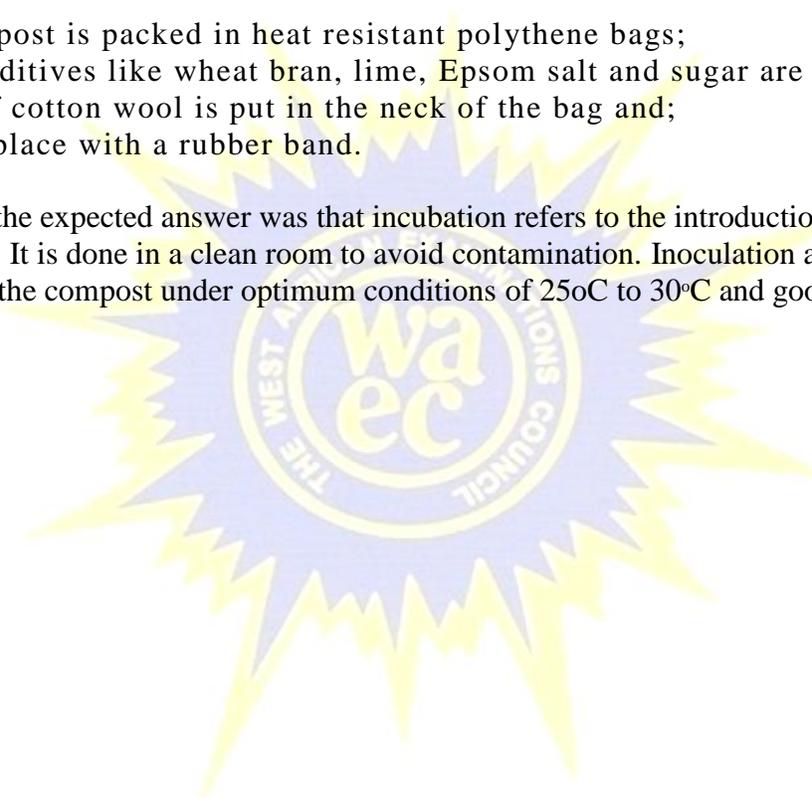
- (a) What is deforestation?**

- (b) State five ways in which deforestation could be controlled.**
- (c) Discuss the commercial bag method of mushroom production under each of the following headings:**
- (i) Preparation of compost;**
  - (ii) bagging of compost;**
  - (iii) incubation and inoculation.**

Majority of candidates answered this question. Parts (a) and (b) were answered satisfactorily. However, answers given to part (c) were unsatisfactory. Expected answers to part (c)(i) included the purpose of composting; main materials and additives required; and the fact that they should be mixed up, sprinkled with water, heaped up and turned at intervals. Expected answers for part (c)(ii) included the following:

- the compost is packed in heat resistant polythene bags;
- some additives like wheat bran, lime, Epsom salt and sugar are added and a piece of cotton wool is put in the neck of the bag and;
- held in place with a rubber band.

For part (c)(iii), the expected answer was that incubation refers to the introduction of spawn into the compost bag. It is done in a clean room to avoid contamination. Inoculation allows the spawn to grow through the compost under optimum conditions of 25°C to 30°C and good ventilation.



## **GENERAL AGRICULTURE 1**

### **1. GENERAL COMMENTS**

The standard of the paper compared favourably with those of previous years with respect to contents, syllabus coverage and level of difficulty. The performance of candidates was slightly above average.

### **2. A SUMMARY OF CANDIDATES' STRENGTHS**

The Chief Examiner commended candidates for the following features noticed in their scripts:

- (1) Most candidates were able to give precise answers.
- (2) Some showed detailed knowledge of the subject matter.
- (3) Most candidates showed improvements in spelling of both English words and scientific terms.
- (4) Most candidates obeyed the rubrics of the paper.

### **3. A SUMMARY OF CANDIDATES' WEAKNESSES**

The following weaknesses were noticed on the scripts of candidates:

- (1) Most candidates did not understand scientific terms.
- (2) Most candidates exhibited poor calculation skills.
- (3) Some candidates could not identify specimens.

### **4. SUGGESTED REMEDIES**

The Chief examiner made the following suggestions meant to remedy the weaknesses of candidates:

- (1) Teachers should periodically use question and answer to drill students on scientific terms.
- (2) Teachers should give exercises involving calculation and identification of specimens to their students. Constant practice will perfect students.
- (3) Teachers should advise students to use simple and straightforward sentence.

### **5. DETAILED COMMENTS**

### **Question 1**

- (a) Identify each of specimens A, B and C by their scientific and common names.**
- (b) State one feature of each of specimens A, B and C that helps them to adapt to their environment.**
- (c) Give four reasons why specimen A is of economics importance to the farmer.**
- (d) State one method each of controlling specimens B and C on the farm.**

In part(a), most candidates identified and spelt the scientific names of specimens A, B and C correctly but some did not start the name of the genus with a capital letter and the species with a small letter and underline them. The following answers were expected:

Specimen	Scientific name	Common name
A	<i>Imperata cylindrical</i>	Spear grass
B	<i>Tridax procumbens</i>	PWD weed/Tridax
C	<i>Boerhavia diffusa</i>	Pig weed

Most candidates could not understand the meaning of the sentence ‘features of each of specimens A, B and C that helps them to adapt to their environment’ in part(b) and therefore gave wrong answers which were not related to the features of the specimens provided, for example, ability to compete with plants for nutrients and water. The following answers were expected:

#### **A (spear grass)**

- produce numerous underground rhizomes with high regenerative ability;
- produce a lot of seeds which can be dispersed by wind;
- have two propagating structures (seed and rhizome).

#### **B (Tridax)**

- produce many fruits which are dispersed by wind;
- fruits have parachute-like structures/pappus which makes it easy for them to be spread by wind.

#### **C (Pig weed)**

- produce many small fruits with adhesive substances on them for easy dispersal by humans/animals;
- has long tap root system to absorb water from deeper soil. Some candidates did not fully

understand the meaning of ‘economic importance’ in part (c) and so gave answers on the gains in economic value of specimen A to the farmer only.

Candidates should note that ‘economic importance’ include both gain and loss in economic value e.g. specimen A cause injury to the farmer and specimen A is used as roofing material.

Part (d) was well answered by most candidates, however, candidates should note that “use of herbicides to control weeds” was wrong. It should rather be “use of appropriate/recommended herbicides to control weeds”.

## **Question 2**

- (a) (i) **Identify each of specimens D, E and F.**  
(ii) **Mention one use of each of specimens D, E and F in surveying.**  
(iii) **State two precautions that should be taken when using specimen D in order to obtain accurate results.**
- (b) (i) **Identify each of the rock types G and H.**  
(ii) **Describe the mode of formation of specimen G.**  
(iii) **Outline the steps that specimen H would go through to become soil.**

Specimens D and E in part a(i) were correctly identified by most candidates as measuring tape/tape measure and ranging pole respectively. Specimen F which was a peg was, however, wrongly identified by a few candidates as dibber.

For part (a) (ii), candidates who correctly identified the specimens provided were also able to give correct answers for their uses. For (iii), most candidates could not give the precautions to be taken when using specimen D. The correct answers were as follows:

- should be stretched taut/should be straight;
- there should be no obstacle in its path;
- marked numbers should be clear and visible;
- there should be no parallax when taking readings.

Part (b) (i) was answered satisfactorily by most candidates. Part (b) (ii) was correctly answered by most candidates as being formed from molten magma (lava)/volcano which cools down and solidifies into the rock. Candidates who wrote ‘cooling down of magma’ without ‘solidification’ lost marks. Part (b) (iii), was poorly answered by most candidates. For some candidates, the steps given did not follow the correct order. The steps given in the correct order were:

- rock is broken down through weathering;
- Weathered material is transported and deposited elsewhere or remains *in situ*;

- plant and animal residues are added over time to form soil/soil profile ;development.

### **Question 3**

- (a) (i) **Which of the specimens J, K and L usually constitutes the highest proportion of formulated poultry feed?**  
(ii) **Give two reasons for your answer in (i).**
- (b) **State three functions of the main nutrient supplied by specimen K in animal nutrition.**
- (c) **State three effects of the absence of specimen L in the ration of farm animals.**
- (d) **Mention two feed ingredients each that could be used to replace each of specimens J, K and L in a ration.**

Although part (a) was simple and straight forward; it was poorly answered by some candidates. The expected answer were that: Specimen J (maize meal) constitutes the highest portion of formulated poultry feed because it provides energy for farm animals and also serves as the main source of material for fattening.

Part (b), was well answered by most candidates. However, a few of them did not know that protein is the main nutrient in fishmeal and so could not give the function of protein in farm animals.

Part (c), was also well answered by most candidates. Some of their answers included;

- poor bone formation;
- rickets/ enlargement of bone joints;
- milk fever;
- infertility;
- poor shell formation/high breakage of eggs;
- decreased egg production;
- decreased activity/sensitivity.

A few candidates were unable to answer part (d) satisfactorily. Wheat meal and rice meal were not accepted as replacement for specimen J since their bran is rather used. Ground limestone and dicalcium phosphate were not mentioned by candidates for specimen L.

#### **Question 4**

The following information was obtained from the record books of *LAP Farms Limited* on 31st December, 2010.

#### **Opening Stock**

Fingerlings - GH¢75.00

#### **Sales**

Eggs - GH¢400.00

Broilers - GH¢190.00

Goats - GH¢80.00

#### **Purchases**

Fish feed - GH¢35.00

Broiler feed - GH¢30.00

Vaccines - GH¢180.00

#### **Closing stock**

Tilapia - GH¢150.00

Old layers - GH¢100.00

#### **Operating Expenses**

Wages - GH¢200.00

Income tax - GH¢50.00

- (a) Use the information provided above to prepare a Profit and Loss Account for the year ending 31st December, 2010 for *LAP Farms Limited*.
- (b) State the main reason for preparing a Profit and Loss Account.
- (c) Name two other records that should be kept by a farm manager.

For part (a), most candidates correctly drew a table with two columns (left and right) to prepare the profit and loss account. The left column was correctly titled.

Expenses/Expenditure and the right column, Income. If the titles for the two columns are interchanged or the table is wrongly titled, all entries into the table are marked wrong.

Some candidates did not use a table in preparing the profit and loss account and also lost the marks allocated to part (a). Some candidates could not calculate the net profit due to poor calculation skills and others who were able to calculate it, wrongly place it outside

the table and, therefore, lost marks. Candidates should note the above mistakes and avoid them. The only answer provided by candidates for part (b) was to see whether the farm business is making profit or loss after a period of production. Other correct answers included providing data for preparation of balance sheet and income surplus account.

Part (c) was answered satisfactorily by most candidates.

## **GENERAL AGRICULTURE 2**

### **1. GENERAL COMMENTS**

The standard of the paper was comparable to those of previous years. Candidates' performance was, however, slightly below those of previous years.

### **2. A SUMMARY OF CANDIDATES' STRENGTHS**

Candidates' strengths are as follows:

- (1) Ability to follow rubrics.
- (2) Better time management.
- (3) More orderly presentation of work.

### **3. A SUMMARY OF CANDIDATES' WEAKNESSES**

Candidates' weaknesses identified are as follows:

- (1) Poor expression in the English language.
- (2) Poor spelling of scientific terms.
- (3) Repetition of answers.
- (4) Poor understanding of agricultural terminologies.

### **4. SUGGESTED REMEDIES**

The following remedies were suggested:

- (1) Students have to improve on spellings and handwriting.
- (2) Students should avoid repetition of answer.
- (3) Students should learn the spelling of scientific terms they come across.

### **5. DETAILED COMMENTS**

#### **Question 1**

- (a) **Mention two types of irrigation.**
- (b) **State six problems associated with drainage in agriculture.**
- (c) **Explain four factors that hinder the production of sufficient food in West Africa.**

- (a) This is a very popular question with candidates but most of them did not know the difference between types or systems of irrigation and examples of the types. The types or systems of irrigation are surface, sub-surface (underground) and overhead irrigation. Examples of surface irrigation include furrow irrigation, drip (trickle) irrigation and basin irrigation. Those of overhead irrigation are sprinkler irrigation and the use of watering can for watering crops.
- (b) Candidates had limited knowledge of the actual problems associated with drainage in agriculture. Most of them knew problems such as drainage channels reduce the size of cultivable lands, channels restrict the movement of farm machineries on the land and the fact that it makes the land prone to soil erosion via the channels. Problems that were hardly stated by candidates included the following:
- it may lead to the pollution of nearby water bodies;
  - salt/salinity problems could arise in the soil;
  - siltation of drainage channels if not well maintained.
- (c) Many candidates could state the factors that hinder the production of sufficient food. They could, however, not adequately explain how the factors hinder food production. Most of them did not, therefore, score full marks for this sub-question.

