

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION**

MAY/JUNE 2012

**AGRICULTURAL SCIENCE
GENERAL PROFICIENCY EXAMINATION**

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GENERAL COMMENTS

Agricultural Science offers the Caribbean student a choice between two options, the Single Award (SA) and the Double Award (DA).

The examination comprised two written papers for the Single Award and three written papers for the Double Award, as well as a practical component called the School-Based Assessment (SBA), for both the SA and DA.

Paper 01 comprised 60 multiple-choice items. Paper 02 comprised nine compulsory structured-type questions. These two papers were common to the SA and DA. Paper 03, written by Double Award candidates only, was a compulsory paper with four structured essay questions. The SBA component was conducted in the school and the school farm environment. Students were tested on a number of skill objectives set out in the syllabus, and on cost analyses based on their crop and animal production activities. The DA required candidates to conduct a research project, in addition to the other SBA requirements.

This report outlines candidates' overall achievement on content profiles, namely:

- Profile 1 – The Business of Farming
- Profile 2 – Crop Production
- Profile 3 – Animal Production

DETAILED COMMENTS

Paper 01 – Multiple Choice

Although performance on this paper was good, there was a decline when compared with 2011. Candidates had difficulties with:

- Defining the term *interest* as it relates to a loan
- Benefits of a cooperative
- Soil pH
- Leaf structures that regulate water loss
- Pasteurization of milk

Paper 02 – Structured Questions

This paper consisted of two sections. Section I comprised six questions, each worth four marks. Section II included three longer response questions, each worth 12 marks.

Section I

Question 1

This question tested candidates' knowledge and understanding of agricultural careers pertaining to crops and livestock. Candidates were also required to apply their knowledge of biotechnology for the improvement of crops and livestock production. Part (a) (i), required candidates to identify agricultural careers associated with crop and livestock management, while Part (a) (ii) tested candidates' knowledge of careers related to diseases in livestock.

For Part (a) (i), the majority of candidates responded well and scored maximum marks. However, some candidates suggested incorrect careers/terms such as agronomist, horticulturist, entomologist, and even agricultural engineer. Popular correct responses were *extension officer, field officer* and *agricultural officer*.

For Part (a) (ii), careers such as pathologist, livestock farmer, nutritionist and animal scientist were incorrect answers. Popular correct responses were *veterinarian* or *veterinary assistant*.

Part (b) required candidates to suggest one way in which biotechnology could improve (i) crop production and (ii) livestock production. Several candidates may have misunderstood the concept of biotechnology, and as such this part was poorly answered. Incorrect responses were: regional islands trading for goods, government could hire people to plant more/produce more, they would have to get more land, encouraging greenhouse farming/hydroponics. Popular correct responses were *more nutritious, resistance to disease/drought, new varieties* and *increase yield*.

Correct responses for Part (b) (ii) were: *DNA can be modified to make animals with desirable traits; genetic engineering can be used to create crops which have higher yield/are more resistant to diseases; creating new and improved feeds for livestock; can aid in the creation of vaccines*.

Question 2

This question tested candidates' knowledge of the demand curve, equilibrium point and strategies that can be used by farmers to make money from surplus crop.

Part (a) was fairly well done. Candidates were required to identify X and Y from the diagram. However, many candidates named the letters but in the wrong order. Many candidates gave numerical values for X and Y. The correct responses for X were *the demand curve, demand, or quantity demanded*. Accepted responses for Y were *equilibrium* or *equilibrium point*.

In Part (b), most candidates correctly identified two strategies that could be used to make money from surplus crop. Some candidates seemed to have misunderstood the word *surplus*, thus giving incorrect responses such as produce best quality, plant early, change the time of planting, plant another crop and crop rotation. They should have said *reduce the price, make a by-product of sorrel and sell it, store it for a later time when there is a high demand* or *export the sorrel*.

Question 3

This question tested candidates' knowledge of acid and alkaline soils, reasons for differences in pH and what could be done to improve an acidic piece of land.

For Part (a), most candidates did not obtain their marks because they failed to use the words *acidity* and *alkalinity*; instead they used words such as phosphorous, hydrogen, acid, alkaline. For Part (b), many candidates did not know to read the pH scale properly which resulted in incorrect responses. The correct response was *Ramesh's plot was more acidic*.

In Part (c), candidates were required to suggest one reason for the difference in pH between the two soils. Good responses included: *types of fertilizers, water logging, improve drainage, topography and use of soil amendments*.

In Part (d), the candidates misinterpreted the word *productivity*. Some of the incorrect responses included addition of urea/inorganic fertilizers, ammonium, farming system, leaching, decrease in acid and increase in alkaline and plant citrus crops. Correct responses were *addition of lime, calcium carbonate, tillage, mulching, crop rotation, organic fertilizer, and organic matter*.

