CSEC Agricultural Science May/June 2012 Paper 1

1. A person whose job is to design, modify and maintain agricultural buildings and equipment has a career as

(A) an engineer
(B) an educator
(C) a manager
(D) a journalist

Answer: A

An agricultural engineer designs and maintains agricultural businesses and equipment.

2. An entomologist is a person who is qualified to work with

(A) insects
(B) soils
(C) plant diseases
(D) medicinal herbs

Answer: A

Entomology is the study of insects and their relationship to humans, the environment, and other organisms. Entomologists make great contributions to such diverse fields as agriculture, chemistry, biology, human/animal health, molecular science, criminology, and forensics.

3. Which of the following can be considered roles of agriculture in the economy of Caribbean territories?

I. Contributing to the G.D.P.
II. Reducing the regional food import bill
III. Securing foreign exchange

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

Answer: D

Agriculture's contribution to Caribbean economies:

Contribution to National Income and GDP
National Income is the total amount of money earned within a country. Gross Domestic Product (GDP) is the market value of all the goods and services produced in a country within a specific time period, usually annually. The value of agricultural goods and services contributes to National Income & GDP.

Creation of Employment
Agriculture provides opportunities for employment. There are many different jobs in or relating to agriculture, from unskilled labor to highly-skilled jobs.

Contribution to Food Security
Food security is a country's ability to supply its people with a sufficient quantity of affordable, nutritious food at all times. Agriculture contributes to food security by supplying the country with enough affordable nutritious food for its citizens.

Production of Raw Materials
Agriculture provides raw materials for downstream industries (industries that use products manufactured by industries before them to manufacture their own products). For example:

- Agriculture produces wheat (Industry #1)
- Wheat is used to make flour (industry #2, downstream of #1)
- Flour is used to make bread (industry #3, downstream of #2)

Earning of Foreign Exchange
Foreign exchange is foreign currency, e.g. U.S. money is foreign exchange in Trinidad and Tobago.
All countries need foreign exchange, usually U.S. dollars ($US), to pay for imports (good & services purchased from another country). Agriculture earns foreign exchange by producing goods that can be exported (sold to other countries), which pay Trinidad and Tobago in foreign exchange.

Saving of Foreign Exchange via Import Substitution
Import substitution is an economic practice in which foreign goods & services are replaces with local goods & services.Agriculture can contribute to import substitution by supplying locally produced agricultural goods and services in the place of foreign ones.This means less foreign exchange is spent importing agricultural goods and services; foreign exchange is therefore saved.

Reduction of Food Import Bill
A country's food import bill is the money spent by the country to import food. Agriculture produces food locally, therefore it reduces the need to import food and so reduces a country's food import bill.

CSEC Agricultural Science May/June 2012 Paper 1

4. Which of the following aim to produce safe, high quality products in an environmentally responsible way? (A) Good soil practices (B) Good irrigation practices (C) Good agricultural practices (D) Good pest control practices	Answer: C Good Agricultural Practices (GAPs) are a set of essential operational, technical and managerial practices necessary to prevent or reduce the risk of food safety hazards. It enables the delivery of safe fresh produce to the consumer in a sustainable manner, reducing negative environmental impact.
5. The BEST term to describe the stealing of agricultural produce is (A) theft (B) pilferage (C) embezzlement (D) praedial larceny	Answer: D Predial larceny is the theft of agricultural produce. It is one of the main challenges to agriculture in the Caribbean. Offenders may have a complex theft and distribution operation that allows them to develop livelihoods & business from predial larceny. Most farmers experience it daily. There are weak sensitivities among police & judiciary (judges) to predial larceny, i.e. they do not see it as a serious offense; therefore offenders are not sternly dealt with, which emboldens them to continue. Loss of produce & the resulting loss of money discourages farmers. Police can help by establishing a squad to deal with predial larceny. Police & the judiciary can help by treating predial larceny sternly.
6. **Which of the following may be the result of global warming?** I. Drought II. Flooding III. Dehydration and death of livestock (A) I only (B) I and II only (C) II and III only (D) I, II and III	Answer: D Increased drought (lack of rainfall) and flooding result from global warming. Drought also reduces the the availability of water to animals, resulting in their deaths.
7. Biodiversity refers to the (A) sum of all the species in a habitat (B) origin of all the species in different habitats (C) size of the species in different habitats (D) weight of the species in different habitats	Answer: A Biodiversity is all the diverse ecosystems & the organisms in them. It may be referred to as the diversity of all species in a habitat, or sum of all species in a habitat.
8. Which of the following are characteristics of organic farming? I. Crop rotation is practised. II. Biopesticides are used. III. Chemical fertilizers improve soil fertility. (A) I and II only (B) I and III only (C) II and III only (D) I, II and III	Answer: A Crop rotation, environmentally friendly practices and maintenance of soil fertility are all principles of organic farming. The use of inorganic chemicals, especially toxic inorganic chemicals, is strictly forbidden in organic farming.

CSEC Agricultural Science May/June 2012 Paper 1

9. Which of the following is NOT a marketing service?

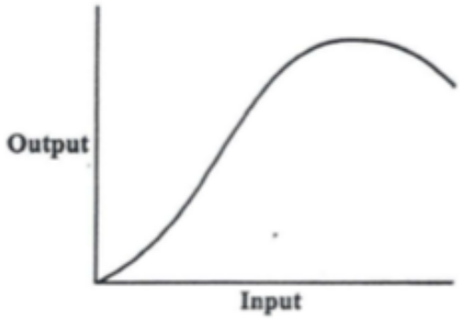
(A) Storage
(B) Reaping
(C) Grading
(D) Packaging

Answer: B

Agricultural marketing includes all the services involved in moving an agricultural product from the farm to the consumer. A large number of activities are involved in doing this: planning, planting, growing, harvesting, sorting, grading, agro-processing, food processing, packing and packaging, distribution, advertising and sales.

Reaping, or harvesting, is not part of marketing. All marking activities occur *after* the produce is harvested.

Item 11 refers to the following diagram.

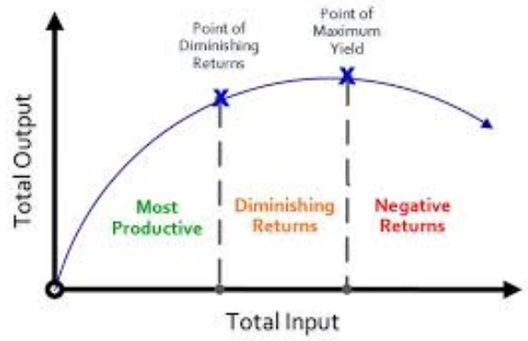


11. The graph above MOST likely represents the

(A) law of supply
(B) law of demand
(C) food conversion ratio
(D) law of diminishing returns

Answer: D

This graph most likely represents the law of diminishing returns. The law states that in any production process, if an input is continually increased by 1 additional unit while all other inputs are kept constant, the marginal output will increase to a maximum level, and then start decreasing. The graph representing the law is shown below.