## **Question 2**

- (a) **State four contributions of forests to national development.**
- (b) **Give four reasons for ploughing a farmland.**
- (c) **Discuss four ways in which science and technology could be used to promote agricultural development in West Africa.**
- (a) This question limited candidates to the contribution of forests to national development. It did not ask for the general importance of forest as answers of most candidates depicted. Expected answers included the following:
- forests are a source of foreign exchange;
  - source of domestic income;
  - source of employment;
  - source of food;
  - source of raw materials for shelter and furniture.
- (b) Most candidates rightly gave the reasons for ploughing a farmland. Reasons that were not common in their answers included the following:
- aiding in soil drainage;
  - controlling soil-borne pests;
  - controlling soil erosion through contour ploughing;
  - controlling weeds;
  - facilitating secondary and tertiary tillage practices.

- (a) Candidates had fairly good knowledge of how science and technology could be used to promote agricultural development in West Africa. They were not, however, convincing in discussing the points to score full marks.

### **Question 3**

- (a) **List three ways in which cover cropping could improve soil productivity.**  
(b) **State five causes of soil acidity.**  
(c) **Describe four mechanized methods of land preparation.**

Very few candidates attempted this question confirming the fact that students do not generally like answering soil science questions.

- (a) Candidates had fairly good knowledge of how cover cropping improve soil productivity. It must, however, be pointed that cover crops do not cool soil temperature as claimed by most candidates, rather they regulate soil temperature.
- (b) This sub-question on the causes of soil acidity was very poorly answered by candidates. It is suspected the topic 'soil reaction' entailing soil acidity, alkalinity and  $pH$  is generally not well taught by teachers. For example, the more application of nitrogenous fertilizer does not cause soil acidity. It is the continuous application of such fertilizers which does cause soil acidity. Other causes of soil acidity included leaching, acid rains, presence of sulphur in the soil, continuous crop removal and organic matter decomposition.
- (c) This sub-question was misunderstood by most candidates as they described traditional rather than mechanized methods of land preparation. Required answers included using machines and implements to clear land. For examples. bulldozing, stumping and to plough, harrow and ridge the land.

### **Question 4**

- (a) **Name four components of soil.**  
(b) **Mention four benefits derived from mulching agricultural soils.**  
(c) **Describe four ways in which human activities contribute to the depletion of soil resources.**

- (a) Many candidates had little or no difficulty in naming the components of soil, namely, air, water, organic matter, living organisms and inorganic matter/mineral matter. Candidates who named mineral salt or minerals for mineral matter were marked wrong. They are not the same.

- (b) Majority of the candidates performance in this sub-question was satisfactory except that some lost marks by using such words as 'prevent' in mentioning the benefits derived from mulching agricultural soils. For examples, mulching does not completely prevent soil erosion. It, however, checks, controls or reduces soil erosion. In the same vein, candidates are advised to be wery of the use of such words as 'lack'/ "lack of " in situation of inadequacy. Examples included: lack of storage facilities instead of inadequate storage facilities.
- (c) Most candidates were generally able to state the human activities that lead to the depletion of soil resources but most of them were unable to describe how the activities cause the depletion of the resources. Common in candidates' answers were human activities such as bush burning, deforestation, surface mining and sand wining. Only a few of them remembered excessive irrigation, continuous use of agrochemicals, poor tillage practices and poor farming methods as causes of depletion of soil resources.

### **Question 5**

- (a) **Give four examples of grasses that could be used to establish lawns.**
- (b) (i) **Name two classes of insect pests of crops based on their feeding habits.**
- (ii) **Give two examples of each of the classes of insect pests named in (i).**
- (c) **Explain three guidelines for selecting quality seeds for propagation.**
- (a) Candidates answered this question fairly satisfactorily but some who gave the examples of lawn grasses using scientific names spelt them wrongly and were therefore marked wrong. It should be noted that Bermuda grass is the same as Bahama grass, Gamba grass and Guinea grass are not lawn grasses as given by some candidates.
- (b) The performance of candidates in this question was below average. Most candidates were familiar with the classes of insect pests based on their feeding habits but only a few of them gave correct examples of the named classes.
- (c) Most candidates misunderstood the demands of this question. They therefore wrongly sought to explain guidelines for selecting crops for propagation instead of for selecting quality seeds for propagation. In their confusion, factors such as maturity period of crops adaptation to local conditions and resistance to diseases and pests were given. Some of the guidelines for selecting quality seeds for propagation were:
- genetic purity;
  - viability/high germination ability;
  - freedom from contamination;

- uniform size and shape;
- no perforation ;
- disease and pests free.

### **Question 6**

- (a) Mention four benefits of hedges.**
- (b) Enumerate four aims of crop improvement.**
- (c) Discuss four factors that influence the successful grafting of crops.**

(a) Candidates answered this sub-question fairly satisfactorily. However, benefits such as hedges absorb noise, dust and light were hardly mentioned.

(b) Strangely, very few candidates enumerated the aims of crop improvement correctly. Common in such candidates' answers were the following:

- increase in yield;
- pest resistance;
- discuss resistance;
- meeting consumers needs.

Aims such as early maturity, adaptation to local conditions and producing crops with desired shape and height were hardly enumerated.

(a) Candidates' performance in this question was not satisfactory. A few of them could partially discuss such correct factors as suitable environmental conditions and compatibility of stock and scion. Such factors as skill of operator, physiological state of stock and scion, diameters of stock and scion and alignment of tissues of stock and scion were rarely discussed

### **Question 7**

- (a) List five causes of mortality of poultry.**
- (b) Distinguish between the extensive system and the intensive system of rearing farm animals.**
- (c) Explain four factors that affect the distribution of farm animals in West Africa.**

(a) This required a mere recall and listing of causes of mortality in poultry. Most of the candidates did not therefore find this tasks difficult. However, causes such as deformities, malnutrition. high and low temperatures; and predators were rarely listed.

(b) Candidates were generally able to distinguish between extensive and intensive systems of rearing farm animals. Only a few of them defined the

two systems without using such conjunctions/phrases such as ‘but’, whilst, ‘on the contrary’, ‘on the other hand’ or a table to effect the distinction. Such candidates lost some marks.

- (c) This question was misunderstood by most candidates. The few who understood it could also not discuss the factors fully. Factors that influence the distribution of farm animals in West Africa include, pests, diseases, feed (pasture), culture and religion and market.

### **Question 8**

- (a) **State four problems affecting fish farming in Ghana.**  
(b) (i) **Define the term *breeding* as used in animal improvement.**  
(ii) **Mention three types of breeding commonly used in livestock production.**  
(c) **Describe three effects of malnutrition in farm animals.**

- (a) A fairly good number of candidates were able to state the problems affecting fish farming in Ghana. But the use of “lack of” instead of “inadequate” as in lack of capital caused the candidates to lose some valuable marks. Other problems included limited technical know-how, high cost of feed, inadequate quality fingerlings and inadequate processing and storage facilities.
- (b) Whilst most candidates could not correctly define the term “breeding”, they were able to mention the types of breeding used in livestock production. The type of breeding rarely mentioned is “outbreeding”.
- (c) Even though most candidates know the effects of malnutrition on farm animals, they could not fully describe the effects to score full marks. Candidates appeared not to be aware the following effects of malnutrition in farm animals:
- loss of blood / anaemia;
  - overweight;
  - deformity;
  - delayed onset of laying;
  - loss birth weight.

### **Question 9**

- (a) **State four advantages of farm visits as an extension teaching method.**  
(b) **Enumerate six factors that cause a change in the demand of agricultural produce.**  
(c) **Give three reasons for processing agricultural produce.**
- (a) Expect in a few cases, candidates misunderstood the question to mean advantages of extension education and therefore stated advantages such as

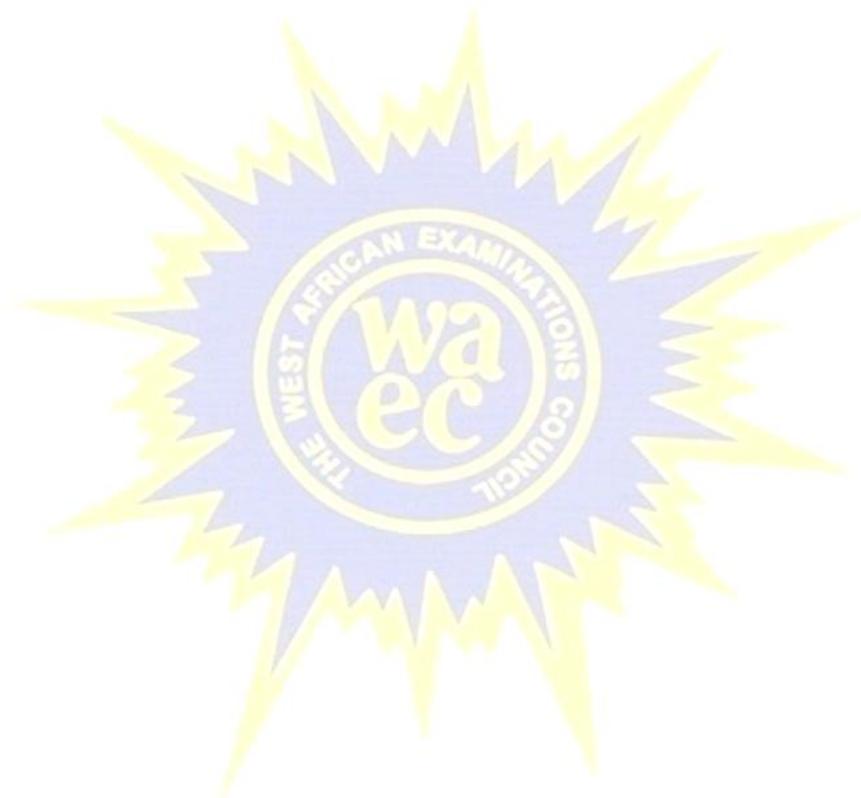
increase in yield and solving farming problems. The demands of the question were on the advantages of farm visits as extension teaching method. The topic “Extension Teaching Methods” should be properly taught in schools.

- (b) Most candidates were able to enumerate the factors that cause change in the demand of agricultural produce. Factors that did not feature frequently in consumers and socio-cultural factors.
- (c) Reasons given by most students for processing agricultural produce were either not satisfactory or repetitive. For example, they said processing adds value to the produce and again produce price increases. Whilst most of them correctly said it enhances the storage of produce, only a few of them knew that processing also:
  - makes produce readily consumable;
  - reduces bulk and facilitates packaging;
  - reduces physical storage space;
  - facilitates handling and transportation;
  - ensures better and correct price.

#### **Question 10**

- (a) **State the law of diminishing returns.**
  - (b) **List four quantities of a good extension agent.**
  - (c) **Enumerate three problems associated with the acquisition of credit by small scale farmers in West Africa.**
  - (d) **Discuss three problems affecting the marketing of tomatoes in West Africa.**
- (a) Only a few candidates stated the “Law of Diminishing Returns” correctly. One of the correct statement of this law is as follow:  
When successive units of a variable input are added to/used with a given quantity of fixed input in production a point is reached beyond which the marginal physical product begins/starts to decline/decrease/diminish.
- (b) A considerable number of candidates misunderstood this question for the benefits of extension system as evidenced by such responses as increase in output, large scale farming etc. The question is on the qualities of the extension agent as a person. Among the many qualities are:
- good communication skills;
  - sound knowledge of agriculture;
  - honesty/trustworthiness;
  - humility;
  - good health;
  - respect for customs and traditions.

- (c) Candidates performed poorly in this question. The problems stated included high interest rate, lack of collateral security and small farm sizes. Other problems hardly enumerated were poor recovery of credit, poor record-keeping, insufficient amount of credit etc.
- (d) Most candidates clearly had knowledge of the problems affecting the marketing of tomatoes in West Africa. As usual, however, they could not discuss them fully.



## **INTEGRATED SCIENCE 1**

### **1. GENERAL COMMENTS**

The standard of the paper compares favourably with those of previous years. However, the performance of candidates was poor compared to previous year.

### **2. A SUMMARY OF CANDIDATES' STRENGTHS**

The following strengths were detected in the scripts of candidates.

- (1) Handwriting of most candidates very legible.
- (2) Adherence to the rubrics of the paper.
- (3) Answers were appropriately numbered.

### **3. A SUMMARY OF CANDIDATES' WEAKNESSES**

Candidates exhibited the following weaknesses:

- (1) Poor knowledge of scientific terms and conventions as applied in science.
- (2) Lack of transfer of knowledge, for example, from Agricultural Science to Biology.
- (3) Poor expression in the English Language.
- (4) Inadequate preparation.

