

G.C.E (A/L) Support Seminar - 2016
Agriculture Science - Paper I
Answer Guide

Question No.	Answer	Question No.	Answer
(1)	2	(26)	1
(2)	3	(27)	3
(3)	5	(28)	4
(4)	4	(29)	2
(5)	1	(30)	4
(6)	4	(31)	1
(7)	4	(32)	4
(8)	3	(33)	2
(9)	1	(34)	4
(10)	3	(35)	1
(11)	1	(36)	5
(12)	1	(37)	4
(13)	4	(38)	2
(14)	1	(39)	3
(15)	3	(40)	3
(16)	2	(41)	2
(17)	1	(42)	4
(18)	4	(43)	4
(19)	2	(44)	5
(20)	3	(45)	2
(21)	3	(46)	5
(22)	1	(47)	4
(23)	2	(48)	1
(24)	3	(49)	2
(25)	1	(50)	4

1 mark × 50 = 50

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Agriculture Science - Paper II
Answer Guide

Part A - Structured Essay

- 1 (A) (i) 5 mm/hr
(ii) more than 25mm/hr
(iii) Able to know,
1. the duration of the rainfall
2. the intensity of the rainfall
3. the time when the maximum and minimum rainfall received/
the amount of minimum and maximum rainfall.
(4 × 5 = 20 marks)
- (B) (i) X - Denitrification
Y - Ammonification
Z - Nitrification
(ii) X - *Pseudomonas denitrificans*
Thiobacillus denitrificans
Mocrococus denitrificans
(name of the Genus is essential)
Z - Rhizobium
(iii) Rizobium
(iv) Paddy field/water logged site
(v) Eutrophication
(4 × 8 = 32 marks)
- (C) (i) 1. Loss of land
2. loss of employments/ poverty
(4 marks)
(ii) 1. Establishment of farmer settlement schemes
2. Start development projects/take actions to increase the local food production/ rehabilitate the irrigation systems/ pass the legislations for development activities.
(iii) 1. Land fragmentation
2. Insufficient water availability
• scarcity of seed and planting materials
• less access to technology
• marketing and storage problems
(4 × 6 = 24marks)
- (D) (i) 1. Through the equipments taking to the protected house from outside
2. Through the people entering from outside/untreated seeds and planting material/ broken or weaken insect proof nets
(ii) 1. sterilize the equipments taking from outside
2. use special boots and cloths when get into the protected house
• use seeds and planting material which are treated against pest and diseases
• use quality insect proof nets

- (iii) 1. Avoid undesirable environmental conditions
2. • Can increase the photosynthesis by maintaining higher CO₂ concentration around the crop.
• able to provide artificial lights when sunlight is limited and consequently higher production can be achieved.

(4 × 6 = 24 marks)

- 2 (A) (i) 1. break down the ecological balance
2. destroy beneficial insects and microorganisms
• enter into the animal or human body through food chains
• contaminate air and water bodies
• harm biodiversity
• develop pesticide resistant insect strains
• create eutrophic conditions in water bodies
- (ii) 1. Orally through food
2. Via Respiratory system
• through skin and wounds
- (iii) 1. Cancer /kidney problems.
2. symptoms like vomiting, headache, fainting and allergy.
- (iv) 1. Make aware the people through media
2. prohibit to produce and distribute the highly toxic agro-chemicals/organize exhibitions.
- (v) 1. Organic farming
2. Conservation farming

(4 × 10 = 40 marks)

- (B) (i) A - Discharge tube
B - Suction valve
C - Out flow valve
D - Piston
- (ii) • When piston move upwards, water enter into the bottom part of the cylinder/
• When piston move down, water enter into the upper part of the cylinder through outflow valve.
- (iii) pumping water with suspended particles.