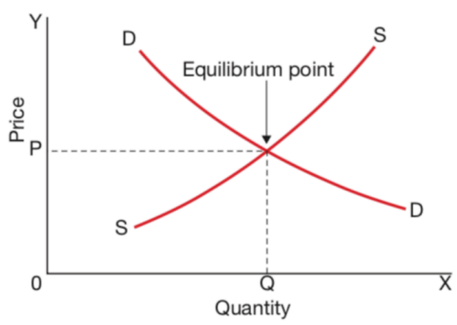


12. The point at which a demand curve intersects a supply curve indicates the

(A) selling price
(B) breakeven point
(C) equilibrium point
(D) point of profit maximization

Answer: C

The price of a commodity in a perfect market is determined by interaction of the two market forces that affect sales of the commodity: demand for the commodity and supply of the commodity. The price of the commodity is determined by the demand for it in relation to the conditions of its supply at a particular time. At some point, demand and supply are brought into balance or equilibrium. The point at which this happens is the called the equilibrium point, the quantity at which this point is reached is called the equilibrium quantity, and the price at this point is called the equilibrium price. The graph below illustrates.



CSEC Agricultural Science May/June 2012 Paper 1

13. The cost of using money borrowed from an agricultural bank is known as

(A) loan
(B) interest
(C) finance
(D) capital

Answer: B

When repaying a loan from from an agricultural bank, or indeed from any lending institution, the borrower pays interest. Interest is calculated as a percentage of the money borrowed, paid by the borrower to the lender periodically for being allowed to borrow the money. It may be thought of as a cost that the institution charges the lender for allowing the lender to borrow the money.

14. To increase coffee production, the government provides incentives through land preparation and planting material. This incentive is known as a

(A) subsidy
(B) reward
(C) credit
(D) tax

Answer: B

Subsides are monetary incentives to farmers; they involve giving farmers money. Credit is the ability of the farmer to borrow money; it is not an incentive. Taxes are monetary, but they involve taking money from farmer's; taxes are therefore not incentives. The answer is therefore reward; the government is rewarding people for getting into coffee production by preparing their land and giving them planting material.

15. In which of the following ways can a cooperative benefit a farmer?

I. Reduced interest rates at commercial banks
II. Reduced cost of inputs
III. Better bargaining power with government

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

Answer: C

Cooperatives act as bargaining bodies, representing their members negotiations with with outside parties such as the government; they have much more influence and bargaining power than farmers would individually have.

Cooperatives can buy inputs in bulk and sell them to farmers retail at educed prices, lowering the costs they pay for inputs.

Cooperatives have no influence on the interest rates that commercial banks set.

16. A dairy farmer has 100 heads of cattle, and wants a loan to add 50 more heads. He should prepare

(A) a cash flow statement
(B) a partial budget
(C) a complete budget
(D) an income statement

Answer: B

A partial budget is prepared when there is a change in a specific aspect of the existing farm plan that requires modification of the budget.

For example, a farmer may want to know whether replacing one crop with another crop, or buying a pick-up truck instead of hiring one, or adding more cattle to his herd, would be more profitable. In such situations, most of the income (receipts) and expenses (costs) in the existing budget will remain the same and only a few of them will change. A partial budget identifies the income and expenses that will change and sets out how additional costs and income will affect the change in profit. The farmer can therefore determine if the proposed change is economically sensible or not.

A partial budget provides an estimate of expected change in income and expenditure resulting from the proposed farm plan change. Therefore it is prepared before the proposed change is implemented.

A partial budget is prepared before the proposed farm plan change that it covers is implemented.

CSEC Agricultural Science May/June 2012 Paper 1

17. The major function of the agricultural section of the Caribbean Development Bank is to

(A) disburse loans to Caribbean governments for agricultural development projects
(B) advise governments on agricultural development projects
(C) give financial help to regional extension services
(D) give loans to individual farmers for agriculture

Answer: A

The Caribbean Development Bank (CDB) is a regional bank that provides loans to Caribbean governments for development of:

- Agriculture - credit, marketing, storage, land development, fisheries, forestry, irrigation, training
- Infrastructure - roads, bridges, water supply etc.

Item 18 refers to the following information.

The yield and average price per kilogram of four crops are given in the table below.

Crop	Yield (thousand kg)	Price (dollar per kg)
Cabbage	27	2.00
Cauliflower	17	3.50
Lettuce	27	1.25
Tomato	22	2.50

18. Based on gross returns alone, which is the MOST profitable crop for the farmer to plant?

(A) Cabbage
(B) Cauliflower
(C) Lettuce
(D) Tomato

Answer: B

The gross return of:

Cabbage = 27,000 kg × $2.00 per kg = 27,000 × 2.00 = $54,000.
Cauliflower = 17,000 kg × $3.50 per kg = 17,000 × 3.50 = $59,500.
Lettuce = 27,000 kg × $1.25 per kg = 27,000 × 1.25 = $33,750.
Tomato = 22,000 kg × $2.50 per kg = 22,000 × 2.50 = $55,000.

Therefore, based only on gross returns, the most profitable crop for a farmer to plant is cauliflower.

Note that gross return is the same as gross income: Gross income, also called total income, is all of the money that a business receives from sales of goods and services.

19. The weight of a porker pig is 70 kg, the dressing percentage is 60 % and the market price of the meat is $ 4.00 per kg. The farmer's income from the sale of pork from this pig is

(A) $ 112.00
(B) $ 168.00
(C) $ 240.00
(D) $ 280.00

Answer: B

Dressing percentage is the percentage of the live animal weight that becomes the carcass weight after dressing. Liveweight is the weight of the live animal. Dressing is the removal of the parts or the carcass that are unwanted e.g. with broilers, these parts are the feathers, head, all internal organs except the gizzard and liver (unwanted internal organs are collectively called the offal), the uppermost layer of the skin covering the feet, and the toes. Dressed weight is the weight of the carcass after dressing.

Equations:

1. Dressing percentage = (Dressed weight ÷ Live weight) × 100
2. Live weight = (Dressed weight × 100) ÷ Dressing percentage
3. Dressed weight = (Live weight × Dressing percentage) ÷ 100

If this pig has a liveweight of 70 kg and its dressing percentage is 60%, then according to equation 3, its dressed weight is (live weight × dressing percentage) ÷ 100 = (70 × 60) ÷ 100 = 4200 ÷ 100 = 42 kg. If the market price of pork is $4.00 kg, then the farmer sells 42 kg of pork from this pig at this price. Therefore his income from the sale of pork from this pig is 42 × 4 = $168.00

CSEC Agricultural Science May/June 2012 Paper 1

20. A complete budget is prepared

(A) after selling produce
(B) before claiming subsidies
(C) before starting an enterprise
(D) when adding a new enterprise

Answer: C

A complete budget is also known as a total budget or a whole farm budget. A complete budget is prepared for a farm that has a new owner or new management. It can also be used when there is a major change in the resources and enterprises of a farm, or when a complete re-organisation is undertaken. It is also prepared when an existing farm wants to change its systems of production and introduce improved technology.

A complete budget provides an estimate of expected gross income and total expenditure. Therefore it is prepared before the start of the enterprise. Indeed, it is an essential part of planning the operation of the enterprise.

21. Unless soil conservation measures are continually practised, the Caribbean will grow more dependent on foreign countries for food.

The problem referred to here is MOSTLY one of

(A) erosion
(B) finance
(C) flooding
(D) land use

Answer: A

Soil conservation refers to protecting the soil from erosion and maintaining its fertility. It is of great importance to agriculture in the Caribbean region. Soil erosion is the process by which particles of topsoil are carried away from one area, by water, wind, or other factors such as human activity, and deposited at another area.

22. Which of the following characteristics is/are true for clay soils?

I. Low water retention
II. Poor aeration
III. High capillarity

(A) I only
(B) III only
(C) II and III only
(D) I, II and III

Answer: C

Clay soil particles are very small and have very high cohesion (the ability of soil particles to stick together to form aggregates). Clay soils therefore have high water retention. They have very small intra-pore spaces (spaces between the particles in each aggregate) and inter-pore spaces (spaces between adjacent aggregates). This means they have very poor aeration; the small pore spaces hold little air.