### **4. SUGGESTED REMEDIES**

The following remedies were suggested:

- (1) Teachers should make efforts to explain scientific terms and conventions to their students during lessons.
- (2) Teachers have the duty to introduce the idea of application of scientific concepts to everyday life experiences.
- (3) Students should read story books and take their lessons in English language more seriously.
- (4) Teachers should ensure that they cover the entire syllabus and also to provide adequate tutorials for their students.

### **5. DETAILED COMMENTS**

#### **Question 1**

- (a)
  - (i) **List two raw materials used in the manufacture of indigenous soap.**
  - (ii) **State three ways of improving upon the quality of indigenous soap.**

- (b) **Explain three ways in which the human sperm cell is adapted to its function.**
- (c) **State four human activities that result in the depletion of soil resources.**
- (d) **Describe how the relative density of a salt solution can be determined using the hydrometer.**

- (a) This sub-question was well-answered by majority of the candidates except that some of them mentioned caustic soda as one of the raw materials used in the preparation of indigenous soap. Candidates must note ash or cocoa pod or plantain peels could be used and not caustic soda which is normally used in the preparation of soap in the industries. Improving upon the packaging, addition of perfumes to improve scent were the popular ways of improving upon the quality of indigenous soap stated by majority of the candidates. However, they failed to add using the required amount of alkali, using well-refined reactants, refining the products, improving upon consistency and salting out.
- (b) Majority of the candidates were aware of the presence of a tail, mitochondria and chromosome in the nucleus as features of the sperm cell but failed to relate these features to the functions they perform. Expected answers included:
  - Acrosome, contain chemicals which dissolve the egg membrane;
  - Mitochondria provide energy needed for swimming/ active transport;
  - Tail for swimming/ active movement;
  - Chromosomes/ Genes in the nucleus for transmitting traits/characteristics from parents to offspring.
- (c) It was clear that majority of the candidates knew the answers to this sub-question. Some of them, however, could not communicate the answers properly because their responses lacked the appropriate scientific terms. For examples, bush-burning and overgrazing were written as 'bush-fire' and 'grazing over land' respectively.
- (d) This sub-question was fairly answered by most candidates who attempted it. They knew what relative density was. They also knew the formula for calculating relative density, that is, dividing the density of a substance by that water. Majority of the candidates could not describe how the hydrometer was used.

They wrongly stated the salt solution was placed inside and tried to read the density of the salt. The expected answer included:

- Dip hydrometer in water;
- Read and record the density=  $D_w$ ;
- Dip hydrometer in salt solution;
- Read and record the density=  $D_s$ ;
- Relative density of salt solution is  $\frac{D_s}{D_w}$ .

## **Question 2**

- (a)
  - (i) **Explain the term tissue as applied to living organisms.**
  - (ii) **List two types of tissues found in a green plant.**
  - (iii) **State one function each of the tissues listed in (ii) above.**
- (b)
  - (i) **State the law of conservation of energy.**
  - (ii) **In a simple machine, the energy input is 129J. If the efficiency of the machine is 80%, calculate the energy output.**
- (c)
  - (i) **What is a chemical compound?**
  - (ii) **State four differences between a covalent and an ionic compound.**
- (d) **State three features of the intensive system of keeping farm animals.**

- (a) Majority of the candidates knew that tissues were made of cells that carried out the same or specific functions. However, only a few of them were able to add that the cells were similar. It is important for candidates to note that for tissues to perform specific functions they ought to be similar. The second part of the question demanded the naming of plant tissues and their functions. Surprisingly, many candidates mentioned animal tissues instead plant tissues. For examples, blood, nerves and muscles. Majority of the candidates mentioned the phloem and the xylem as examples of plant tissues. However, the names of these tissues were wrongly spelt by them. Also, the candidates did not know which of these tissues was responsible for transport of water and mineral salts and for manufactured food. The palisade/ spongy mesophyll, epidermal parenchyma and cambium tissues were not mentioned by most candidates.
- (b) On the law of conservation of energy, majority of the candidates were able to state that energy could not be created nor destroyed. However, they failed to add the second part of the law which stated that energy could be converted from one form to another. Some of the candidates' wrong responses included 'energy can be transported from one form to another' and 'energy can be transformed from one place to place to another'. The second part of this question which involved the calculation of energy output was well answered by most candidates. Some of them made wrong substitutions into the formula others ignored the steps in the calculation. Also, quite a number of the candidates lost marks because they stated wrong units.
- (c) This sub-question was poorly answered by majority of the candidates. They were wasting time stating the differences in the formation of ionic covalent compounds and omitted high conductivity of electricity, high melting point, high boiling point, solubility in water, exist as ions and crystals as characteristics of ionic compounds, which could be compared with covalent compounds which exist as molecules and non crystals among the differences between the two.
- (d) Most candidates were able to state the features of the intensive system of keeping farm animals.

### **Question 3**

- (a)
  - (i) **Describe briefly the production of sound in each of the following instruments:**

- ( ) trumpet;
- ( ) drum.
- (b) (ii) **State one difference between a musical note and noise.**
- (b) (i) **Give the reason for the treatment of water for domestic use.**
- (b) (ii) **State three methods of improving upon the quality of water for domestic use.**
- (c) (i) **Explain the term artificial insemination as used in animal production?**
- (c) (ii) **State three benefits of artificial insemination.**
- (d) **Describe the processes involved when the human eye views an object.**

- (a) This sub-question was difficult for most candidates. They failed to state that when air is blown into the trumpet it disturbs the air column in the trumpet making the latter to vibrate producing the sound. Similarly, when the skin/ membrane covering the drum is beaten, the skin vibrates putting air beneath into resonance producing sound. It was important to emphasize the beating of the skin.
- (b) This sub-question was well answered by majority of the candidates as they were able to state the reason for treating water for domestic use. However, few candidates wrongly stated that it was to make the water soft. These candidates must know that water is treated in order to make it safe.
- (c) Most candidates knew that artificial insemination involved the introduction of semen from male animal, but failed to indicate that the introduction of the semen into the vagina/ uterus of the female animal is by human devices and not through natural mating. Its benefit is not the creation of new species as stated by some candidates, but rather it results in production of desired traits because the farmer selects the desired traits in the male.
- (d) This question was not well answered by majority of the candidates who attempted it. They failed to transfer their knowledge of the properties of light to correctly respond to this sub-question. It must be noted that as light passes from an object through a more dense medium such as lens, cornea, aqueous humor and vitreous humor, the rays are refracted not reflected and brought to a focus on the retina to form the image. Candidates need to know that the image formed is inverted, but when the brain is notified of the image through impulses from the retina, the brain interprets the image as an upright object. Some of the candidates also had problem with spelling of words such as lens, vitreous humor, cornea and fovea.

#### **Question 4**

- (a) (i) **List three methods of fertilizer application.**
- (a) (ii) **State three factors to be considered before the application of fertilizer to crops.**
- (b) **Explain the following ecological terms:**
  - (i) **community;**

- (ii) **population;**  
(iii) **habitat.**
- (c) (i) **What is dispersion of light?**  
(ii) **Name the**  
( ) **natural phenomenon that involves dispersion of light**  
( ) **dispersing medium for the phenomenon named in ( ) above.**
- (d) **Describe how a pure sample of sodium chloride could be obtained from a mixture of sodium chloride and sand.**

- (a) Many candidates responded appropriately to this sub-questions as they correctly named the methods of fertilizer application and also the factors to be considered before applying fertilizer. However, the difficulty here was the appropriate expression and spelling. For examples, instead of 'water-holding capacity' candidates wrote, there must be drainage and also instead of 'pH' of the soils some candidates wrote the farmer must check the acid of the soil.
- (b) This sub-question was poorly answered by majority of the candidates. The responses of the candidates indicated that they lacked knowledge in ecological concepts. Some of the candidates wrongly explained the term 'community' as a place where people live and 'population' as the total number of people living in country. Expected answers included:
- Community is the populations of all the different species living in a habitat;
  - Population refers to all organisms of a particular species living in a habitat;
  - Habitat is particular place within the environment where organism lives.

It is important for candidates to note that these ecological concepts needed should be explained as used in ecology and not in social studies.

- (c) This sub-question was generally well answered by the majority of the candidates as they correctly explained what dispersion of light was. However, the second part of the question was difficult for them. Even though a prism is a dispersing medium it does not answer the question in the second part which involves rainbow, a natural phenomenon, in which case the refracting medium is rain drops which make up the rainbow.
- (d) Majority of the candidates were able to describe how a pure sample of sodium chloride is obtained from a mixture of sand and salt. However, some of them mixed up the steps involved in their description. The steps involved included:
- Water is added to the mixture of sand and sodium chloride;
  - This is stirred to dissolve the sodium chloride;
  - The sand is filtered off;
  - and the filtrate evaporated;
  - The salt is crystallized and collected dry/ salt left behind

### **Question 5**

- (a) (i) **State two characteristics of a concentrated acid.**

- (ii) **State three precautions to be taken when diluting concentrated sulphuric acid in the laboratory.**
- (b) **A man heterozygous for the rhesus factor marries a woman of the same genotype. Determine the proportion of the children who would carry the rhesus factor. Illustrate your answer with a genetic diagram.**
- (c) (i) **Name three sources of electric power.**  
(ii) **An electric stove is rated 1000 W, 240 V. Explain the statement.**
- (d) (i) **What is a crop pest?**  
(ii) **State three harmful effects of crop pests in agriculture.**

(a) Almost all the candidates who attempted this question were able to say that a concentrated acid was corrosive and had *pH* less than seven. It appears that candidates only remembered these two characteristics of concentrated acids. Other characteristics of a concentrated acid included:

- it changes blue litmus paper to red;
- it has high concentration of hydrogen ions;
- reacts with bases to form salt and water;
- reacts with metals to release hydrogen gas;
- reacts with carbonates to release carbon dioxide.

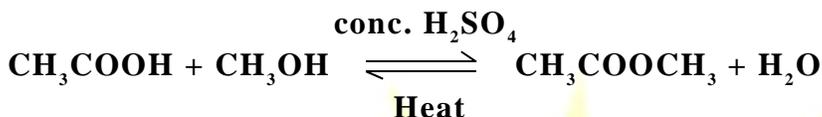
Many candidates also were able to state the precautions to be taken when diluting concentrated acids in the laboratory.

- (b) This sub-question was poorly answered by majority of the candidates. Candidates need to know the conventional symbols used in genetic crosses. A heterozygote for rhesus is represented by  $Rh^+Rh^-$  where  $Rh^+$  represents the gene for the rhesus factor and  $Rh^-$  represents the gene for the absence of the rhesus factor.  $Rh^+$  is dominant over the  $Rh^-$ . Each parent therefore produces two types of gametes. And it is conventional to circle the gametes. The offsprings produced when the gametes combine are in the ratio of  $1Rh^+Rh^+ : 2Rh^+Rh^- : 1Rh^-Rh^-$ , giving 75 percent of the population of the children who would carry the rhesus factor. There was clear indication that this simple application of the Mendelian Inheritance was not covered by the candidates.
- (c) Majority of the candidates were able to list the sources of electric power. However, the second part of the question was difficult for them. They were unable to explain the statement ‘An electric stove is rated 1000W,240V’. It is important for candidates to note that the statement means that the electric stove converts 1000 joules of electrical energy into heat every second. No calculation was required in this question.
- (d) This sub-question was generally fairly answered by majority of the candidates. However, they were expected to state the specific destructive effects of pests which included slowly down growth rate of crops, stunted growth in plants, feeding on young leaves of plants,

eating the grains of plants, destruction of stored grains/maize, creating holes in young leaves and reduction in crop yield.

### **Question 6**

(a) Consider the chemical reaction below:



- (i) Name the type of reaction illustrated.
- (ii) What is the role of the concentrated  $\text{H}_2\text{SO}_4$ ?
- (iii) What is the scent of the organic product formed?
- (iv) Name the organic product formed.
- (b) (i) Name the causative organism of malaria.
- (ii) State four ways of controlling the incidence of malaria in a community.
- (c) (i) Define force.
- (ii) Name the forces which are at play during the following activities:
- ( ) an object is placed on a table;
- ( ) a passenger jerks forward when a moving car comes to a sudden stop.
- (d) (i) Name two tools which could be used in the preparation of a nursery bed.
- (ii) State three factors which must be considered when selecting a site for vegetable production.