(4 × 4 = 16 marks)

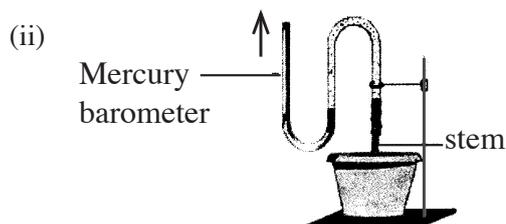
(4 marks)

(4 marks)

- (C) (i) Japanese reversible plough/mould board plough
(ii) a. Tine tiller
b. Disc harrow/ Nail tooth harrow/ ridger
(iii) Three point linkage

(4 × 4 = 16 marks)

- (D) (i) 1 for metabolic activities
2 to transport nutrients and other substances/to maintain the rigidity in the plants



- (iii) root pressure is associated with metabolic activities
- (iv) Transpiration pull

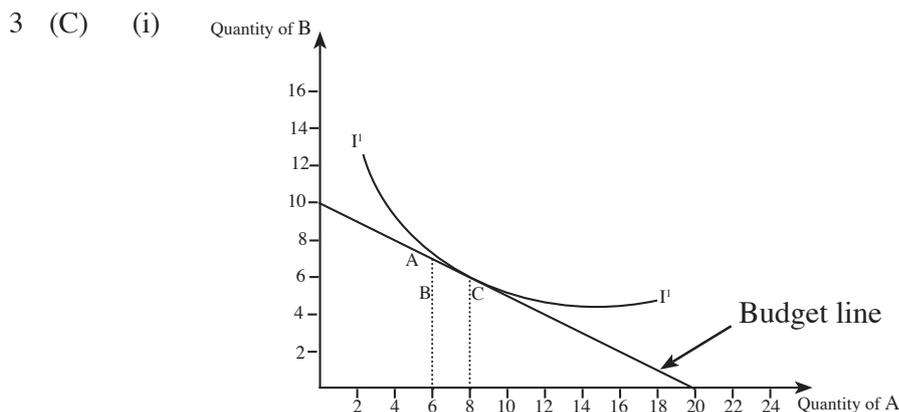
(4 × 5 = 20 marks)

- 3 (A) (i) A place caring the planting material/plants until planting in a permanent field.
- (ii) 1. Sand nursery/pot nursery (polythene)
2. sponge nursery/nursery plates
3. dapog nursery/mud nursery/nursery plates
- (iii) 1 Burning
2 application of fungicide
3 expose to high solar heat/
• fumigation
• application of boiled water
- (iv) 1 Must be with germination percentage more than 85%
2 free from waste (other material)/
3 free from weed seeds or other seeds
• unbroken seeds/
• filled seeds/
• seeds without pest damages
- (v) 1 Being a tropical country, seeds expose to higher temperature and hence loose the viability soon due to high rate of metabolic reactions.
2 Shortage of good storage facilities
the methods used in harvesting and processing, cause damages to the seeds

(4 × 12 = 48 marks)

- (B) (i) the amount sprayed to the field = 6000 - 2950
= 3050 ml
= 3050 ml
- (ii) Number of tanks for a hectare = $\frac{3050 \times 10000}{100}$
= 305000 ml
= 305 l
- (iii) $\frac{305}{16}$ = 19 tanks

(4 × 3 = 12 marks)



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$$\text{Possible amount of consumption for } = \frac{200}{10} = 20$$

$$\text{Possible amount of consumption for B } = \frac{200}{20} = 10$$

- (ii) (a) 8 units
(b) drawing the indifference curve
(c) 1. Have a negative gradient
2. Indifference curves do not overlap
curve is convex to the base of the plot

(iii) (a) Slope/gradient of budget line = $\frac{10}{20} = 0.5$

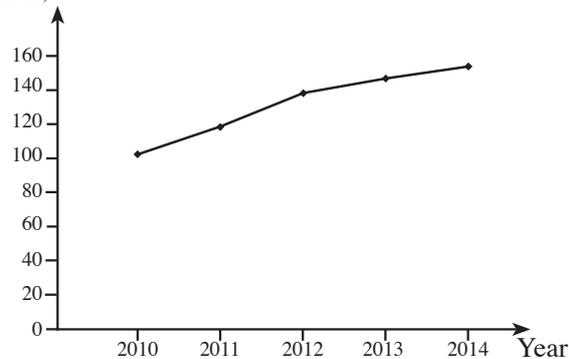
(b) Slope of the indifference curve = $\frac{1}{2} = 0.5$
(Considering A, B and C triangle)

(c) At the optimum consumption, slope of the indifference curve and the budget line are equal

(d) The amount of B replaced by increasing one unit of A is known as marginal rate of substitution (MRS). This is indicated by the slope of the indifference curve. Budget line is the line that connects the maximum number of units of A and B that a consumer can purchase for his income. The point where the slope of the indifference curve equal to the slope of the budget line is the point of maximum satisfaction of the consumer.