Soil capillarity is the movement of water upwards in the pore spaces of the soil due to capillary action.In capillary action, water molecules stick to the sides of very small channels (such as soil pore spaces), causing water to be pulled up along the space. The narrower the space, the higher up the water rises. The smaller the pore spaces, the higher the water rises upward in the soil. Sandy soils have low capillarity due to their large pore spaces. Clay soils have high capillarity due to their small pore spaces. Capillary water in soil pore spaces is the water that is available to plant roots.

23. What is the function of bacteria in the carbon cycle?

(A) Combustion of fossil fuels
(B) Assisting with photosynthesis
(C) Release of oxygen into the air
(D) Decomposition of organic matter

Answer: D

The carbon cycle is the natural recycling of carbon in nature. All carbon in nature, including in plants, originally comes from atmospheric carbon dioxide gas. The carbon enters plants via photosynthesis. The process of photosynthesis releases oxygen into the air as a byproduct. Carbon in plants enters animals when they feed on plants; this is called nutrition. Carbon in dead plants and animals enters the soil via decomposition by bacteria and fungi. Fossilization is a process that converts dead plants and animals into fossil fuels (petroleum, natural gas and coal), rather than them decomposing. Combustion (burning) of plants (e.g. trees for fuel) and fossil fuels returns carbon to the atmosphere as carbon dioxide gas.

CSEC Agricultural Science May/June 2012 Paper 1

24. A farmer tested the pH of garden soil and found it to be 5.0. To increase the pH of this soil, she should add

(A) urea
(B) ferrous sulphate
(C) calcium carbonate
(D) ammonium sulphate

Answer: C

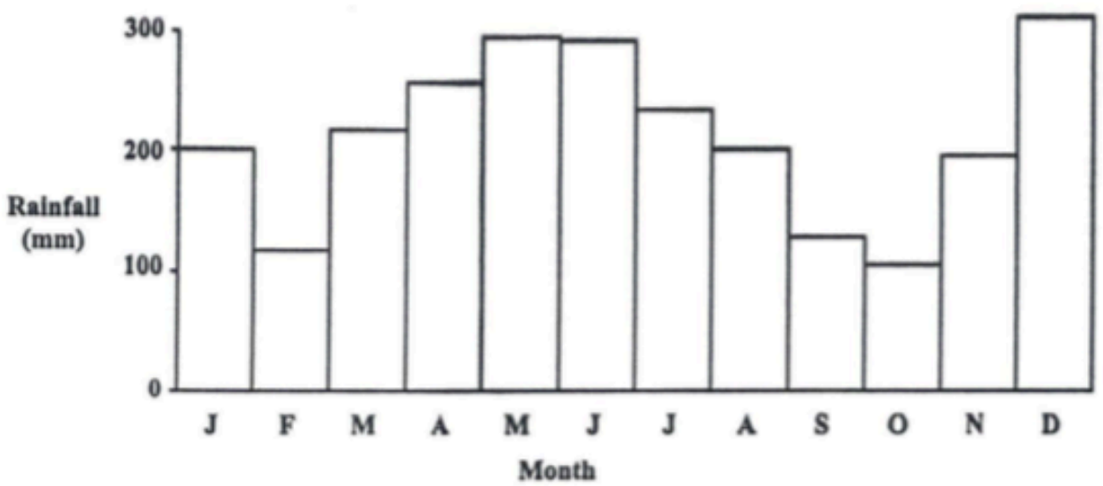
This is the acidity or alkalinity of a soil.
pH is measured in pH units on a scale running from pH 0 (completely acidic) to pH 14 (completely alkaline). A pH of 7 is neutral (neither acidic nor alkaline). As the pH gets lower, i.e. from 6.9 down to 0, the acidity gets higher, As the pH gets higher, ie. From 7.1 to 14, the alkalinity gets higher. Soils generally range from pH of 3 to 10.

Plant nutrients become unavailable according to a soil's pH level. If the pH is too low, i.e. the soil is too acidic, plants can get poisoned.Deficiencies of major plant nutrients often occur in very acidic soil because nutrients are less available to plants in acidic soils.Alkalinity impairs plant growth by restricting water supply to the roots, thus obstructing root development. It results to phosphorus and zinc deficiencies, and possibly iron deficiency and boron toxicity. Plants have less ability to extract essential nutrients from the soil when damaged by alkalinity.

Before attempting to change a soil's pH, its current pH needs to be known. This will determine by how much it needs to be changed.The soil's texture must be also be known.A soil pH test using a commercially available soil testing kit can be used to determine the pH. More effort is needed to change the pH of a clay soil than a sandy soil because the electrically charged surfaces of clays make them more resistant to pH changes than the uncharged surface of the sand particles.

Generally, limestone (calcium carbonate) is added to a soil to raise its pH level, i.e. make it less acidic, and sulphuric salt e.g. ammonium sulphate is added to a soil to reduce its pH level, i.e. make it more acidic.

Item 25 refers to the following histogram which shows the rainfall for a country in the Caribbean.



25. The highest incidence of fungal diseases will MOST likely be in the months of

(A) January, February and October
(B) February, March and October
(C) May, June and December
(D) September, October and November

Answer: C

Fungi proliferate (increase rapidly in numbers) in damp conditions. Rainfall is highest in May, June and December. This ensures the damp conditions that fungi proliferate in.

CSEC Agricultural Science May/June 2012 Paper 1

26. Burning as a form of land clearing is NOT advisable because it

(A) leaves the soil black
(B) breaks down soil texture
(C) increases atmospheric temperature
(D) removes valuable nutrients from the soil

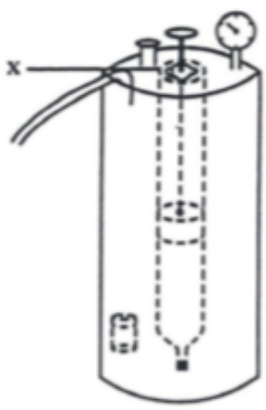
Answer: D

Burning vegetation as part of land clearing has positive and negative effects. Among the positive effects are:
- Unwanted material, such as cane trash, is burned out, so cane-cutters work more efficiently.
- Land clearing can be carried out more speedily.
- Harmful plants, such as nettles, are destroyed.
- Harmful animals, such as snakes, scorpions, centipedes and nests of wasps, are destroyed.
- The ashes on the land add potash (potassium) to the soil.
- The soil is sterilized as a result of the intense heat, killing plant pathogens (organisms that causes disease in plants).

Other negative effects of burning vegetation are:
- The destruction of organic matter that took many years to accumulate
- Humus in the soil is also destroyed
- Beneficial soil organisms, e.g. earthworms, are killed
- The soil surface becomes bare, with no plant cover so it is more exposed to soil erosion.
- Soil water is lost more rapidly through evaporation.
- Leaching of nutrients can occur more easily. Leaching of soil nutrients is the draining away of the nutrients when they get dissolved in soil water, which then percolates through the soil, i.e. it runs through the soil's pore spaces, deeper into the soil. This takes the nutrients beyond the reach of plant roots.
- It creates smoke pollution in the atmosphere.

It is recommended instead that harmful plants and crop residues are cut and stacked in an area where they can decompose slowly.