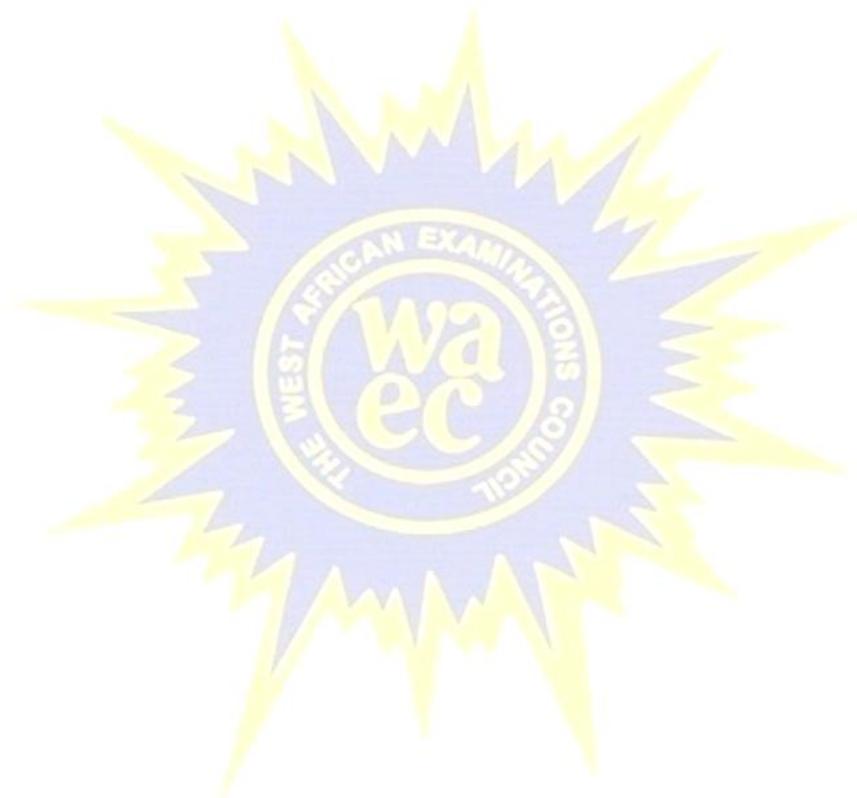
(a) Majority of the candidates of the candidates who attempted this sub-question responded appropriately. Their responses indicated that they knew that the reaction was esterification and that the concentrated sulphuric acid played the role of a catalyst. They were also able to describe the scent of the product formed. Surprisingly, they were unable to name the product formed which was methylethanoate.

(b) Many candidates were able to state ways of controlling the incidence of malaria in a community. However, only few knew that *Plasmodium* was the causative agent. Here some of them wrote *Plasmodium* without paying attention to convention and therefore lost marks. It must be noted that anopheles mosquito is the vector whilst *Plasmodium* is the causative agent.

(c) The first part of this sub-question was well answered by most candidates as they were able to define correctly the term force. The second part of the question which sought to test candidates' knowledge on forces at play under different conditions was poorly

answered. It is important for candidates to note that the forces at play when an object is placed on a table are weight of object on table and reaction of the table on the object. Force of the moving vehicle on the passenger and frictional force of tyres on the road are the forces at play when a passenger jerks forward when a moving car comes to sudden stop.

- (d) Most candidates were able to name the tools used in the preparation of a nursery bed. Also, they were able to state the factors to be considered when selecting a site for vegetable production.



## **INTEGRATED SCIENCE 2**

### 1. **GENERAL COMMENTS**

The standard of the paper compared favourably with those of previous years. However, the performance of candidates was average.

### 2. **A SUMMARY OF CANDIDATES' STRENGTHS**

The following strengths were detected in the scripts of candidates:

- (1) Adherence to the rubrics of the paper.
- (2) Display of simple arithmetic skill.
- (3) Provision of concise answers and relevant examples.

### 3. **A SUMMARY OF CANDIDATES' WEAKNESSES**

Candidates exhibited the following weaknesses:

- (1) Diagrams/ figures were not critically observed for correct responses.
- (2) Inability to read figures correctly from given measuring instruments.
- (3) Poor plotting of graph.
- (4) Poor spelling scientific terms.
- (5) Poor expression in the English Language.

### 4. **SUGGESTED REMEDIES**

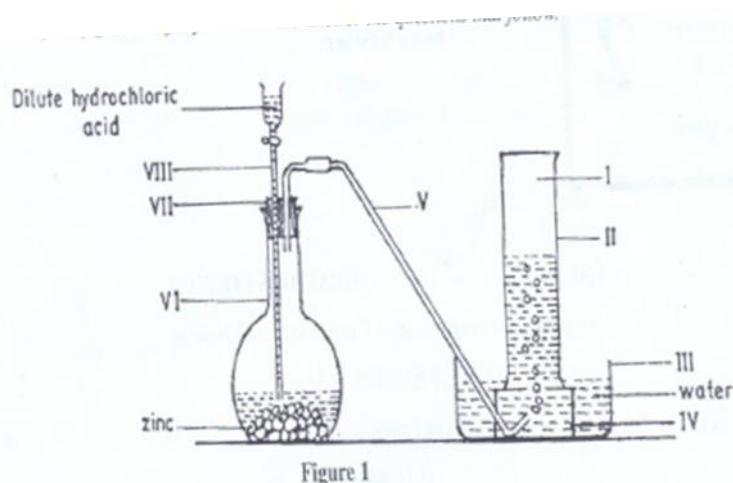
The following remedies were suggested:

- (1) Teachers should involve their candidates in more practical work.
- (2) More graph work by students must be enforced by teachers.
- (3) Teachers must insist on correct spelling of scientific words during lessons.
- (4) Students should read story books and take their lessons in English language more seriously.

## 5. DETAILED COMMENTS

### Question 1

Figure 1 is an illustration of a set-up for the preparation of gas in the laboratory. Study the figure carefully and use it to answer the questions that follow.



- (a) Name the parts labelled I, II, III, IV, V, VI, VII and VIII.
- (b) (i) Name the gas produced.  
(ii) How could the gas produced be tested for?  
(iii) State two uses of the gas named in (i) above.
- (c) Write a balanced chemical equation for the reaction that occurred.
- (d) Suggest two suitable metals which could be used instead of the zinc.
- (e) State two precautions that should be taken in this experiment.
- (a) Performance of candidates in answering this sub-question part of the question was encouraging. Candidates correctly named the labelled parts as I – Hydrogen gas / Gas, II – Gas jar/ cylinder, III - Trough / Basin , IV - Beehive stand / Beehive shelf / beehive, V - Delivery tube / Glass tube, VI - Flat bottomed flask, VII - Rubber bung/ cork/ Rubber stopper and VIII - Thistle funnel.
- (b) Many candidates named the gas produced in as hydrogen and described how it could be tested. They stated that a lighted / glowing splint is lowered into a gas jar of hydrogen and a pop sound is heard. Candidates were able to state the uses of hydrogen gas . Their answers included filling balloons, fuel for rockets, hardening of oils to make margarines

/ cooking fats, conversion of coal to synthetic petrol, in oxy- hydrogen /acetylene flame for cutting/ welding of steel, manufacturing of ammonia and as a reducing agent.

- (c) This sub-question was poorly answered by most candidates. In writing compounds products and reactants capital and small letters used must be unambiguous. Candidates must pay attention to the sizes of letters whose small and capital letters are the same. The expected chemical equation was:



- (d) Response of the majority of the candidates to this sub question was encouraging. The candidates suggested suitable metals such as calcium, magnesium, aluminium and iron.
- (e) This sub-question was difficult for most candidates. Candidates were expected to state the precautions which included:
- The thistle funnel must be immersed in the dilute hydrochloric acid solution in the flat bottomed flask;
  - The rubber cork must be fitted into the flat bottomed flask properly to make it airtight/ stopper must be airtight;
  - Water in the trough must cover the open end of the gas jar and No source of flame/ fire near the set up.

## Question 2

**In an experiment to investigate the relationship between the density of a cuboid and its mass, five cuboids of different masses,  $M_1$ ,  $M_2$ ,  $M_3$ ,  $M_4$  and  $M_5$  of equal dimensions were used. The mass of each of the cuboids was determined using a weighing balance. The volume,  $V$ , of one of the cuboids was determined by measuring the length ( $l$ ), breadth ( $b$ ) and height ( $h$ ).**

**Figure 2a below represents the masses,  $M_1$ ,  $M_2$ ,  $M_3$ ,  $M_4$  and  $M_5$  while figure 2b represents the diagram of one of the cuboids.**

**Study the figures carefully and answer the questions that follow.**

Study the figures carefully and answer the questions that follow.

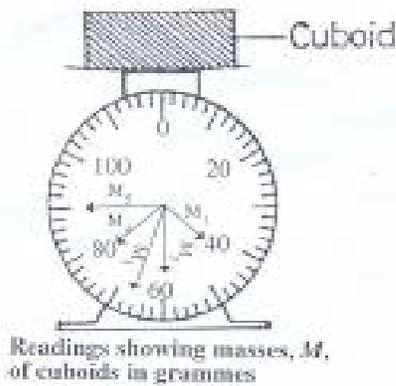


Figure 2a

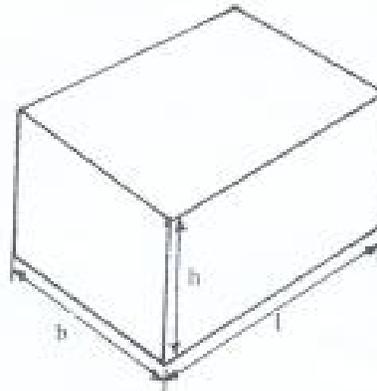


Figure 2b

- (a)
- (i) Read and record the mass  $M = M_1, M_2, M_3, M_4$  and  $M_5$ .
  - (ii) Measure and record the length ( $l$ ), breadth ( $b$ ), and height ( $h$ ) of the cuboid in Figure 2b.
  - (iii) Calculate the volume ( $V$ ) of the cuboid in Figure 2b.
  - (iv) Determine the ratio for each of the cuboids.
  - (v) Tabulate the results obtained in (i) and (iv) in your answer booklet using the table shown below.

M/g	$M_1 =$	$M_2 =$	$M_3 =$	$M_4 =$	$M_5 =$
$\frac{M}{V}$	$\frac{M_1}{V} =$	$\frac{M_2}{V} =$	$\frac{M_3}{V} =$	$\frac{M_4}{V} =$	$\frac{M_5}{V} =$

- (b) Plot a graph with  $M$  on the vertical axis and  $\frac{M}{V}$  on the horizontal axis.
- (c)
- (i) Determine the slope of the graph.
  - (ii) What does the slope determined in (i) represent?

- (a) This sub-question was well-answered by majority of the candidates because they measured accurately the length, breadth and height of the cuboid. Quite a number of candidates obviously read the values of the masses  $M$  by looking at the figures that the

arrows pointed to on the scale. Candidates should have used a straight edge along the arrow line to the calibration to give the accurate reading. For example  $M_1$  seemed to be 40g but extension of arrow hit 43g calibration.

- (b) This sub-question was fairly answered by most candidates. In plotting a graph candidates should have rounded all figures to one decimal point. They erred trying to plot points for two decimal places. They labelled axes without correct units. In science, stated figures from measurement without units mean nothing. Every measurement must show in figures with corresponding units.
- (c) In calculating the slope a triangle is needed to give limitation of  $\frac{dx}{dy}$ . Candidates who drew no triangle could not score for slope. The value of the slope should be accompanied by unit to score. Most candidates could state the significance of the slope which represents the volume of the cuboid.

### Question 3

**Figure 3 below is an illustration of a farm animal. Study the figure and answer the questions that follow.**

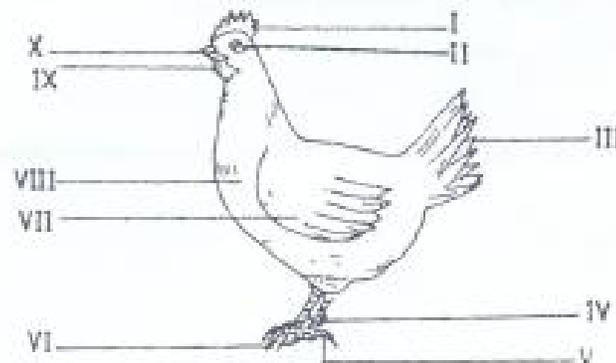


Figure 3

- (a) **Identify the farm animal illustrated.**
- (b) (i) **Name the parts labelled I, II, III, IV, V, VI, VII, VIII, IX, and X.**  
(i) **State one function each of the following labelled parts:**  
( ) **VI;**  
( ) **VII;**

( ) X.