- (iv) Though the indifference curves may touch the budget line at other places, those are not considered as the equilibrium points as they are in a other low or higher indifference curves (4 × 10 = 40 marks)

- 4 (A) (i) Poultry meat products
(000 MT)



(ii) Annual average poultry meat production
= $104.16 + 116.76 + 137.39 + 144.54 + 150.32$
= $653.17 / 5$
= 130.634
= 130634 MT

- (iii) 1. Increasing demand for poultry meat
2. production can be obtain within short period of time
• large number of birds can be reared within a smaller area/ easy management

- (iv) 1. Kurunegala
2. Puttlam/ Gampaha/Colombo/ Kalutara

(4 × 6 = 24 marks)

- (B) (i) Due to an external stimuli, the alveoli contract and the milk in them flow into the gland cistern through milk ducts and then release to the teat cistern. This process is called as milk let down
- (ii) X - Transmission of neuro pulse
Y - Oxytocin secretion
- (iii) X - Hypothalamus
Y - Posterior Pituitary
- (iv) a - Adrenalin/Epinephrine
b - Adrenaline gland
- (4 × 7 = 28 marks)
- (C) (i) $0.77 \times 40 = 30.8\text{g / day}$
- (ii) 1 - Cell growth
2 - repair worn tissues/hemoglobin production/ antibody production
- (iii) mung bean protein deficient in essential amino acids like lysine.
- (4 × 4 = 16 marks)
- (D) (i) Turning food into unconsumable filthy condition
- (ii) 1 colour change
2 loss of attractiveness
3 loss of nutritional value/stickiness/ change of taste, pH, smell, appearance/ microbial growth
- (iii) 1 Moisture
2 Temperature
- mechanical damage
 - duration (time)
- (iv) **Traditional Preservation method** **Principle**
- | | |
|-------------|-------------------------------------|
| (1) Salting | Concentration/Osmotic drying |
| (2) Smoking | Remove water/destroy microorganisms |
| • Pickling | Acetic acid fermentation |
- (4 × 8 = 32 marks)

Part B - Essay

(1) (i) **Impact of climate change on agriculture.**

Definition for climate change.

(10 marks)

- ★ changes in rainfall distribution pattern, wind pattern and distribution changes lead to drought weather conditions.
- ★ because of the temperature rise, huge amount of water vapour add in to the atmosphere. So that high intensity rains are common and cause floods. Consequently, land slides, erosion, capacity reduction of reservoirs takes place due to the silt deposition.
- ★ the variation in the rainfall course scarcity of water for irrigation, exposure of crops to drought, loss of soil fertility, reduction of water holding capacity, increased pest and disease incidents and increased post harvest losses due to rains at the time of harvesting.
- ★ reduced light intensity due to cloudiness cause yied reduction, because of the reduced photosynthesis.
- ★ the invasive weeds can be increased with increasing temperature.
- ★ drying of tanks and reservoirs due to increased evaporation.
- ★ Elnino and lanino condition affect the crop.
- ★ higher temperatures cuse discomfort among farm animals and reduce the production.
- ★ reduced yields in tuber crops due to increase night temperatures.
- ★ high temperatures reduce the length of crop life time.
- ★ the sea level rise caused by high temperatures reduces the cultivable land area.

(Description of facts - $8 \times 5 = 40$)

(ii) **Importance of food standardization.**

Definition of the food standardization.