Item 27 refers to the following diagram which shows a piece of equipment often used by small farmers.



27. Why is there a small opening at point X?

(A) To allow it to act as an overflow outlet
(B) To enable air to be drawn inside the cylinder
(C) To enable the operator to see inside the cylinder
(D) Because the operator failed to screw on the cap

Answer: B

The pump handle is continually pulled up and pushed down. This forces air out of the tank via a small hole near the pump handle. The removal of air from the tank creates a vacuum that sprays the chemical out the nozzle when the trigger is pressed. At the chemical sprays out, air gradually enters the tank space around the pump handle, reducing spray pressure. Further pumping via the pump handle rebuilds pressure.

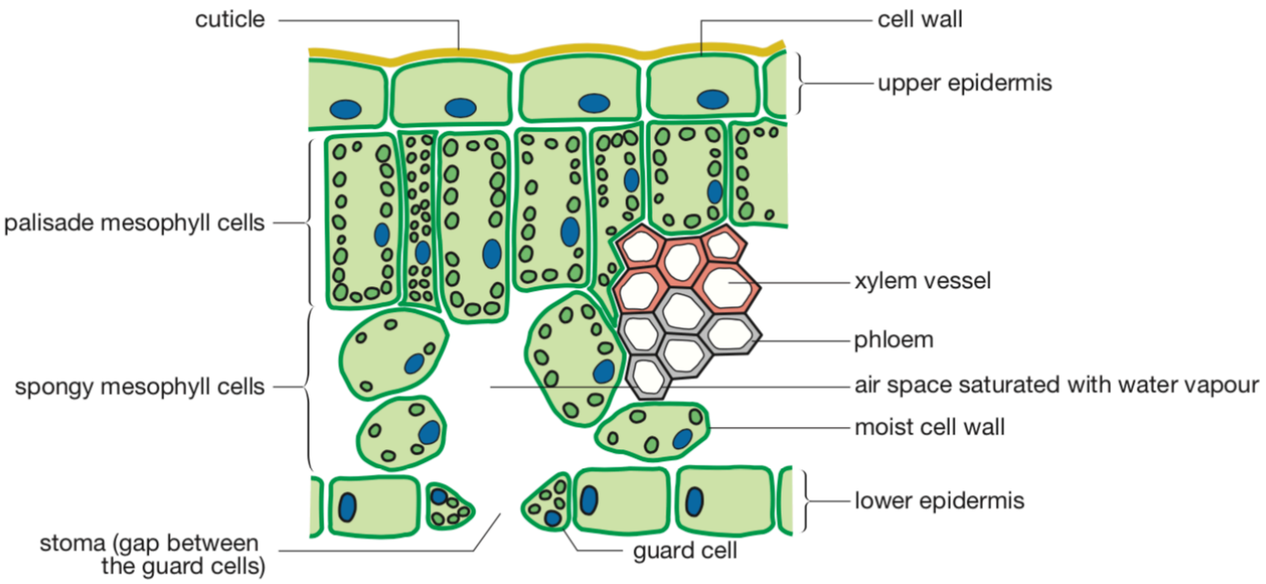
CSEC Agricultural Science May/June 2012 Paper 1

28. Which of the following structures regulate(s) water loss in a leaf?

(A) Cuticle
(B) Guard cells
(C) Epithelial cells
(D) Mesophyll cells

Answer: B

The cuticle slows down water loss from a leaf. However it does not *regulate* water loss; regulation means active control. Regulation of water loss in a leaf is done by the leaf's guard cells. These are specialized cells that open and close the stomata (pores on the underside of a leaf) through which transpiration (water loss from the leaf by evaporation occurs. When the stomata are fully open, maximum transpiration occurs. When they are fully shut, no transpiration occurs. The degree to which the stomata are open and shut is directly controlled by the guard cells.



Type of tissue	Position in leaf and characteristics	Functions
Epidermis	• Upper epidermis: single layer of cells covering upper surface; layer covered by waxy cuticle. • Lower epidermis: single layer of cells covering lower surface; contains more stomata than the upper epidermis.	• Protects the internal tissues. • Cuticle on upper epidermis slows down the evaporation of water from the leaf. • Stomata allow gas exchange.
Mesophyll	Tissues between the upper and lower epidermis; cells contain chloroplasts; divided into: • palisade mesophyll in the upper part of the leaf; can be one to three layers thick; contains large numbers of chloroplasts • spongy mesophyll in the lower part of the leaf; cells are irregularly-shaped and contain air spaces; contains fewer chloroplasts than palisade cells.	• The chloroplasts in the mesophyll cells contain chlorophyll, which absorbs light energy needed for photosynthesis. • Most photosynthesis occurs in the palisade mesophyll; air spaces in spongy mesophyll allow the circulation of gases needed for photosynthesis and respiration.
Vascular tissue	• Vascular tissue is composed of xylem and phloem and is present in the main vein and the network of smaller veins.	• The xylem transports water and mineral ions to the leaf, and supports the leaf tissues. • The phloem transports sugars from the leaf to other parts of the plant.

29. The requirements for the manufacture of food in plants are

(A) oxygen, water, sunlight, soil
(B) oxygen, water, sunlight, chlorophyll
(C) carbon dioxide, water, sunlight, soil
(D) carbon dioxide, water, sunlight, chlorophyll

Answer: D

Photosynthesis is the process by which plants manufacture organic food from inorganic materials. The plant uses carbon dioxide and water (inorganic materials) to produce glucose (organic food) using energy from sunlight trapped by chlorophyll. The process mainly takes place in leaves, in tissue called palisade mesophyll tissue. Oxygen is a byproduct of the process, not a requirement.

CSEC Agricultural Science May/June 2012 Paper 1

30. Crop rotation is a method of protecting the soil and replenishing its nutrients by planting (A) crops following the contour around a slope (B) a succession of different crops on the same land (C) a single crop on the same area of land each time, after herbicides have been applied (D) crops in an area where the fertilizer has been applied in a circular manner	Answer: B Crop rotation is a cropping system in which different crops are grown in succession on the same land chiefly to preserve the productive capacity of the soil. For example, a leafy crop e.g lettuce is cultivated, followed by a legume e.g. bodi; the legume replaces the nitrogen used up from the soil by the lettuce (leafy crops use a lot of nitrogen for leaf development). This can be followed by cultivation of another leafy crop e.g. spinach; the spinach uses the nitrogen that was put back into the soil by the bodi. The spinach can then be followed by pigeon peas, a legume that replaces the nitrogen used by the spinach. The cycle is then repeated, starting with lettuce, which uses the nitrogen put back by the pigeon peas.
31. Food produced during photosynthesis moves from the leaves to other parts of the plant by a process called (A) absorption (B) respiration (C) translocation (D) transpiration	Answer: C In translocation, phloem vessels transport the glucose produced by photosynthesis & other substances manufactured by the plant to other parts of the plant for use or storage.
32. Which of the following plants CANNOT be propagated by either grafting or budding? (A) Mango (B) Banana (C) Grapefruit (D) Avocado pear	Answer: B Grafting is inserting a shoot or twig into a slit on the trunk or stem of a living plant, from which it receives sap, so that the twig and trunk unite to form a single plant. It is an artificial procedure used in agriculture to propagate plants (produce more plants) artificially by vegetative propagation (propagation without seeds). Budding is a grafting technique in which a single bud from the desired scion is used. Mango, grapefruit and avocado are all propagated by grafting and/or budding. Banana naturally propagates vegetatively via suckers.
33. Which of the following are characteristics of weeds? I. Reduced crop yield II. Lower crop quality III. Increased nutrients for crops (A) I and II only (B) I and III only (C) II and III only (D) I, II and III	Answer: A Technically, a weed is any plant that grows where it is not wanted. However there are certain wild plants that are of no economic value, may poison or cause injury to livestock, and easily kill crops by crowding them out in terms of spacing, by taking most of the soil's nutrients, and by growing much faster than crops and thus shading them from sunlight, which the crops require for photosynthesis. These plants are what are commonly thought of as weeds. Weeds grow very much faster than crops and propagate very easily, both by seeds and vegetatively. They shade crops from needed sunlight, reducing their ability to photosynthesis and crowd crops, reducing their growing space. They also severely reduce nutrients available to crops by quickly depleting the soil of nutrients.