- (c) (i) **Name the management practice that could be carried out on the part labelled X.**
- (ii) **State two advantages of the practice named in (i) above.**
- (d) (i) **Name one endoparasite that infests the farm animal illustrated.**
- (ii) **State one way of controlling the parasite named in (i) above.**
- (e) **State two reasons why the illustrated farm animal is reared.**

- (a) Most candidates identified the farm animal as domestic fowl/ hen/cock / fowl / chicken.
- (b) Performance of candidates in this sub-question was very encouraging. Many candidates stated correctly the labelled parts as I - Comb , II - Eye, III - Feathers / Saddle feather/ Tail, IV - Spur, V - Toe/ Digit, VI - Claw/ Nail, VII - Wing ,VIII - Breast / Body, IX - Wattle, X – Beak. Some candidates wrongly stated that Part VI was used for walking but the expected function was for scratching the ground for food / scratching body. However, many candidates correctly stated the functions of VII and X.
- (c) Most candidates were able to state the name of the management practice correctly as debeaking. Also, they were able to state the advantages of debeaking. Some of their responses included: to reduce wastage of food /eat better, to prevent / stop cannibalism/ pecking and to prevent the breaking of eggs/causing damage to egg. It is also important for candidates to understand that pecking constitutes cannibalism so they are the same concept therefore cannot be scored separately.
- (d) Majority of the candidates were able to name an endoparasite that infests the domestic fowl. Some their responses included tape worm, roundworm and nematode /eel worm. It is important to note it was not correct to state ‘worm’ as endoparasite of fowl. Many candidates correctly stated the ways in which the named parasite could be controlled. Some of the correct answers of the candidates included: the avoidance of creating dump stops for the development of worm’s eggs/ good sanitation, carrying out routine deworming of the birds, use of recommended dewormer/drug and drenching.
- (e) Most candidates answered this sub-question correctly, the commonly stated answers included: provision of food / meat/ eggs for human consumption, source of employment, provision of income for farmers, the droppings from birds can be used for fertilizing the soil, feathers of poultry can be used for decoration, feathers can be prepared and used as source of protein for farm animals, feathers can also be used for making pillows, research and medicinal /religion purpose.

#### **Question 4**

- (a) **Construct a food chain using the organisms listed below:  
hawk, grasshopper, frog, grass.**
- (b) **Figure 4 illustrates a reflex arc in a human.  
*Study the figure carefully and answer the questions that follow.***

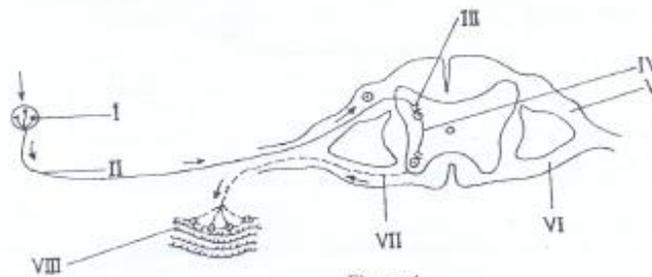
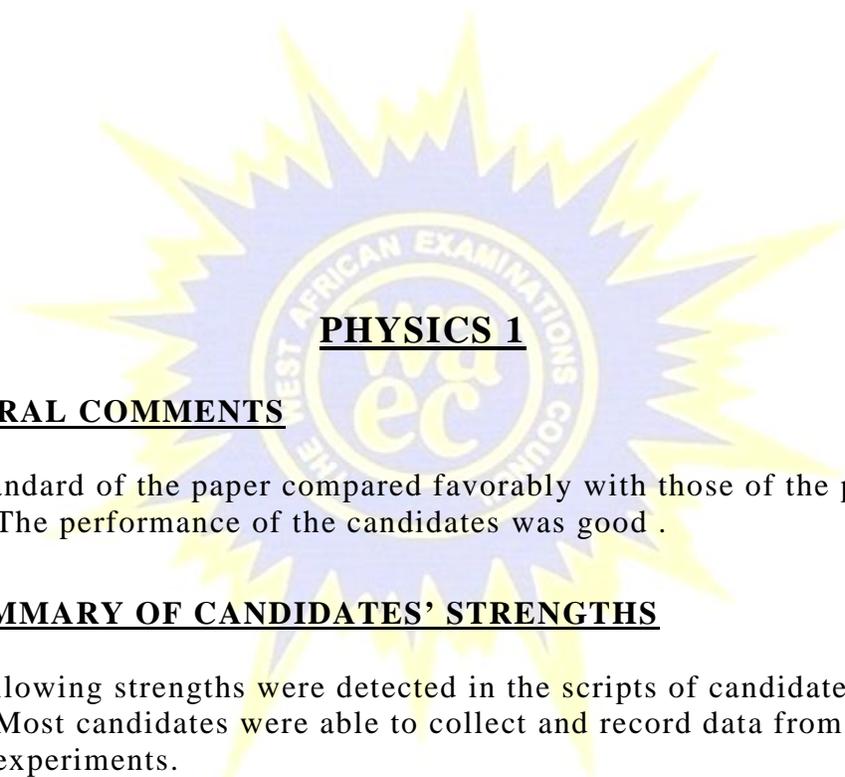


Figure 4

- (i) Name the parts labelled I, II, III, IV, V, VI, VII and VIII.
- (ii) State one function each of the following labelled parts:
- ( ) I;
  - ( ) III;
  - ( ) VIII.
- (iii) Explain what would happen when each of the following labelled parts is damaged:
- ( ) V;
  - ( ) VI.
- (a) Performance of candidates in this sub-question was not encouraging. Most candidates constructed the food chain correctly:  
Grass Grasshopper Frog Hawk.  
However, a few candidates did not show correct direction of arrows. Candidates must note that food chain is simply a chain of producers and ending in a consumer. Therefore, it cannot be cyclic but linear with arrows linking the producers.
- (b) Many candidates could not label the diagram correctly. They labelled part which is neurones as nerves, however, a few of them named labelled parts as follows: I (sensory ) receptor, II (sensory neurone /afferent neurone, III ( synapse), IV ( relay/ intermediate neurone), V (dorsal root ), VI ( ventral root), VII –(motor /afferent neurone), VIII (effector / muscle). Candidates could not explain what would happen if the labelled part V is damaged. The expected answer was that damage to dorsal root was damage to sensory cells hence break the impulse transfer between sensory cell and central nervous system/ spinal cord, impulses / message could get into the spinal cord. Also, what would happen when the part labelled VI is damaged. Here, the expected response was that the damaged of the ventral root would damage the motor neurons, impulses / message leaving the spinal cord cannot get to the effector muscle.



## **PHYSICS 1**

### 1. **GENERAL COMMENTS**

The standard of the paper compared favorably with those of the previous years. The performance of the candidates was good .

### 2. **A SUMMARY OF CANDIDATES' STRENGTHS**

The following strengths were detected in the scripts of candidates.

- (1) Most candidates were able to collect and record data from the experiments.
- (2) Most of the candidates were able to state correctly the appropriate scales of graphs drawn.
- (3) Candidates were able to summarise data collected, processed and presented them in a composite table.
- (4) Many candidates used large right-angled triangle in computing slopes of their graphs.

### 3. **A SUMMARY OF CANDIDATES' WEAKNESSES**

Candidates exhibited the following weaknesses:

- (1) Data collected by most candidates did not have units and /or were not written to the appropriate decimal place.
- (2) Some candidates did not know how to read and record intercept values

- of graphs drawn.
- (3) The section (b) of every question which was based on the practical performed was generally poorly answered.

4. **SUGGESTED REMEDIES**

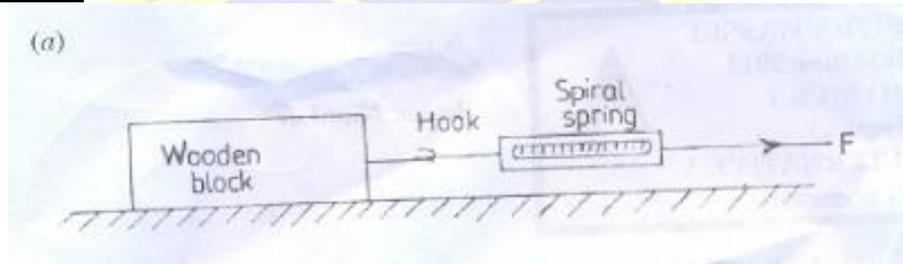
The following remedies were suggested:

- (1) Candidates should spend time to study the subject physics, particularly the theory, to facilitate the understanding and handling of the practical question.
- (2) Students should be exposed to the practical lessons early. This will enable them to practice graph plotting and how to read intercept.
- (3) Candidates should learn to record data to the accuracy of the instrument/equipment used.

5. **DETAILED COMMENTS**

**ALTERNATIVE A**

**Question 1**



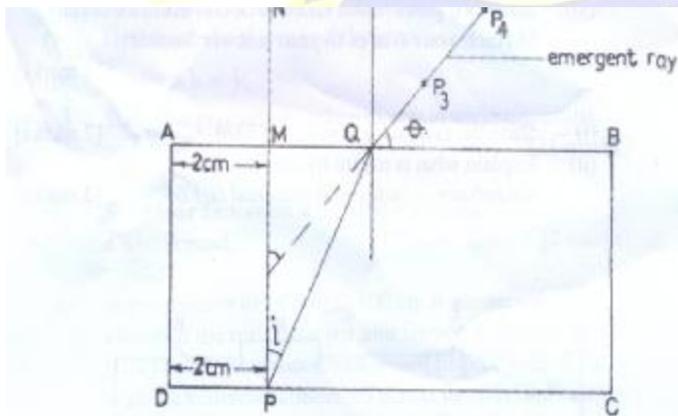
- (a) You are provided with a wooden block to which a hook is fixed; set of masses, spring balance and other necessary materials. Using the diagram above as a guide, carry out the following instructions.
- (i) Record the mass  $m_0$  indicated on the wooden block.
  - (ii) Place the block on the table.
  - (iii) Attach the spring balance to the hook.
  - (iv) Pull the spring balance horizontally with a gradual increase in force until the block just starts to move. Record the spring balance reading  $F$ .
  - (v) Repeat the procedure by placing in turn mass  $m = 200, 400, 600$  and  $800\text{g}$  on top of the block. In each case, read and record the corresponding value of  $F$ .

- (vi) Evaluate  $M = m_0 + m$  and  $R =$  in each case.
  - (vii) Tabulate your readings.
  - (viii) Plot a graph with  $F$  on the vertical axis and  $R$  on the horizontal axis.
  - (ix) Determine the slope,  $s$ , of the graph.
  - (x) State two precautions taken to ensure accurate results.
- (b)
- (i) Define coefficient of static friction.
  - (ii) A block of wood of mass 0.5 kg is pulled horizontally on a table by a force of 2.5 N. Calculate the coefficient of static friction between the two surfaces. [ $g = 10\text{ms}^{-2}$ ]

(a) This question was satisfactorily answered. Many candidates were able to complete a composite table of summarised data and use the data to plot the graph. They calculated correctly the slope of the graph drawn using a larged triangle. However, they did not record the value of  $F$  corresponding to  $m_0$ . Those who recorded the value of  $F$  did so without units. Candidates stated precautions in unaccepted language. Most candidates stated the precautions in command language.

(b) Many candidates could not define coefficient of static friction. They were able to recall the relation. However, they failed to convert the given mass into newtons and hence ended up obtaining the wrong ratio.

## Question 2

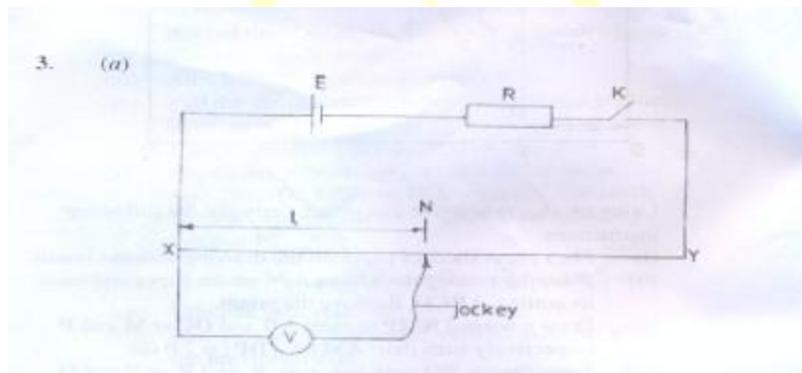


- (a) Using the diagram above as a guide, carry out the following instructions:
- (i) Fix a plane sheet of paper on the drawing cellotex board.
  - (ii) Place the rectangular glass prism on the paper and trace its outline, ABCD. Remove the prism.
  - (iii) Draw a normal NMP to meet AB and DC at M and P respectively such that  $|AM| = |DP| = 2.0\text{cm}$ .

- (iv) Trace the ray PQ with two pins, P<sub>1</sub> and P<sub>2</sub> at P and Q respectively such that angle MPQ = i = 5°.
  - (v) Replace the prism on its outline. Trace the emergent ray with two other pins P<sub>3</sub> and P<sub>4</sub> such that they lie in a straight line with P<sub>2</sub> and the image of P<sub>1</sub> viewed through the glass prism.
  - (vi) Measure and record, the angle between the emergent ray and face AB of the glass prism.
  - (vii) Evaluate cos and sin i.
  - (viii) Repeat the procedure for four other values of i = 10°, 15°, 20° and 25°.
  - (ix) Tabulate your readings.
  - (x) Plot a graph with cos on the vertical axis and sin i on the horizontal axis.
  - (xi) Determine the slope, s, of the graph.
  - (xii) State two precautions taken to obtain accurate results.  
(Attach your traces to your answer booklet)
- (b) (i) State the laws of refraction of light.  
(ii) Explain what is meant by the statement:  
*the refractive index of a material is 1.65.*
- (a) Candidates who attempted this question answered it satisfactorily. Candidates presented neat traces of ray diagrams and composite table of results. Many candidates correctly plotted the required graph and appropriately determined the slope of the graph plotted.
- (b) Many candidates could not correctly state the laws of refraction. They failed to realise that the ratio  $\sin i / \sin r$  is for a pair of media. Also, they could not explain the meaning of the given statement.