(10 marks)

- ★ consumer protection.
- ★ producer also get the benefits as the higher quality food products fetch higher demand.
- ★ it guarantee the identify of a food product, quality and safety.
- ★ creates healthy population and save the money spent for illnesses.
- ★ increase resource utilization efficiency.
- ★ reduce food spoilage.
- ★ consumers become aware about the product they purchase.
- ★ can increase the food export and increase the foreign revenue.

(for description of 8 facts - $8 \times 5 = 40$)

(iii) **Actions taken to increase the paddy production.**

- ★ Increase the number of cultivation seasons in a year where the irrigation facility is available.
- ★ Popularize improved rice varieties.
- ★ increase the cultivated land area annually.
- ★ create marketing facilities.
- ★ fertilizer subsidy
- ★ improved extension service
- ★ seed paddy production process
- ★ provide loan facilities
- ★ purchase harvest by the government
- ★ provide storage facilities.

(for brief description of 10 points - $10 \times 5 = 50$)

(2) (i) **Defining the water pollution.**

It is the contamination of water resources such as rivers, streams, sea, aquifers and ground water. Disposal of waste and pollutants directly or indirectly to the water resources,

(10 marks)

Agricultural activities that create problems.

- ★ improper use of pesticides.
- ★ improper use of chemical fertilizer
- ★ improper waste disposal
- ★ unsuitable waste management

(2 marks × 4 = 8 marks)

Actions to minimize

- ★ implement integrated pest management practices.
- ★ prohibit pesticides containing highly toxic active ingredients.
- ★ apply pesticides only when required and at right quantities.
- ★ restrict the application of pesticides as a mist.
- ★ use of Integrated Plant Nutrient Systems (IPNS)
- ★ adopt proper waste management plans
- ★ use only the recommended fertilizers.
- ★ systematic water management.

(4 marks × 8 points = 32 marks)

- (ii) without doing the primary land preparation, limit the secondary land preparation only to the place where the seed is planted or the rows that seeds to be planted.

(10 marks)

How zero tillage affect soil physical characters.

- ★ since secondary land preparation done in the point where seed is planted, first reduce the bulk density. (But if the mechanory is used for planting or for the application of agrochemicals bulk density rises due to soil compaction)
- ★ soil structure improved because of the activity of soil microorganisms.
- ★ water absorption to the root zone is increased.
- ★ improve the aeration in the root zone.
- ★ soil color is less due to the low rate of mineralization of soil organic matter.

(8 marks × 5 points = 40 marks)

- (iii) Definition for soil moisture conservation.

(10 marks)

Possible actions

- use of mulch / planting cover crops
- zero tillage
- shading
- establishment of live wind belts
- improve soil texture / adding organic matter to the soil.

(8 marks × 5 points = 40 marks)

(3) (i) **Micropropagation**

- a technique that can produce large number of plantlets lets commercialy. which are resemble to the mother plant.

(10 marks)

- should describe under 5 stages.
 - 1 selection of mother plant and maintenance
 - 2 explant establishment
 - 3 multification stage
 - 4 rooting
 - 5 training the plants / acclamatization

(Description of 5 facts × 8 marks = 40 marks)

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- (ii) Definition of drainage (10 marks)

Methods

- use of surface drainage methods
- use of subsurface drainage systems
- pump excess water
- grow plants with high evapo - transpiration ability in water logging areas.

(To describe 4 points × 10 marks = 40 marks)

- (iii) Define the genetical variation in plants (10 marks)

In order to achieve the crop production targets, it is needed to select the plants with desirable genotypic characters and make the genetic variations. Following methods should be described.

- selection
- cross breeding
- mutation breeding
- genetic engineering (biotechnology)

(Describe 4 points × 10 marks = 40 marks)

- (4) (i) Farming without using agrochemicals such as chemical pesticides or chemical fertilizer is known as organic farming. Only the organic materials are used. (10 marks)

Importance

- 1 soil become fertile as organic fertilizer provide all required nutrients.
- 2 organic material absorb toxic substances and heavy metal. That prevent the absorption of them to the crops.
- 3 retain soil fertility for long, as the activity of soil microorganisms improved.
- 4 as no chemicals are used the quality of products are high.
- 5 quality harvest fetch high prices in the markets.
- 6 no agrochemicals are used and hence healthy nation is developed.
- 7 export of good quality products could fetch high foreign exchange.
- 8 use of organic wastes as fertilizer, reduce the environmental pollution.
- 9 save money that could have spent on agrochemical.
- 10 organic matter rich soil improve the water holding capacity and reduce soil erosion.