CSEC Agricultural Science May/June 2012 Paper 1

34. If tallness (T) is dominant to shortness (t), what will be the possible genotype of the offspring of a TT x tt cross?

(A) All TT
(B) All Tt
(C) Half TT and half tt
(D) Half tt and half Tt

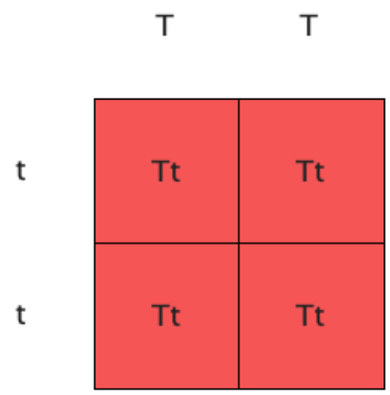
Answer: B

Alleles are different forms of a gene that code for contrasting characteristics. In this question, T and t are alleles - different forms of the same gene that control height. T codes for tallness and t codes for shortness.

A genotype is the collection of genes on paired chromosomes. TT, Tt and TT are genotypes. Genotypes cause phenotypes. A phenotype is the physical expression of a genotype. For example, if a genotype causes tallness, then the phenotype is tallness. If a genotype codes for shortness, then the phenotype is shortness.

In a pair of alleles, one allele may de dominant and the other may be recessive. The dominant allele displays its characteristic in the phenotype even though the recessive allele is present. The recessive allele only shows its characteristic in the phenotype only if the dominant allele is absent.

In this question, T is dominant over t. So genotypes TT and Tt produce tall plants and genotype tt produce short plants. The phenotypes of the offspring of this cross are all Tt. The diagrams below illustrate.



1 trait cross
4 squares
1 allele combination

Genotype	Count	Percent
Tt	4	100

35. Which of the following is NOT a mulching material spread on the soil in order to lessen the evaporation of water?

(A) Straw
(B) Fertilizer
(C) Compost
(D) Dried leaves

Answer: B

Mulching is the application of mulch. A mulch is a covering, as of straw (dried grass), compost, or plastic sheeting, spread on the ground around plants to prevent excessive evaporation or erosion, enrich the soil, etc.

Straw (dry grass), fertilizer, compost, dried leaves and plastic sheeting are used as munching material. Fertilizer is not mulch; it is used to increase soil fertility by adding nutrients to the soil.

36. You observe round spots which turn brown on the citrus leaves in the school orchard. The leaves then fall off. The MOST likely disease affecting the plants is

(A) leaf spot
(B) root rot
(C) anthracnose
(D) sooty mold

Answer: C

Anthracnose is a general term for a variety of plant fungal diseases. On leaves, more or less **circular**, chocolate **brown spots** (1 to 5 mm in diameter) develop. Leaves eventually fall off.

CSEC Agricultural Science May/June 2012 Paper 1

Item 37 refers to a situation where a field of cabbages shows signs of a heavy attack by larvae of the cabbage white butterfly.

37. Which of the following symptoms are the plants MOST likely to show?

(A) Entire leaf veins eaten
(B) Root system destroyed
(C) Leaves yellow and plant stunted
(D) Severe damage to leaves and heads

Answer: D

The cabbage white butterfly is a pest of crops in the *Brassica* family. This includes cabbage, broccoli, cauliflower, kale & pak-choi. The adult butterflies are harmless, but their larvae (caterpillars) are highly destructive. The caterpillars feed very heavily, consuming leaves and heads of any plan of the *Brassica* family..

38. Which of the following instructions for harvesting are appropriate?

I.	Tomatoes	Pick when fruits are dark-green in colour.
II.	Beans	Pick when pod will snap clean when broken.
III.	Cabbage	Uproot from the ground.
IV.	Sweet potato	Dig when leaves begin to dry, avoid bruising and do not break roots.

(A) I and II only
(B) I and III only
(C) II and III only
(D) II and IV only

Answer: D

Tomatoes should be harvested when they just begin to turn color. Leaving them to ripen on the plant risks damage from feeding birds.

Beans should be harvested at the snap stage. This is when they snap clean when broken.

Cabbages should be harvested by cutting off the head from the root with a sharp knife 3 to 4 months after transplanting.

Sweet potato should be harvested by digging them up when leaves begin to dry. Bruising and breakage of the root tubers should be avoided.

39. Postharvest losses are LEAST likely to occur in the process of

(A) storing
(B) labelling
(C) packaging
(D) transporting

Answer: A

Labelling, packaging involve direct handling of producing, increasing the chance of damage that causes postharvest losses. Transporting is also likely to cause damage leading to post harvest loss if packaging for transport is improper. Provided that conditions are suitable, storage is least likely to cause post-harvest losses.

40. Which of the following are advantages of processing?

I. Allows the farmer to maximise profits.
II. Reduces the incidence of post-harvest diseases.
III. Prolongs the storage life of the produce.

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

Answer: D

Processing adds value to the produce, which can greatly increase the market price and thus maximize profits. Processing can also reduce the incidence of post-harvest diseases by asking the physicals condition of the produce unsuitable for pathogens (disease-causing organisms). Processing cal also prolong the storage life of the produce by making its physical condition unsuitable for organisms that cause spoilage.

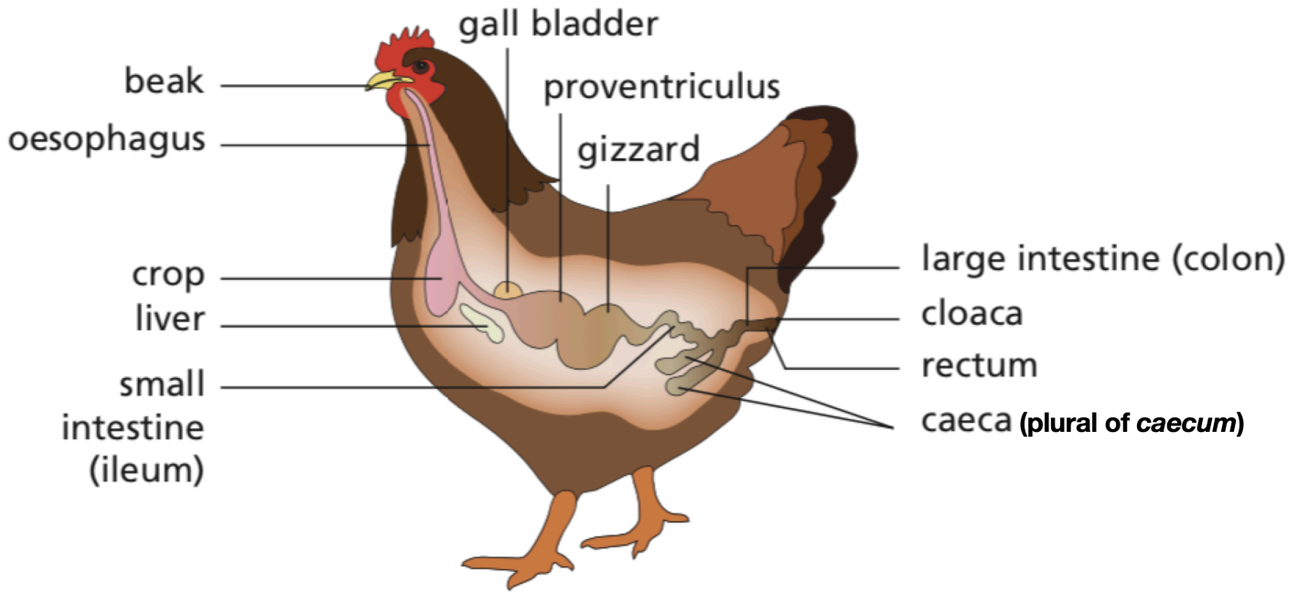
41. In the digestive system of a bird, which part stores food immediately after swallowing?