Question 4

This question tested candidates' knowledge and understanding of the causes of soil erosion, the relationship between burning the land and erosion, as well as soil management practices used to prevent soil erosion.

Part (a) was generally well done but some candidates faltered by confusing soil erosion with weathering. Correct responses were *washing away of soil and removal of soil by water or wind*. Many candidates gave partial responses for Part (b), with many being unable to analyse the data given in the table. The correct response was *more burning, more erosion/less burning, less erosion*. Incorrect responses were *burning destroys the nutrients and burning causes erosion*.

In Part (c), most candidates answered correctly — *mulching, proper drainage, planting trees and cover crops* — although some of them interpreted soil management practices as anything that is done to the soil or not burning garbage on the soil.

Question 5

This question sought to test candidates' knowledge of two aspects of rearing broilers, namely feeding and brooder temperature control. Few candidates were able to obtain maximum credit. Several candidates failed to score any mark, while some did not offer any response. There were candidates who seemed to have clearly misunderstood the management practices associated with broilers.

Part (a) asked candidates to name the feed that is fed to the chicks at: (i) two weeks of age and at (ii) five weeks of age. The correct responses were *starter ration* at two weeks of age, and *broiler finisher* at five weeks of age.

In Part (b), a diagram of two different situations in a brooder was presented. Candidates were asked to suggest a reason for the difference in the way the chicks were distributed. This part allowed for comparisons to be made in relation to two brooding systems, A and B, and to conclude the differences in each. It was poorly answered. For A, accepted responses included *the brooder was at the correct temperature and the chicks displayed normal feeding habits*. Several candidates gave incorrect responses such as *chicks were overcrowded, have a higher feed conversion ratio, not enough room to move about, and feed disturbed all over the brooder*. For B, the correct answer should have been *the brooder temperature was too high so chicks were away from heat source, chicks were uncomfortable or the heat source was too low*.

Question 6

This question was based on artificial insemination (AI) and oestrus synchronization.

In Part (a), candidates were required to state two advantages of AI in farm animals. Unaccepted responses included *AI works faster; AI is reliable; less sperms wasted and increased fertility*. Common correct responses were: *it prevented inbreeding, the upgrading of local stock, reduction in the spread of diseases and the storage of semen*.

For Part (b), a table was presented that compared the two reproductive techniques of artificial insemination and oestrus synchronization. Candidates were required to deduce which was the better technique and to give one reason for the response given. The correct response given by many candidates was oestrus synchronization, accepted reasons being *better management of pregnant and lactating animals, more offspring and more sales*.

Section II

Question 7

Part (a) required a definition for each of *working capital, fixed capital and subsidy*.

For *working capital*, candidates were awarded marks for *money invested to meet recurrent expenditure*. Examples of working capital were also accepted, as well as *money to run the business*. *Fixed capital* is defined as *money invested on buildings and other permanent structures that cannot be changed easily*. Examples were also accepted. Correct responses for *subsidy* were *money, items or services given by sponsors to assist in agricultural activities*. Examples were also accepted.

For Part (b) (i), candidates were informed that a rural community was given a tractor by the government to assist them in agricultural production. They were asked for three benefits that the tractor would bring to the rural community. Correct responses included *saved money, allowed for ease in agricultural production, reduced labour cost and increased earnings*.

Part (b) (ii) sought to have candidates identify three additional incentives the government could provide to further improve agriculture in the community. Poor responses included establishment of greenhouses/green belt areas, employment, capital, machinery, and provision of money. Correct responses were: *tax exemption, loans at reduced rate and price support*.

In Part (c), candidates had to complete a loan application form by writing three requirements that a farmer needed in order to qualify for a loan from a commercial bank. Some incorrect answers were liability, subsidy by government and CXC qualifications. Some candidates wrote a letter instead of pointing out the requirements. They should have written *ability to repay the loan, land title, project proposal and collateral*.

Question 8

For Part (a), candidates were required to describe three given methods of pest and disease control in agriculture. Accepted for manual method, Part (a) (i), were *done by hand, hoeing and forking*. The mechanical method, Part (a) (ii), involves *the use of traps, machinery and ploughing*. Many candidates had difficulty distinguishing between manual and mechanical methods and as such offered statements such as manual control employed the use of the hand to apply chemicals while mechanical control employed the use of manpower and a sprayer.

For Part (a) (iii), most candidates were able to correctly describe chemical method as *the use of chemicals such as insecticides, herbicides and fungicides*. Examples of chemicals were also accepted.