(8 facts × 5 marks = 40 marks)

- (ii) Eco - friendly management practices

Mechanical methods

- collect by hand and destroy
- cover the fruits
- apply light traps
- use pheromone traps
- drag thong branches in the field
- drag threads that impregnated with resins
- use winnowing fans to trap insects

Cultural methods

- systematic land preparation
- all field plant together
- cultivate at the right season
- use recommended fertilizer at correct dosage
- proper water management
- control weeds near the crop field
- crop rotation
- mixed cropping
- maintain recommended spacing between rows / plants
- plant trap crops
- plant repellent crops

Biological methods

- introduce parasites
- use predators
- use pathogens

(10 points × 5 marks = 50 marks)

(iii) The information that noted wown to facilitate the management of a farm are called as farm records.

(10 marks)

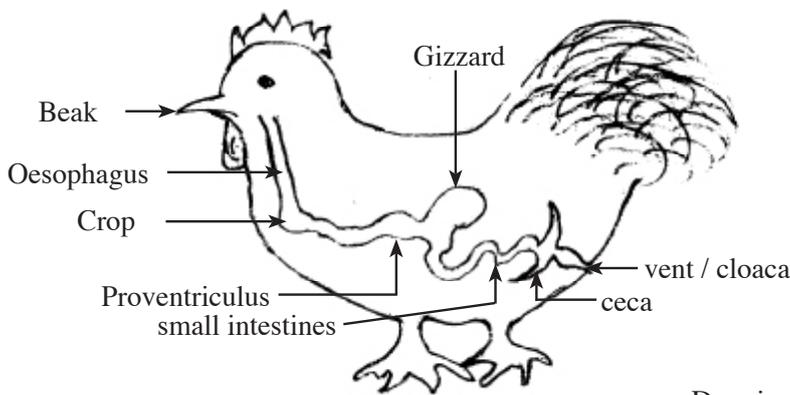
Importance

- 1 able to know the cost, income, profit for the products generated in a farm.
- 2 can analyze the farm expenditure and as efficiency of utilizing inputs.
- 3 to know the seasonal requirements of inputs.
- 4 to estimate different physical and financial resources and assets which are available in the farm.
- 5 to pay the income tax
- 6 to minimize the risk
- 7 to maintain the farm efficiently in the long run.
- 8 to identify the weaknesses in the form

(8 points × 5 marks = 40 marks)

(5) (i) Defining the digestive process of fowl.

(10 marks)



Drawing the figure - 02
labelling - 08
10 marks

- 1 Mouth
Mouth is modified to beak. There is no mechanical digestion here. Although Amylase is secreted no digestion takes place.
- 2 Temporary store food in the crop.
- 3 In proventriculus enzyme secreted but no digestion take place.
- 4 Mechanical digestion takes place in gizzard.
- 5 Enzymatic digestion and absorption of digested products takesplace in small intestines.
- 6 Describe starch, protein, and fat digestion with enzymes.
- 7 Contain 2 ceca and fiber digestion occurs inside them.
- 8 Large intestines absorb water.
- 9 excreta remove through cloca.

(4 marks × 8 points = 32 marks)

(ii) **Define quality crop yield**

(10 marks)

Procedures to be adopted to obtain quality yield.

- Select a good site for cultivation.
Land without a history of epidemic of pest and diseases should be selected. It leads a healthy crop and a quality yield.
- Select the recommended crops for the area.
Selection of recommended crops for the area based on the map of Agro Ecological Zones lead to healthy crop and quality yield.