(A) Crop
(B) Gizzard
(C) Proventriculus
(D) Small intestine

Answer: A

The crop stores food after swallowing. The food then passes to the proventriculus. The proventriculus is a tube-like area that produces digestive juices such as pepsin and hydrochloric acid. The food is thoroughly soaked with these digestive juiced here. The food then passes to the gizzard, a muscular organ that grinds up the food. The gizzard has small stones called grit (swallowed by the bird or fed to the bird as a constituent of its feed) to assist in grading up the food. The food then passes to the small intestine, where nutrients are absorbed from it into the birds' body.

CSEC Agricultural Science May/June 2012 Paper 1



42. Cellulose digestion in sheep starts in the

(A) abomasun
(B) reticulum
(C) omasum
(D) rumen

Answer: D

Goats, sheep and cattle are ruminants. A ruminant is an animal that has a rumen. The rumen is part of a ruminant's complex, four-chambered stomach. It allows a ruminant to live entirely on cellulose (the main material in vegetation, i.e. grass and herbage).

The four chambers of a ruminant's stomach are the rumen, the reticulum, the omasum and the abomasum. The rumen is the largest chamber. Food is swallowed without chewing and enters the rumen from the mouth, where the cellulose in the food is digested by bacteria, which also manufacture B-complex vitamins, which the ruminant's body absorbs (they are nutrients).

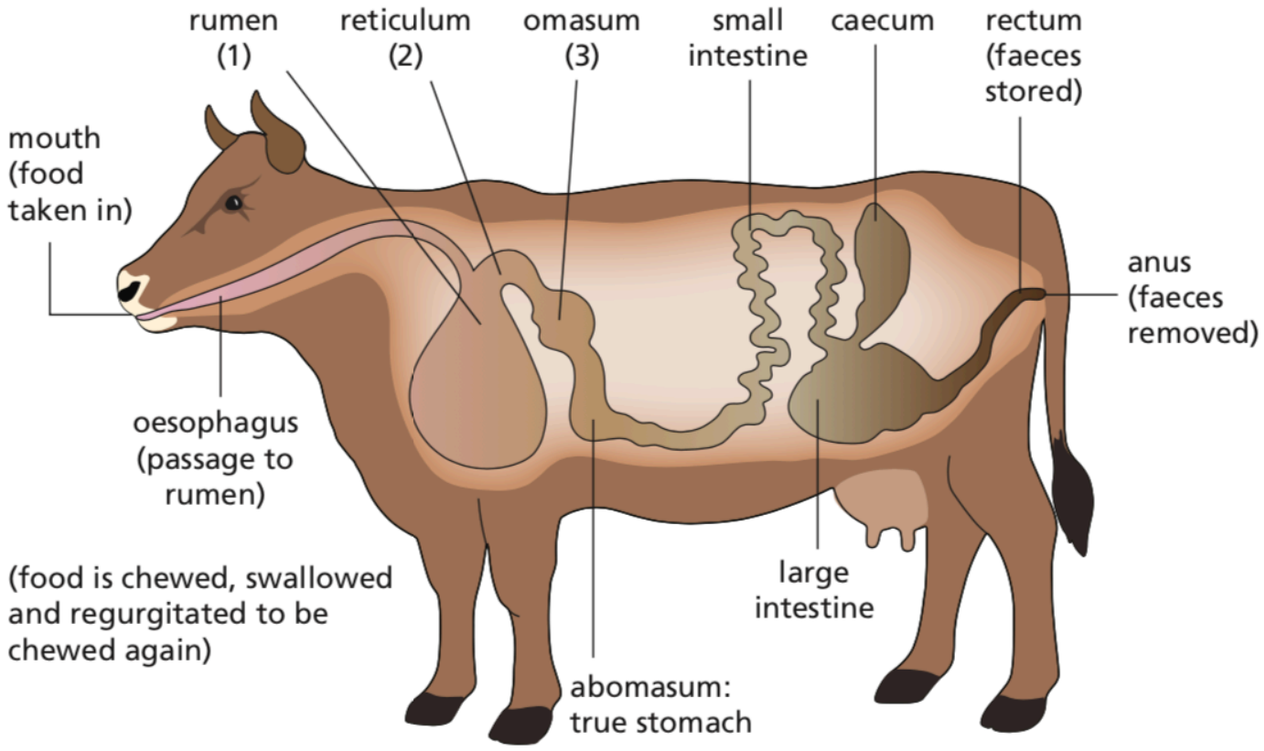
The food passes into the reticulum. The food is now semi-liquid. The reticulum forms the semi-liquid food into boluses or cuds, which are retuned to the mouth via regurgitation, or anti-peristalsis, for chewing (commonly called 'chewing the cud').

The chewed cuds are swallowed and pass back through the rumen and reticulum to the omasum. The omasum squeezes liquids out of the cuds. Fatty acids and water are absorbed from the cuds into the bloodstream through the wall of the omasum. The remaining solids in the cuds are passed from the omasum to the abomasum.

The abomasum produces gastric juice, which begins digesting proteins in cuds into amino acids, and fats in the cuds into fatty acids and glycerol. The cuds become completely liquified and enter the small intestine. All the simple nutrient molecules resulting from the digestion of the food (amino acids, glucose, fatty acids & glycerol) are absorbed into the animal's bloodstream here.

The undigested remains of the food pass into the large intestine, where water is absorbed from them and they are formed into feces, which are removed from the ruminant's body via egestion/defecation though the anus.

CSEC Agricultural Science May/June 2012 Paper 1



Bacteria and other micro-organisms in (1) and (2) break down cellulose.
Water is absorbed from (3). Digestion continues in the true stomach and small intestine.

43. What is the feed conversion ratio of the birds?

(A) 4:1
(B) 8:1
(C) 8:4
(D) 12:1

Answer: A

Feed conversion ratio (FCR) is the quantity of feed required by an animal to gain a unit of weight; the unit may be kg, lbs or whatever unit that the weight is measured in. It is a measure of the efficiency with which an animal converts feed into meat.

The table below gives the FCRs of common Caribbean livestock animals.