### Question 3

(a)



You are provided with a potentiometer XY, a voltmeter, V, a standard resistor, an accumulator, E, a plug key, K, a jockey and connecting wires.

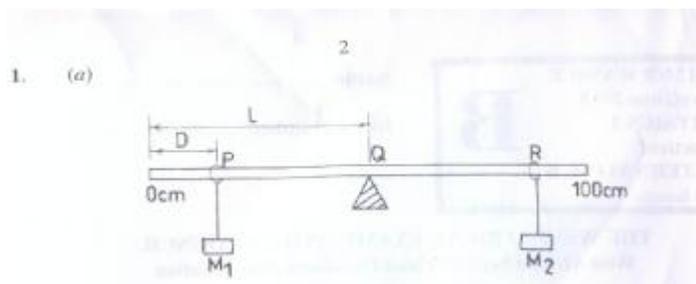
- (i) Connect a circuit as shown in the diagram above.
  - (ii) Close the key and use the jockey to make contact with the potentiometer wire XY at a point N such that  $l = XN = 15\text{cm}$ .
  - (iii) Read and record the value of the potential difference  $V$  on the voltmeter.
  - (iv) Evaluate  $I^{-1}$  and  $V^{-1}$ .
  - (v) Repeat the procedure for five other values of  $l = 25, 35, 45.55$  and  $65\text{cm}$  respectively.
  - (vi) Tabulate your readings.
  - (vii) Plot a graph with  $V^{-1}$  on the vertical axis and  $I^{-1}$  on the horizontal axis, starting both axes from the origin  $(0,0)$ .
  - (viii) Determine the slope,  $s$ , of the graph.
  - (ix) Evaluate  $k =$  .
  - (x) State two precautions taken to obtain accurate results.
- (b)
    - (i) State four factors on which the resistance of a wire depend.
    - (ii) A resistance wire of length  $100\text{cm}$  is connected in a circuit. If the resistance per unit length of the wire is  $0.02\text{ cm}^{-1}$ , how much heat would be produced in the wire if a voltmeter connected across its ends indicates  $1.5\text{V}$  while the current runs for 1 minute?

- (a) This question was satisfactorily answered. Many candidates were able to measure six values of  $l$  and read the corresponding values of  $V$  and completed a composite table. Many candidates plotted the appropriate graph and determined the slope. However, they read the intercept wrongly. Precautions were fairly well stated by most candidates.
- (b) Many candidates were able to state the factors on which the resistance of a wire depend. These are the length of the wire, the thickness of the wire, nature of the wire and the temperature of the wire. They were also able to recall the relation correctly and substituted the given values to obtain the heat required.

## ALTERNATIVE B

### Question 1

(a)

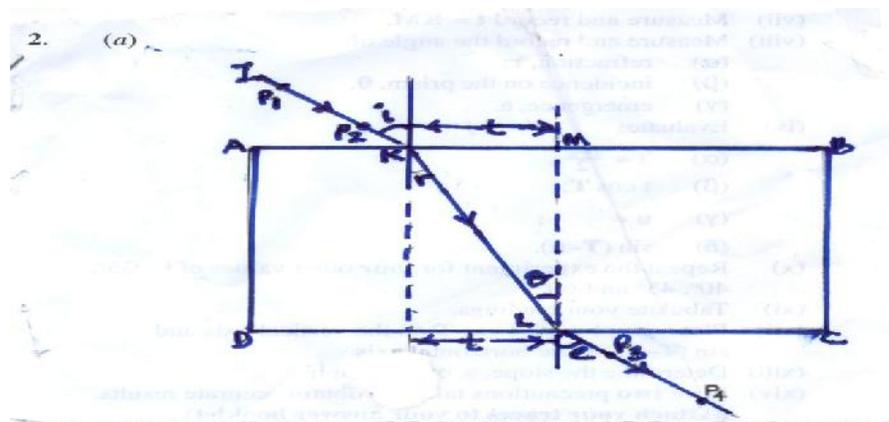


You are provided with two masses,  $M_1$  and  $M_2$ , a uniform metre rule, a knife-edge and a piece of thread.

- (i) Suspend the mass  $M_1$ , by means of a thread on the metre rule at P a

- distance  $D = 5\text{cm}$  from the  $0 - \text{cm}$  end of the rule.
- (iii) Suspend  $M_2$  on the other side of the rule. Balance the loaded metre rule horizontally on the knife-edge at Q, the centre of gravity of the metre rule, by adjusting the position of  $M_2$ .
  - (iii) Read and record the position R of suspension of  $M_2$ . Keep  $M_2$  fixed at this point throughout the experiment.
  - (iv) Read and record the distance L of the pivot from the  $0 - \text{cm}$  mark of the metre rule.
  - (v) Repeat the procedure for four other values of  $D = 10, 15, 20$  and  $25\text{cm}$ . Each time, the loaded metre rule is balanced horizontally by adjusting the position of the knife-edge while keeping  $M_2$  fixed at R.
  - (vi) Read and record the corresponding values of L in each case.
  - (vii) Tabulate your readings.
  - (viii) Plot a graph with L on the vertical axis and D on the horizontal axis, starting both axes from the origin (0, 0).
  - (ix) Determine the slope, s, of the graph and the intercept, c, on the vertical axis.
  - (x) Given that m and s are related by the equation, obtain a value for m.
  - (xi) State two precautions taken to ensure accurate results.
- (b)
    - (i) State two conditions under which a rigid body at rest remains in equilibrium when acted upon by three non-parallel coplanar forces.
    - (ii) Explain how the positions of the centre of gravity of a body affects the equilibrium of the body.
- (a) This question was satisfactorily answered by candidates who attempted it. However, few candidates failed to record the measured values of D and L to one decimal place. Measured quantities were recorded in a composite table and graphs plotted and slopes determined. Precautions were also correctly stated.
  - (b) Many candidates could state the conditions under which a rigid body remains in equilibrium when acted upon by non-parallel coplanar forces. Candidates could not explain how the centre of gravity of a body affects its equilibrium. When the centre of gravity of a body is low relative to the ground, then the body will be in a stable equilibrium and when the centre of gravity is high, the body is in unstable equilibrium.

## Question 2

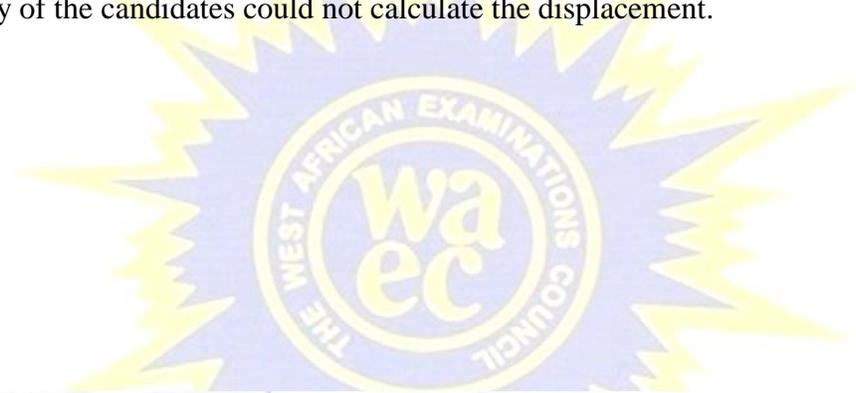


- (a) You are provided with a rectangular glass prism, a board, optical pins and other necessary materials.
- (i) Place the glass prism on the drawing paper and trace its outline ABCD.
  - (ii) Remove the glass prism; draw a straight line JK such that it makes an angle  $i = 30^\circ$  with the normal at point K on side AB as illustrated in the diagram above.
  - (iii) Fix two pins  $P_1$  and  $P_2$  vertically on line JK. Replace the prism the outline.
  - (iv) Looking through the face DC of the prism, fix two other pins  $P_3$  and  $P_4$  such that they appear to be in a straight line with the images of  $P_1$  and  $P_2$ .
  - (v) Remove the prism and pins. Draw a line to join the positions of  $P_4$  and  $P_3$  and produce the line to meet DC at L.
  - (vi) Draw a normal at L and produce it to meet AB at M.
  - (vii) Measure and record  $t = KM$ .
  - (viii) Measure and record the angle of:
    - ( ) refraction  $r$ ; .
    - ( ) incidence  $n$  the prism;
    - ( ) emergence,  $e$ .
  - (ix) Evaluate:
    - ( )  $T =$
    - ( )  $t \cos T$ ;
    - ( )  $u =$  ;
    - (<sup>u</sup>)  $\sin (T-u)$ .
  - (x) Repeat the experiment for four other values of  $i = 35^\circ, 40^\circ, 45^\circ$  and  $60^\circ$ .
  - (xi) Tabulate your readings.
  - (xii) Plot a graph with  $t \cos T$  on the vertical axis and  $\sin (T-u)$  on the horizontal axis.
  - (xiii) Determine the slope,  $s$ , of the graph.
  - (xiv) State two precautions taken to obtain accurate results.

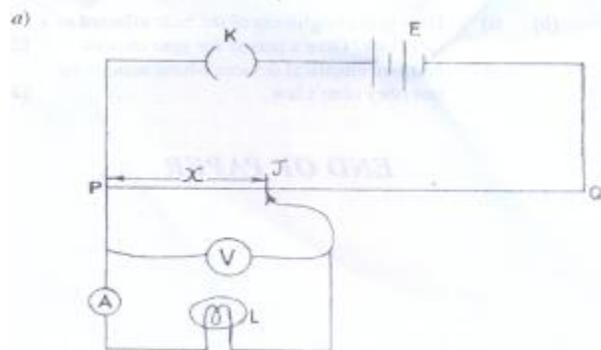
- (b) (i) Distinguish between *deviation* and *refraction*.  
 (ii) A rectangular glass prism of refractive index 1.06 and thickness 1.6cm is placed on a point object. The object is viewed vertically from above the prism. Calculate the apparent displacement of the object.

(a) There was not enough information provided to enable candidates answer this question satisfactorily. The question was incomplete. Candidates who attempted this question, provided neat traces of ray diagrams but could not plot the appropriate graph and determine the slope because the information provided was insufficient.

(b) Many candidates could differentiate between deviation and refraction. They must note that refraction is the change in direction of light as it travels from one medium to another medium of different refractive index whilst deviation is change in the direction of light either due to reflection or refraction. The medium need not be different. Majority of the candidates could not calculate the displacement.



### Question 3



You are provided with cells, a potentiometer, an ammeter, a voltmeter, a bulb, a key, a jockey and other necessary materials.

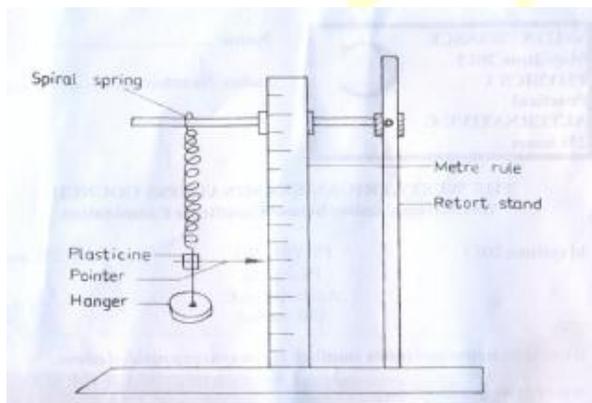
- (i) Measure and record the *emf* of the battery.
- (ii) Set-up a circuit as shown in the diagram above.
- (iii) Close the key K and use the jockey to make a firm contact at J on the potentiometer wire such that  $PJ = x = 10\text{cm}$ .
- (iv) Take and record the voltmeter reading V and corresponding ammeter reading I.