Part (b) dealt with the control of white flies using sticky traps and insecticides given data in a table. For Part (b) (i), candidates were to give three conclusions that could be drawn from the information. Some candidates merely reproduced the information as their response. They should have said *that the best treatment was a combination of sticky traps and insecticides; the worst treatment was the use of sticky traps only; and that insecticides gave better results than sticky traps*.

In Part (b) (ii), candidates were to state three other methods that could be used to control white flies in tomato production. This part was not well done as candidates did not take heed of the word *other* and as such responses such as traps and pesticides were reproduced. Accepted responses were *pest predators, sterile male, the use of biopesticides, mulching and crop rotation*.

In Part (c), candidates were informed that a new forage legume from Africa was to be introduced into a Caribbean country. The seeds arrived at the airport but were destroyed by the Plant Quarantine Officer. Candidates were expected to suggest three reasons why the seeds had to be destroyed, such as *import procedures not followed, no import certificate, pests and diseases detected and seeds considered an invasive species*.

Question 9

Candidates were required to name three ingredients used in making livestock feeds, for Part (a). Correct responses included *rice bran, bone meal, coconut meal and peelings*. Many candidates responded incorrectly by stating carbohydrates, proteins, iron and sand.

In Part (b), a situation was presented to the candidates whereby a farmer wanted to know if rearing broilers on sand was better than rearing them on wood shavings litter. A table was presented that showed the effect of sand and wood shavings litter on feed conversion ratio (FCR) over four weeks.

For Part (b) (i), candidates were expected to calculate the average FCR over the four weeks on the sand and wood shavings litter systems. Most candidates did the computation correctly.

For Part (b) (ii), candidates were asked to name the better system of rearing broilers and to suggest one reason for the answer. The correct response was *wood shavings litter*, the reason being the *lower FCR*. Many candidates stated sand and simply gave the reason as 'it is better'.

Part (b) (iii) required candidates to explain the effect of each of the two systems on the health of the broilers. Acceptable responses were *sand has wetter faeces than wood shavings and so more breathing problems; wood shavings reduce flies and the spread of diseases*. Some candidates incorrectly stated that sand will trap heat and cause bacteria to grow.

Part (b) (iv) asked candidates to suggest three other management practices that could affect the performance of broilers up to market age. The response to this part was quite good in that many candidates stated *proper feeding of starter, good ventilation, ensure footbath and vaccination*.

Paper 03 – Structured Essay

This paper was made up of two sections and consisted of four compulsory structured essay questions, two from Section D (Horticulture) and two from Section E (Animal Husbandry) of the syllabus. Only candidates sitting the Double Award option were required to write this paper.

Section I

Question 1

This question tested candidates' knowledge of banana production and a method of composting. Performance was below average.

Part (a) (i), required candidates to name two varieties of banana recommended for the fresh fruit market. Most candidates were able to correctly identify *Lacatan*, *Gros Michel*, *Apple* and *Cayenne*. Incorrect examples were plantain, fig and Valencia.

Characteristics of high quality banana planting material (Part (ii)), such as *high-yielding planting material*, *uniformity of planting material* and *pest and disease free* were the correct answers given. A few candidates named the best planting material as sword sucker/maiden head, instead of characteristics of the planting material. Some examples of incorrect responses included long-stem large sucker, large corm size, low maturity period, and material must be cleaned and well sanitized. Some candidates focused on the preparation of suckers for planting, not the characteristics.

For Part (a) (iii), candidates had to identify the recommended stage for harvesting banana intended for the fresh fruit market. The recommended stage of harvesting bananas is *three-quarter green*, *mature stage* or *slightly turning/yellow*. This was not expressed by most candidates. Incorrect responses included three-quarter ripe, half-ripe, green, hard and firm. Many candidates stated the time to harvest rather than describe the stage at harvest.

Part (b) started with the statement that a farmer planted banana at a spacing of 1.5 m by 1.5 m rather than the recommended spacing of 3 m by 3 m. Candidates were required to explain how closer spacing was likely to affect the cultivation and production of banana in terms of (i) number of suckers per stool and (ii) marketable yield.

For Part (b) (i), candidates' responses indicated a lack of knowledge of the term *stool*. Correct responses should have been *competition for sunlight and nutrients resulting in less suckers per stool; more pests and diseases caused less number per stool; less space, less root room resulting in a lower yield*.

For Part (b) (ii), most candidates realized that there would be a reduction in marketable yield due to reduced spacing. However, they were not able to provide an explanation, namely *reduced spacing can result in smaller finger size, reduction in bunch size, or diseased bananas resulting in lower marketable yield*.