The closest FCR to the FCR for chickens, which are birds, is 4:1, so A is the best answer:

Class of livestock	Average feed conversion ratio (FCR)
Cattle	4.5 to 5.0 : 1
Pig	3.5 to 4.0 : 1
Goat	4.5 to 5.0 : 1
Rabbit	3.0 to 3.5 : 1
Chicken	3.0 to 3.5 : 1

44. A poultry farmer adds double the recommended dosage of antibiotics to the drinking water of his broilers. He is advised that this practice is wrong MAINLY because it may

(A) endanger the farm workers
(B) reduce the growth rate of the broilers
(C) endanger the health of his consumers
(D) lead to a low mortality rate of his birds

Answer: C

Excessive antibiotics in broilers endangers those who consume the chicken. Bacteria can develop resistance to an antibiotic if they are frequently exposed to to large amounts of it. These bacteria may be ingested by consumers who eat the chicken, leading to diseases that are difficult to treat because the antibiotics that previously killed the bacteria no longer do so.

CSEC Agricultural Science May/June 2012 Paper 1

45. Which of the following groups of feedstuffs supplies animals with MAINLY carbohydrates?

(A) Soybean, acacia, kudzu, gliricidia
(B) Fish meal, bagasse, rice bran, corn
(C) Coconut meal, cocoa meal, fish meal, citrus meal
(D) Broken rice, wheat middlings, brewer's grain, molasses

Answer: D

A feedstuff is any food provided for livestock. Feedstuffs, provide nutrients for energy, growth, development, maintenance, production and reproduction
.
There are 4 types of feedstuffs: forages, fodder, silage and concentrates. A forage is any food obtained by animals via grazing. Fodder is dried feedstuffs, such as hay, straw and chaff; they are used when forage is unavailable. Fodder can also include green chopped feedstuffs, for example, corn stalks, elephant grass and kudzu. Silage is pasture grasses, legumes and other crops that have been conserved and stored in silos.

Concentrates are produced commercially in feed mills using local and imported feedstuffs. They are designed to suit the maintenance and production needs of different farm animals and they can be mixed, mashed, ground, granulated or pelleted. Concentrates may be high protein, low protein, high fibre, low fibre, high carbohydrate, rich in essential vitamins and minerals, or have a low percentage of fat or low moisture content.

Rice, wheat middlings, brewer's grain and molasses are feedstuffs that are all high in carbohydrates. Soybean, acacia, kudzu and gliricidia are all forage legumes; these are high in proteins. Fish meal is also high in proteins. The other feedstuffs provide various nutrients, such as lipids, vitamins and minerals.

46. The term 'Barbados Black Belly' refers to

(A) a disease fatal to cattle
(B) a type of fish found in Barbados
(C) the name of a regional breed of sheep
(D) the beetle which destroys sweet potato tubers

Answer: C

Breeds of rabbits include Flemish Giant, New Zealand White, New Zealand Red, California and Chinchilla.
Breeds of goats include Saanen, British Alpine, Anglo-Nubian and Toggenburg.
Breeds of pigs include Landrace, Large White, Duroc, Hampshire and Tamworth.
Breeds of layer chickens include White Leghorn, Rhode Island Red, Bevan Brown (or Bovan Brown) and Hyline.
Breeds of broiler chickens include Vantress Cross, Peterson and Shaver.
Breeds of sheep include Barbados Blackbelly, Blackhead Persian, West African and Virgin Island White.
Breeds of dairy cattle include Jersey, Jamaica Hope and Holstein (or Holstein-Friesian).
Breeds of beef cattle include Jamaica Black, Jamaica Red (or Jamaica Red Poll), Charolais, Zebu and Buffalypso.

47. Which type of equipment is used to lift out frames from the 'super' in a hive?

(A) Smoker
(B) Hive tool
(C) Bee net
(D) Decapping knife

Answer: B

In managed hives, honey is stored in the cells of the combs in the supers in a hive. Supers are removable sections of a managed beehive that are used to hold frames of combs that contain mostly honey. The supers are usually at the top of a managed hive. A hive tool is used to lift the frames from the super

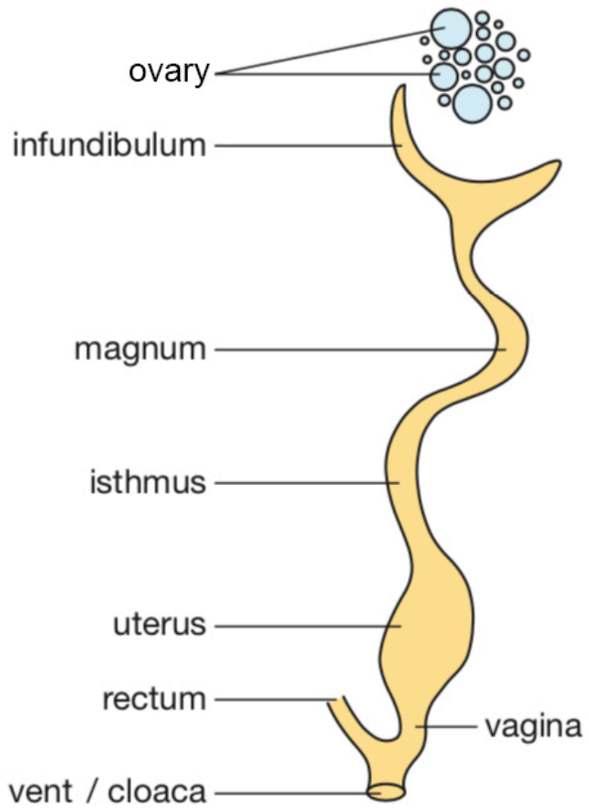
CSEC Agricultural Science May/June 2012 Paper 1

48. During the process of egg formation in poultry the shell is formed in the

(A) uterus
(B) isthmus
(C) magnum
(D) infundibulum

Answer: A

An egg starts in the hen's ovary. The yolk (ovum) of the egg develops here. The yolk moves into the magnum. Albumen (egg white) is produced here and surrounds the yolk. Thickened albumen forms the chalazae, which hold the yolk in a central position. The developing egg then moves into the isthmus. Two shell membranes are placed around the egg here. Finally moves into the uterus. The shell, formed mainly of calcium carbonate, is deposited on the outer shell membrane here.



49. Litter is spread on the floor space of a poultry pen MAINLY to

(A) provide warmth
(B) prevent pecking
(C) absorb droppings
(D) supply extra feed

Answer: C

Chicken litter can be rice hulls, wood shavings or any material that does not produce large amounts of dust. The litter is 3 to 4 cm deep; this allows it to generate sufficient heat to dry the watery feces.

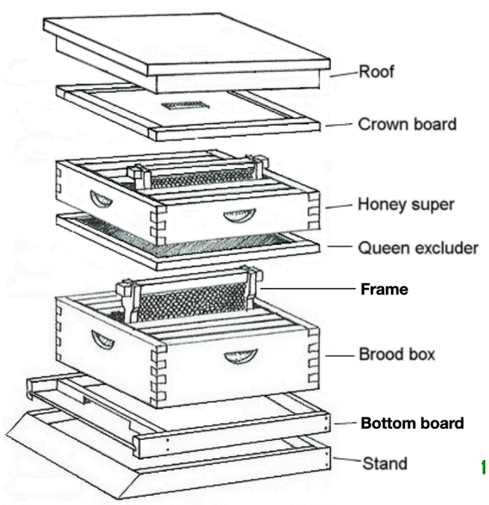
CSEC Agricultural Science May/June 2012 Paper 1

50. The queen excluder prevents the queen from

(A) escaping the hive
(B) mating with the drone
(C) interacting with workers
(D) laying eggs in honey cells

Answer: D

The queen excluder is one of the 7 parts of an apiarist's hive. The word apiarist is the technical term for beekeeper. beehive. The other parts are the stand, the bottom board, the brood box, brood chamber or body, the honey super, the crown board and the roof.
At the bottom of the hive is the stand. It lifts the hive 75 cm off the ground and protects hive against ground predators.
The bottom board is the floor of the hive.
The brood box, brood chamber or body contains a number of *frames* for the bees to make honeycombs. In a hive, brood is the name for all of the hive's larvae and eggs. A honeycomb is a structure of hexagonal cells of wax, made by bees to store honey, pollen and eggs. The queen lays eggs here. Workers are reared here. Frames must be spaced 4 cm apart tp provide space for the bees to pass between them.
The queen excluder keeps queens and drones out of the honey super, but allows workers into it.
The honey super is a honey storage compartment. Only the workers get in here, to make and store honey; the queen excluder keeps the queen out.
The crown board is the ceiling of the hive. It allows the roof to be removed without disrupting the hive.