- (v) Evaluate  $\log V$  and  $\log I$ .
  - (vi) Repeat the procedure for other values of  $x = 20, 30, 40, 50$  and  $60\text{cm}$ .
  - (vii) Tabulate your readings.
  - (viii) Plot a graph with  $\log I$  on the vertical axis and  $\log V$  on the horizontal axis.
  - (ix) Determine the slope,  $s$ , of the graph.
  - (x) Determine the intercept,  $c$ , on the vertical axis.
  - (xi) State two precautions taken to obtain accurate results.
- (b)
- (i) How is the brightness of the bulb affected as  $x$  increases? Give a reason for your answer.
  - (ii) List two electrical devices whose actions do not obey ohm's law.
- (a) Candidates who attempted this question answered it satisfactorily. Candidates correctly read values of  $V$  and  $I$  for corresponding values of  $X$ . The correct graph was plotted and slope calculated using a large right-angled triangle. Many candidates could not correctly read the intercept,  $c$ , on the vertical axis.
- (b) Devices which do not obey Ohm's law are capacitors, thermistors, diode valves, transistors and thyristors.

## ALTERNATIVE C

### Question 1

(a)



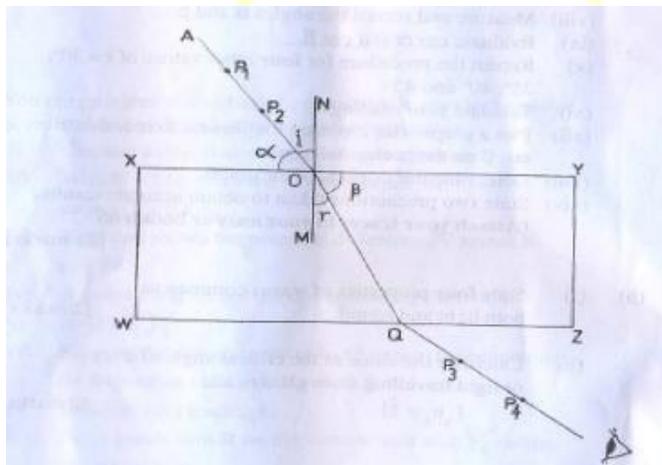
You have been provided with a retort stand, clamp and boss; a metre rule; a spiral spring, a set of slotted weights and a pointer.

- (i) Set-up the apparatus as illustrated in the diagram above.

- (ii) Read and record the length,  $l_0$  of the spiral spring.
  - (iii) Place a mass  $m = 50\text{g}$  on the hanger.
  - (iv) Read and record the new length,  $l$ , of the spring.
  - (v) Determine the extension  $e = l - l_0$ .
  - (vi) Set the system into small vertical oscillations. Measure and record the time,  $t$  for 10 complete oscillations.
  - (vii) Determine the period,  $T$ , of the oscillations and evaluate  $T^2$ .
  - (viii) Repeat the procedure for four other values of  $m = 100, 150, 200$  and  $250\text{g}$ .
  - (xi) Tabulate your readings.
  - (x) Plot a graph with  $e$  on the vertical axis and  $T^2$  on the horizontal axis.
  - (xi) Determine the slope,  $s$ , of the graph.
  - (xii) Evaluate  $b = 4\pi^2 s$ .
  - (xiii) State two precautions taken to obtain accurate results.
- (b) (i) State Hooke's law for an elastic material.
- (ii) A spiral spring is compressed by  $0.03\text{m}$ . Calculate the energy stored in the spring if its force constant is  $300\text{Nm}^{-1}$ .
- (a) This question was poorly answered by most candidates. They recorded the values of extension produced without the  $l_0$  and  $l$  readings. Some candidates used the raw values of time  $t$ , for the period  $T$ . This led to the wrong graphs being plotted.
- (b) Many candidates were able to state Hooke's law. They were able to recall the relation and substituted the parameters to obtain the energy required.

## Question 2

(a)



Using the diagram above as a guide carry out the following instructions:

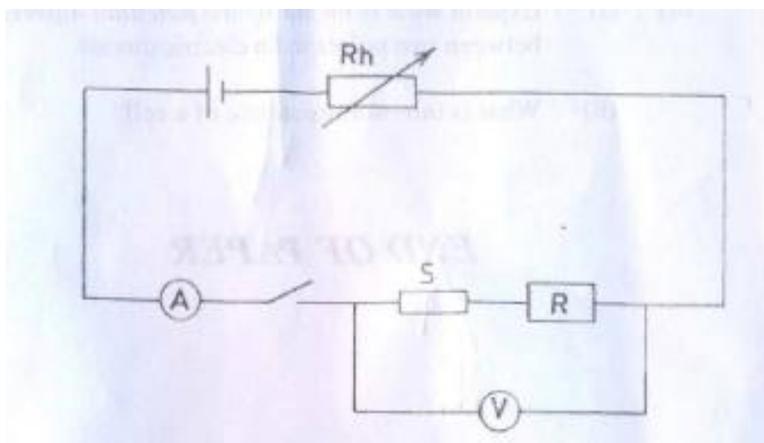
- (i) Fix the sheet of paper provided on the drawing board. Place the rectangular glass prism on the paper and trace its outline WXYZ.
  - (ii) Remove the prism. Select a point on XY close to the middle, and draw a normal NM through it.
  - (iii) Draw a straight line AO making an angle  $i = 25^\circ$  with the normal at O.
  - (iv) Replace the prism on its outline.
  - (v) Place two pins  $P_1$  and  $P_2$  vertically on AO.
  - (vi) Looking through side WZ, place two other pins  $P_3$  and  $P_4$  such that they fall on the same straight line with the images of  $P_1$  and  $P_2$ .
  - (vii) Remove the prism. Draw a straight line through the pin holes of  $P_4$  and  $P_3$  to meet WZ at Q. Join OQ.
  - (viii) Measure and record the angles  $r$  and  $i$ .
  - (ix) Evaluate  $\cos r$  and  $\cos i$ .
  - (x) Repeat the procedure for four other values of  $i = 30^\circ, 35^\circ, 40^\circ$  and  $45^\circ$ .
  - (xi) Tabulate your readings.
  - (xii) Plot a graph with  $\cos r$  on the vertical axis and  $\cos i$  on the horizontal axis.
  - (xiii) Determine the slope,  $s$ , of the graph.
  - (xiv) State two precautions taken to obtain accurate results.  
(Attach your traces to your answer booklets)
- (b) (i) State four properties of waves common to both light and sound.
- (ii) Calculate the value of the critical angle of a ray of light travelling from glass to air.

$$\left[ {}_g n_a = \frac{2}{3} \right]$$

- (a) Candidates who attempted this question produced neat traces of ray diagrams. They were able to collect data and summarised the data into a composite table. Graphs were correctly plotted with well labelled axes. Some candidates however did not record values of  $\cos r$  and  $\cos i$  to at least three decimal places. The accuracy of the slope obtained was also poor.
- (b) Majority of the candidates were not able to state the properties common to both light and sound. The expected answers included: reflection, refraction, interference and diffraction. Also, they were able to calculate the required critical angle.

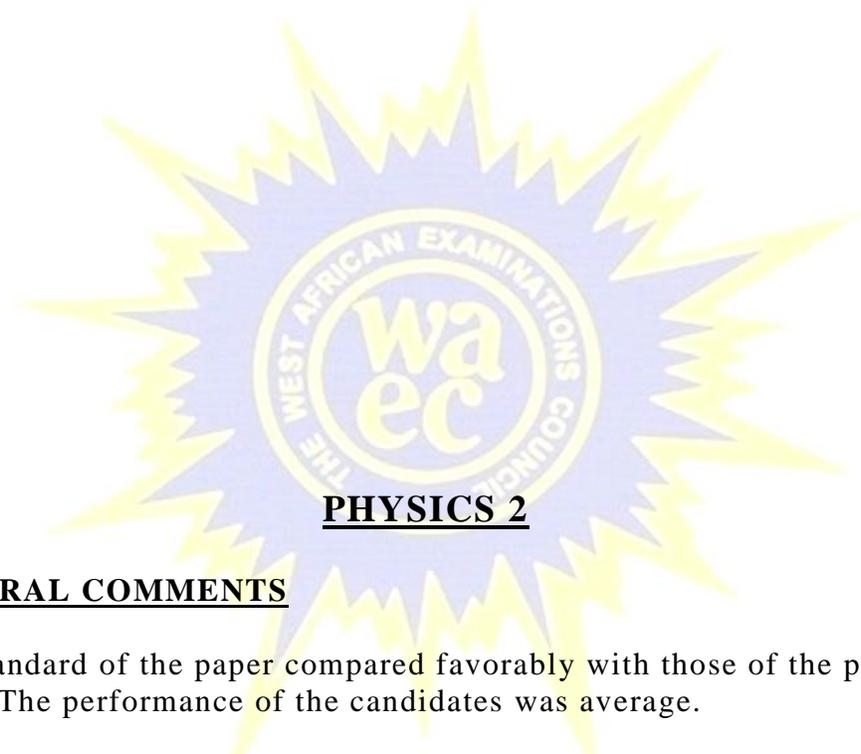
### Question 3

- (a)



**You are provided with a battery, rheostat  $R_h$ , standard resistor  $S$ , resistance box  $R$  and other necessary apparatus.**

- (i) **Connect a circuit as shown in the diagram above.**
  - (ii) **With  $R = 2 \Omega$ , close the key and adjust  $R_h$  to set the current  $I = 0.8A$ .**
  - (iii) **Read and record the potential difference,  $V$  across  $S$  and  $R$ .**
  - (iv) **Also read and record the corresponding current,  $I$ .**
  - (v) **Evaluate  $v/I$ .**
  - (vi) **Keeping the rheostat setting fixed, repeat the procedure for four other values of  $R = 4 \Omega, 6 \Omega, 8 \Omega$  and  $10 \Omega$ .**
  - (vii) **Tabulate your readings.**
  - (viii) **Plot a graph with  $R$  on the vertical axis and  $v/I$  on the horizontal axis.**
  - (ix) **Determine the slope,  $s$ , of the graph and the intercept,  $c$ , on the vertical axis.**
  - (x) **State two precautions taken to obtain accurate results.**
- (b)
- (i) **Explain what is meant by the potential difference between two points in an electric circuit.**
  - (ii) **What is internal resistance of a cell?**
- (a) Many candidates who attempted this question were able to measure  $I$  values for various values of  $R$ . The information obtained was processed, tabulated and the appropriate graph plotted. The slope of the graph plotted was calculated using a large right-angled triangle. Many candidates however read the Intercept wrongly. Precautions were also poorly stated.
- (c) Majority of the candidates could properly explain the terms. They must know that the work done when one coulomb of electric charge moves from one point to another is the potential difference between the two points. Also, the Internal resistance of a cell is the opposition to the flow of current by the cell.



## **PHYSICS 2**

### 1. **GENERAL COMMENTS**

The standard of the paper compared favorably with those of the previous years. The performance of the candidates was average.

### 2. **A SUMMARY OF CANDIDATES' STRENGTHS**

The candidates were commended for the following features:

- (1) Candidates were able to evaluate complex calculations involving exponents.
- (2) Terms, quantities and phenomena were well defined or correctly explained.
- (3) For questions involving calculations, many candidates provided the correct unit of measurement for their final answer.

### 3. **A SUMMARY OF CANDIDATES' WEAKNESSES**

Candidates exhibited the following weaknesses:

- (1) Candidates generally exhibited lack of understanding and application

- of concepts principles and phenomena.
- (2) Candidates seemed ill prepared for the examination. Many of the responses provided were poor, indicating that candidates did not treat many topics or did not revise adequately before taken the examination.
  - (3) Candidates could not express themselves well in the English Language. This made it difficult for examiners to understand the responses they provided.

#### 4. **SUGGESTED REMEDIES**

The following remedies were suggested:

- (1) Physics should be taught as a practical subject. Teachers are advised to cite examples in their lessons that relate to the immediate environment of the students to enable them appreciate and grasp concepts and their applications.
- (2) Students should be exposed more to exercises and encourage to solve more questions from other text books and not only rely on exercises given in class.
- (3) Tutors must pay attention to the use of correct English Language in their lessons and ensure that candidates provide responses to exercises given in good English.

#### 5. **DETAILED COMMENTS**

##### **Question 1**

**An oil drop weighing  $1 \times 10^{-15} \text{ N}$  and carrying a charge of  $1 \times 10^{-19} \text{ C}$  is found to remain at rest in a uniform electric field of intensity  $E$ . Calculate the value of  $E$ .**

This was a very popular question and many candidates provided the correct answer.

##### **Question 2**

**Explain why at high temperatures the behavior of all gases approaches the ideal gas situation.**

Many candidates could not give the reasons why real gases are ideal gases at high temperatures. The reason is that at high temperatures, molecules move faster and thus the interaction between them is negligible leading to loss of attractive forces between them and hence the ideal nature.

### Question 3

- (a) **What is a parking orbit for a satellite.**
- (b) **State with reason an advantage of a space-based satellite transmission system over conventional ground-based transmission system for TV.**

Many candidates could not explain parking orbit. They must note that it is an orbit in which the period of the satellite is exactly equal to the period of rotation of the earth about its axis. Also, space-based satellite covers large area of the earth's surface whereas a ground-based system needs many transmitters and repeated stations to cover large areas because of hills/obstacles.