Part (c) required candidates to describe four measures that were likely to increase the composting process in a compost heap where banana leaves and stems were placed. Performance was below average leading to the conclusion that candidates were not exposed to practical work. Some examples of correct responses included *add manure*, *and add microorganism/earth worms as decomposers*; few candidates knew about *turning the heap*, *keeping it damp*, and *adding limestone*. Some incorrect responses were cover the heap, expose it to sunlight and rainfall, maintain optimum or suitable temperature, and add soil to the heap.

Question 2

The performance of candidates on this question was average.

In Part (a), candidates had to explain tissue culture, state the benefits of tissue culture and a technique which is used to produce new varieties of anthurium. Most candidates were unable to correctly define tissue culture as a method of vegetative propagation using plant tissues. The benefits of tissue culture – *large number of plants produced in a short space of time*, *uniformity of planting material* and *reduction in cost of plantlets* – were stated. The majority of the candidates could not *identify genetic engineering*, *cross pollination* and *biotechnology* as techniques for producing new varieties of anthurium.

In Part (b), candidates had to discuss the prevention and management of pests and diseases of an ornamental plant. They were able to score at least 50 per cent of the marks allocated by correctly identifying pest and disease prevention methods such as *disinfect tools, minimize the presence of visitors, no smoking and install footbath*. However, many candidates used the term ‘pesticide’ rather than be specific with chemical control.

Part (c) focused on the effect of light intensities on the flowering characteristics of anthurium plants. A table was presented showing varying light intensities and the effect on spade width, petiole length and flowering interval.

Candidates were asked to describe the relationship between the percentage of light and flowering interval, for Part (c) (i). Many responded with the correct interpretation – *as the shade levels increase flowering interval decreases*.

For Part (c) (ii), candidates had to predict the likely effect of full sunlight on petiole length and offer a reason for the answer. Many were able to say that there was a reduction in petiole length.

Candidates were challenged by the final part of the question which required knowledge of the practical use of the information in the table. They should have said that the information could assist farmers *to capture market share, meet specific requirements and increase production by decreasing the light intensity*.

Section II

Question 3

This question tested candidates’ knowledge and understanding of pig production. Performance was average.

Knowledge of breeds of pigs, and by-products of the pig industry were required for Part (a). Candidates could not differentiate between breeds for pork and breeds for bacon. However, by-products could be named.

Most candidates described the castration process in pigs (Part b). The procedure *involved the cutting of the scrotum and scraping the spermatic cord until it is separated from the body. Iodine is then applied*.

Part (c) required candidates to calculate dressing percentage, and to discuss the importance of dressing percentage in the pig industry. Performance was good.

Part (d) informed candidates that a farmer fed her pigs solely on a rice diet and candidates had to explain how this diet may be modified to be suitable for weaners and for pregnant sows. It was evident from the information given by candidates that they were not able to correctly analyse the statement. Expression was poor, they were unable to say what modification should be done and why. Correct responses were: *For weaners – add crude protein to reduce protein deficiency and boil the rice to increase digestibility. For the pregnant sow – add crude protein to reduce protein deficiency and for production of colostrum.*

Question 4

Part (a) required the name of a milk breed and a meat breed of goats. Most candidates responded correctly.

In Part (b) (i), candidates were informed that a farmer decided to rear goats using both an indoor and an outdoor system of management. Candidates were asked to name three systems of grazing that the farmer can use. Most were able to name *continuous*, *rotational*, and *zero grazing*. Incorrect responses given were overgrazing and undergrazing.

Part (b) (ii) informed the candidates that bamboo grass (*Paspalum* spp) was found in local pastures but was not well liked by goats. Candidates were asked to suggest three ways to improve the consumption of this grass by goats. Many candidates were of the view that the animals were to be force-fed and their responses reflected that. Acceptable responses were *the use of a mixture of grasses*, *inclusion of legumes*, *addition of concentrates* and *production of silage*.

In Part (b) (iii), candidates were required to explain two ways by which increased consumption of bamboo grass could improve production. Correct responses included *more milk or meat*, *healthier animals*, *better growth* and *improved rumen digestion*.

Part (c) focused on embryo transfer. Candidates were required to suggest advantages of using a donor mother and a recipient mother. Many candidates responded well to this part and as such gained full marks. Unacceptable responses included: large sums of money would be involved and the production of a new breed. Accepted responses for advantages of using a donor mother included: *breed improvement to the herd*, *reduction in the transmission of diseases* and *higher-priced offspring*.

Correct responses for advantages of the recipient mother included *better adapted to heat stress*, *better tick resistance* and *less likely to transfer exotic disease*