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- Use of healthy planting material.
Create a vigorous and healthy crop and quality yield.
 - Use quality water for irrigation.
Avoid irrigation water contaminated with agrochemicals, industrial wastes and salts.
Ex : Heavy metals should be avoided
pH should be in a suitable range
 - Suitable soil conditions
Maintaining cation exchange capacity (CEC), pH in desirable range, prevent deficiencies and produce quality yield.
 - Use of environmental friendly fertilizers.
Toxic free quality yield can be obtained by using organic fertilizer.
 - Adapt environmental friendly pest and disease control methods.
Minimize chemical pesticides.
 - Use suitable farming methods and cultivation patterns.
Ex : Organic farming, conservation farming, crop rotation
- (8 marks × 5 points = 40 marks)
- (iii) The potential of seeds to germinate when suitable conditions such as moisture, temperature, air is provided is called as seed viability. (10 marks)

Strategies to be adopted to maintain viability

- **Moisture control**
When moisture is high, seeds start respiration and decrease the food reserves, Also may cause bacterial or fungus damages. Therefore seeds should be stored around 13 - 14% moisture.
- **Temperature control**
Maintaining the storage temperature around 5°C reduces the enzyme activities and maintain longterm seed viability. At higher temperatures, seed metabolic activities take place at a higher rate and viability loses.
- **Control the storage humidity**
When the relative humidity of air is increased, seed absorb water and moisture inside the seed is increased and viability loses. Dehydrators can be used to control this situation.
- **Control mechanical damages**
Need to minimize the damages to the seeds at harvesting, threshing and transport.
- **Control fungus, bacteria and insects**
Seeds should be clean to prevent microbial infections. Storage facilities should be free of insects and clean. Fumigation of stores sterilization of packages before use is important to prevent microbial damages.
- **Control aeration**
High oxygen content in storage environment, increase the seed respiration. Storing seeds in N₂ or H₂ environment, reduces the oxygen and hence reduce respiration. It increase the seed viability.

(5 marks × 8 points = 40 marks)

(6) (i) **Food diversification**

Offer a food product in different forms which suits the consumer preferences and facilitate the usage is known as food diversification.

(10 marks)

Importance

- Increase the market demand and market share.
- Minimize food wastage.

[see page twelve

- Able to incorporate the nutrients that loose during processing - fortification.
 - Some foods consumable only after diversification.
Ex : Some fish species tastes when only it is diversified as dryfish.
 - Increase the nutrition value of a product through adding nutrients that are not containing naturally in them.
 - Can regulate the seasonal price fluctuations.
 - The crops only growing in particular area can be distributed to all over the country after diversification.
 - Promote diverse food products in the market according to the consumer preference.
- (5 marks × 8 points = 40 marks)

(ii) **Weeds - introduction**

The plants grow with the crops competing for nutrients, water, space and light are called as weeds.

(10 marks)

Adaptations

- Hibernation ability
Survive long time under unfavourable condition through dormancy, underground stems etc.
- Production of large number of seeds.
- Short life cycles.
- Reproduction through sexual and asexual methods.
- Fast growth
Ex : Salvinia
- Multiple and efficient dispersal methods.
Ex : through wind, irrigation water, animals, fertilizer, birds, workers
- Ability to grow well even under harsh environments
- Ability to resist pest and diseases.

(5 marks × 8 points = 40 marks)

(iii) **Introduction - photosynthesis efficiency**

(10 marks)

adaptations of plants

- Amount of chlorophyll a and b in a leaf.
★ chlorophyll a and b which directly contribute for photosynthesis present in leaves and increase the efficiency of photosynthesis.
- Leaf angle towards the light
leaves angled towards light to receive more light and use the light efficiently.
- Bearing of transparent epidermis facilitate light penetration.
- Leaves are thin and take flat shape.
- Air exchange efficiency is increased through bearing large number of stomata in leaves.
- In response to light, stomata opens.
- Efficient management of food produced in a leaf by well distributed vein system.
- Well developed vein system to transport water in a leaf.
- Having different leaf arrangements.
Ex : spiral arrangement
It assures that every leaf gets the maximum amount of light.

(5 marks × 8 points = 40 marks)