### Question 4

- (a) **What is meant by dimension of a physical quantity?**
- (b) **For a uniformly accelerated motion in a straight line,  $v^2 = u^2 + 2as$ , where  $v$  is the final velocity,  $u$  is the initial velocity,  $a$  is the acceleration and  $s$  is the distance covered. Show that  $u^2$  and  $2as$  are dimensionally equivalent.**

Many candidates were able to explain what the dimension of the physical quantity is, but majority could not show that the dimensions of  $U^2$  and  $2as$  in the equation  $V^2 = U^2 + 2as$ , were the same.

### Question 5

**Explain briefly the voltage-current characteristics of a  $p-n$  junction when reverse biased.**

The candidates could not explain the reverse bias characteristics of a  $p-n$  junction. The low current is caused by the flow of minority carriers, the increased in potential barrier and the depletion layer at the junction.

### Question 6

**A piano tuner hears 3 beats per second when tuning fork and a note are sounded together and 6 beats when the string is tightened. What should the tuner do next, tighten or loosen the string? Explain.**

Many candidates did not understand the question. It is important for them to note that a piano tuner tunes the piano to avoid beats. Beats are not heard if the two notes are in tune. The tuner should loosen the string to reduce the tension and hence the frequency.

### Question 7

**List three devices in everyday life which operate on the deflection of electric charges in a magnetic field.**

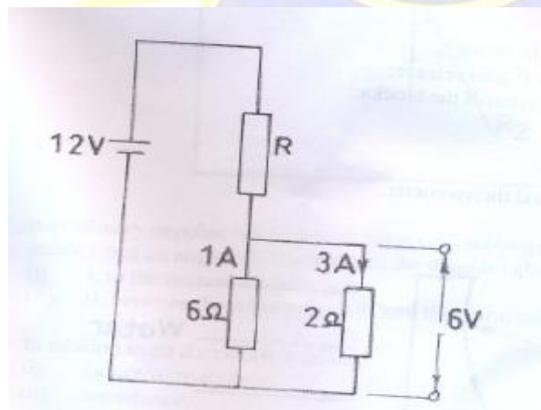
Many candidates could give examples of devices that operate on the deflection of electric charges in a magnetic field. Some examples are cathode ray tube, computer monitor, television sets and mass spectrometer.

### **Question 8**

**List three uses of an oscilloscope.**

Majority of the candidates did not know the uses of an oscilloscope. The device is not known and use by candidates. The oscilloscope can be used to measure voltages. It is used for the measurements and comparisons of frequencies. It can also be used as a clock.

### **Question 9**



**The circuit diagram above represents a voltage divider network. If the voltage source is to supply a current of 3A, 6V to the 2 load, determine the value of R.**

This question was poorly answered by many candidates. Candidates needed to apply Kirchoff's law to enable them determine the value of R.

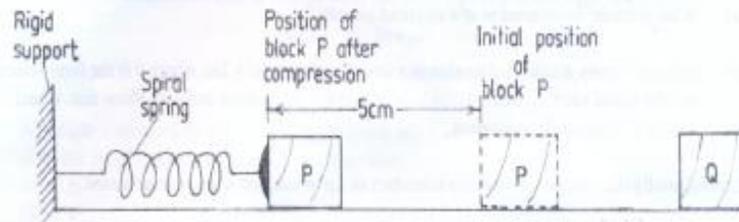
### **Question 10**

**The output of a two-input OR gate is connected to a NOT gate. Draw the resultant gate and the truth table for it.**

Many candidates did not know how a logic gate works and its truth table. Candidates should be taught how gates are combined to produce an equivalent gate and its truth table. This is a new area in the syllabus and should be emphasized.

**Question 11**

- (a) **State the triangle law of vector addition.**
- (b) **Name the four physical qualities that are associated with the equations of linear motion.**
- (c) **Using the same set of axes, sketch and label two graphs to illustrate the variation of potential energy and kinetic energy with time for a body in simple harmonic motion.**



- (d) **A light spiral spring of force constant  $k$  lies on a horizontal frictionless surface and has one end fixed to a vertical wall. A block P of mass  $2.0\text{kg}$  placed against the free end of the spring is pushed a distance  $5\text{cm}$  towards the wall with  $10\text{J}$  of energy as illustrated in the diagram above. The block is released and after  $0.25\text{s}$ , it collides inelastically with a stationary block Q of mass  $4.0\text{kg}$ .**

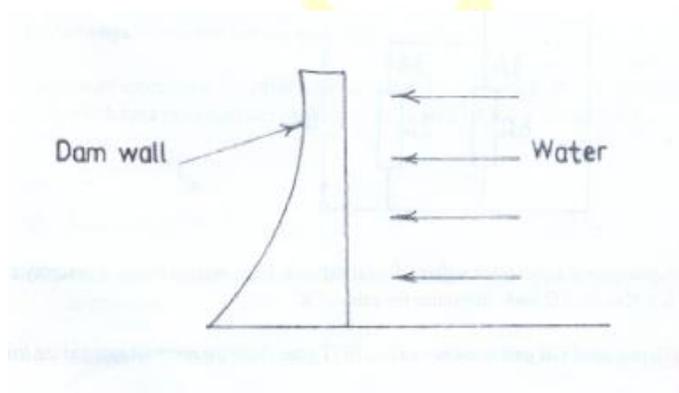
**Calculate the:**

- (i) **value of  $k$ ;**
  - (ii) **force used to compress the spring;**
  - (iii) **acceleration of the block P after release;**
  - (iv) **common speed after collision of the blocks.**
- (a) Many candidates could not state the triangular law of forces. The triangle law of vector addition states that if three forces are in equilibrium, they can be represented in magnitude and direction by the three sides of a triangle taken in order.
  - (b) Many candidates were able to give the physical quantities associated with linear motion. These were time, acceleration speed/velocity and distance /displacement.

- (c) Candidates were able to draw the two energy transformation diagrams on the same graph. However, labelling of the axes of the graph was difficult for some candidates.
- (d) This question was fairly well answered. Many candidates were able to determine the value of the spring constant  $k$  and the force used in compressing the spring. However, they could not determine the acceleration of the body when released as well as the common velocity of the block.

### **Question 12**

- (a) **Define heat capacity.**
- (b) **State two features of the clinical thermometer.**
- (c) **Explain why dam walls are thicker at the bottom than at the top.**



- (d) **The pressure of a perfect gas is given by the equation  $p = nmc^{-2}$ . State the meaning of the symbols in the equation.**
- (e) **Electrical energy from a 5.0V source supplying a current of 1.54A is passed through a liquid boiling at a steady temperature of 78.5°C for 6 minutes. Vapour of mass  $3.15 \times 10^{-3}$ kg from the boiling liquid is bubbled through  $7.56 \times 10^{-2}$ kg of the same liquid contained in a calorimeter of negligible thermal capacity, at an initial temperature of 28.05°C. If the final temperature is 43.5°C, calculate the:**
- (i) **specific latent heat of fusion  $L$ , of the liquid;**
- (ii) **specific heat capacity,  $c$  of the liquid.**
- (a) Many candidates were able to define heat capacity.
- (b) Majority of the candidates correctly stated the important features of a clinical thermometer. The most important features of a clinical thermometer are the kink and the short temperature range.
- (c) Some candidates could not state the basic fact of pressure increasing with depth in a liquid. This is easily demonstrated in a classroom with a tin can filled with liquid.

This question involves energy exchange or transformation. Many candidates were able to

write the relevant equations involving L and C and correctly determined the values of L and C.

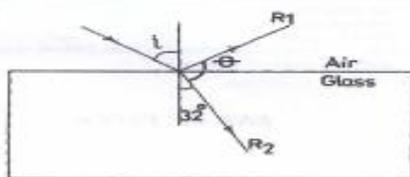
- (d) Many candidates could not explain the meaning of the symbols in the given equation. The meaning of the symbols in the equation are

$C^2$	-	mean square speed
n	-	number of moles
p	-	pressure of gas exerted on walls of container
m	-	mass of each molecule

- (e) Majority of the candidates performed well on this sub-question as they calculated correctly the specific latent heat of fusion and specific heat capacity of the liquid.

### Question 13

- (a) (i) Explain diffraction.  
(ii) Give two uses of diffraction.
- (b) Name two effects that a triangular glass prism produces white light passes through it.
- (c) (i) Sketch and label a diagram for the image formed by a converging lens if an object is situated at a distance between the focus  $f$  and twice the focal length  $2f$ .
- (d)



An ordinary unpolarized light is incident on a rectangular glass prism of refractive index 1.6 at an angle  $i$  as illustrated in the diagram above.

Calculate the value of:

- (i)  $i$ , to the nearest whole number.  
(ii)  $r$ , between the reflected ray  $R_1$  and the refracted ray  $R_2$ .
- (a) This sub-question was poorly answered by most candidates. They should note that diffraction is the spreading out of waves after passing through an aperture. They used the word 'bending' instead of spreading out. Diffraction should not be confused with refraction. The uses of diffraction is not known to them.

- (b) The two effects of light passing through a triangular glass prism are refraction and dispersion of the light ray and not diffraction as many candidates stated. Total internal reflection may also occur under special conditions.
- (c) Many candidates confused a converging lens with a converging mirror. A few candidates were able to sketch the appropriate ray diagram and gave the correct features of the image formed as real, inverted, Beyond  $2f$  on the other side and magnified.
- (d) This was a typical geometrical optics question and by studying the sketch carefully the problem could easily be solved. Many candidates were able to determine the value of the incident angle  $i$  and but not determine from the geometry of the sketch.

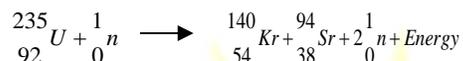
#### Question 14

- (a) **In relation to an *a.c* circuit, explain:**
- (i) **inductive reactance;**
  - (ii) **impedance.**
- (b) (i) **Explain eddy current.**
- (ii) **How are the effects of eddy currents minimized in a transformer?**
  - (iii) **State one use of eddy current.**
- (c) **A rectangular lantern battery charging unit contains a transformer which has 1375 turns of wire in its primary section. When connected to a mains 220 *V<sub>rms</sub>*, 50 Hz, it converts it into a 8 *V<sub>rms</sub>*, 500mA alternating supply.**
- (i) **State the frequency of the secondary output.**
  - (ii) **Calculate the:**
    - ( ) **number of turns in the secondary section;**
    - ( ) **current in the primary section;**
    - ( ) **power output of the transformer, assuming 100% efficiency.**
- (a) Many candidates could not explain inductive reactance and impedance in relation to an a.c. circuit. Inductive reactance is the opposition offered by an inductor to the flow of current in the circuit. Its units is ohm and it depends on the source of frequency. Impedance is the overall opposition to the flow of current by both resistive and reactive circuit components. It is measured in ohms and depends on the source of frequency.
- (b) Majority of the candidates could not explain what eddy current is neither could they state the use of eddy current. Eddy currents are induced currents in a solid metallic sheet as it cuts a magnetic field. The uses of eddy currents are used in the following ways:
- detecting metals in the soil;
  - the speedometer of vehicles;
  - detection of cracks in metals.
- (c) This was a straight forward application question and candidates were able to recall the formula, appropriately substituted the given parameters to arrive at the required power output.

### Question 15

- (a) Define excitation potential.
- (b) State two applications of atomic line spectra.
- (c) An electron in a tube is accelerated with a potential difference of 350 V from the cathode to the anode. Calculate the speed of emergence of the electron from the anode.  
[ $e = 1.6 \times 10^{-19}$  C,  $m_e = 9.1 \times 10^{-31}$  kg]
- (d) The following equations represent two nuclear reactions:

Reaction A:



Reaction B:



- (i) Identify each of the reactions.
- (ii) Distinguish between the two reactions under the following headings:
- ( ) raw materials;
  - ( ) radiation hazards;
  - ( ) control.
- (iii) State, with reason, the reaction which is more difficult to initiate.
- (iv) Give a natural example of reaction B.
- (a) Many candidates were able to define excitation potential as the energy required to move an electron from a lower energy state to a higher energy state
- (b) Candidates could not state the application of line spectra. Line spectra is used for identification of elements, production of laser and the study of stars.
- (c) Candidates who were able to recall the relation  $eV = \frac{1}{2}mv^2$  correctly substituted the given values of the parameters in the equation to obtain the required velocity.
- (d) This question was very well answered by many candidates. They were able to identify the given reactions as nuclear fission and nuclear fusion respectively. They were able to distinguish between nuclear fusion and nuclear fission under the given headings. Also, they were able to state that fusion reactions are more difficult to initiate because very high temperatures are required. They, however, mentioned the atomic bomb as a natural example of a fusion reaction. This was not correct, because the atomic bomb is man made. A natural example of a fusion reaction is reactions in the stars/sun.