51. Which of the following is a true layer breed of poultry?

(A) Shaver
(B) Peterson
(C) White Leghorn
(D) Vantress cross

Answer: C

Breeds of rabbits include Flemish Giant, New Zealand White, New Zealand Red, California and Chinchilla.

Breeds of goats include Saanen, British Alpine, Anglo-Nubian and Toggenburg.

Breeds of pigs include Landrace, Large White, Duroc, Hampshire and Tamworth.

Breeds of layer chickens include White Leghorn, Rhode Island Red, Bevan Brown (or Bovan Brown) and Hyline.

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Breeds of beef cattle include Jamaica Black, Jamaica Red (or Jamaica Red Poll), Charolais, Zebu and Buffalypso.

CSEC Agricultural Science May/June 2012 Paper 1

52. An animal 'in heat' is

(A) ready to be mated
(B) in need of water
(C) suffering from fever
(D) under severe heat stress

Answer: B

The estrus cycle is a sequence of events occurring in female mammals, occurring over a specific number of days from the beginning of one heat period (estrus) to the beginning of the next heat period.

The heat period is the length of time during which the female farm animal is sexually receptive to the male farm animal. During this period, the female is said to be in heat. This means she will allow a male to copulate (have sexual intercourse) with her.

The estrus cycle is controlled by hormones. Once puberty is reached, female farm animals come into heat at regular intervals. Puberty is the period during which growing mammals reach sexual maturity and become capable of reproduction.

It is only when in heat that the female allows a male to copulate with her. Heat occurs as a result of the high levels of the hormone estrogen, produced by the ovaries, circulating in the blood.

Ovulation (the release of an ovum from the ovary) is closely associated with the heat period. It usually occurs during estrus or shortly after it. Mating during this time can result in fertilization and pregnancy.

53. Debeaking of chickens is done to prevent

(A) eating of litter
(B) spillage of feed
(C) pecking one another
(D) attacking the farmer

Answer: C

Debeaking is the removal of about 2 mm of the chicken's upper beak using a hot iron. It prevents the birds from pecking at each other, and thus reduces/prevents cannibalism. It is no longer generally practiced as it has been found to be cruel.

Item 54 refers to the following information.

A poultry farmer allows fifty healthy hens to run on his farm with one mature rooster. He feeds the birds with a balanced ration and they produce a very large number of eggs. The eggs are incubated at an average temperature of 38 °C, but after 21 days only 20 % of the eggs hatch.

54. Which of the following BEST explains why only 20 % of the eggs hatched?

(A) All the eggs are not fertilized by the rooster.
(B) All eggs do not hatch at the same temperature.
(C) The incubator is too large for the number of eggs.
(D) The incubation temperature is not appropriate.

Answer: A

A hen does not need to mate to lay eggs, but she *does* need to mate to produce fertile eggs, or hatching eggs (eggs that hatch into chicks). This is because hatching eggs contain a germinal disc, or blastoderm, on their yolks. The germinal disc develops into the chick and results from the fertilization of the ovum that develops into the egg by a sperm cell from a cockerel, or rooster.

The ratio of cockerels to hens should be 1 : 10 to 1 : 12; this means 1 cockerel for every 10 to 12 hens. This ensures that all the hens can mate with and be fertilized by a cockerel, which is needed to produce hatching eggs (eggs that hatch into chicks).

This farm has a cockerel to hen ratio of 1:50. Thus the majority of the hens do not mate and thus produce only infertile eggs, or table eggs. These are eggs that have no germinal disc and thus do not hatch into chicks.

CSEC Agricultural Science May/June 2012 Paper 1

55. Artificial insemination has become increasingly popular in the Caribbean in recent years because

(A) it ensures that conception takes place
(B) fewer trained technicians are now available
(C) it is a less costly way to upgrade local animals
(D) regional governments have been expanding the service

Answer: C

Artificial insemination (AI) is the introduction of semen into the uterus of a female by artificial means, i.e. by means other than copulation. Mating in livestock farming refers to bringing together mature male and female animals of the same species for the purpose of breeding. Female animals that come into heat may be bred or serviced naturally by the male (boar, bull, ram or buck). As an alternative, semen from the male can be obtained and introduced into the reproductive tract of the female in heat via artificial insemination. Artificial insemination is carried out in cattle, sheep, goats and pigs.
AI is a skilled process that requires training. Attempts by untrained people can cause injury to the animal and failure of the insemination to lead to pregnancy. Upgrading local animals is crossbreeding them with breeds from other countries; it is much less expensive to ship stocks of semen from these animals than to ship the live animals.

56. A farmer who is mating his Flemish Giant females to New Zealand White males is rearing

(A) goats
(B) rabbits
(C) sheep
(D) cattle

Answer: B

Breeds of rabbits include Flemish Giant, New Zealand White, New Zealand Red, California and Chinchilla.

Breeds of goats include Saanen, British Alpine, Anglo-Nubian and Toggenburg.

Breeds of pigs include Landrace, Large White, Duroc, Hampshire and Tamworth.

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Breeds of dairy cattle include Jersey, Jamaica Hope and Holstein (or Holstein-Friesian).

Breeds of beef cattle include Jamaica Black, Jamaica Red (or Jamaica Red Poll), Charolais, Zebu and Buffalypso.

57. Farmer Keith observed that his cows had the following symptoms:

I. A dull ruffled coat
II. An offensive body odour
III. Excessive salivating

The farmer concluded that the animals were

(A) sick
(B) healthy
(C) restless
(D) in heat

Answer: A

A dull coat, an offensive body odor and excessive salivation are among the signs of illness in farm animals, including cattle.

58. Which of the following organisms causes coccidiosis?

(A) Fungus
(B) Bacterium
(C) Protozoan
(D) Mycoplasma

Answer: C

Coccidiosis is caused by a protozoan. It symptoms are droopiness, loss of of appetite, bloody diarrhea and a bloody, swollen vent (cloaca).

Coccidiosis is treated with sulfa drugs and magnesium sulphate in the birds' drinking water. Medications called coccidiostats can also be added to the feed. Excessively high stocking density and use of wet litter facilitate multiplication and spread of the protozoan that causes the disease. Birds that recover have high immunity from subsequent infections.

CSEC Agricultural Science May/June 2012 Paper 1

59. Which of the following is NOT a benefit of pasteurization of milk? (A) Improvement of milk composition (B) Destruction of harmful bacteria (C) Maintenance of nutritive value (D) Improvement of flavour and taste	Answer: A Pasteurization kills pathogenic bacteria and reduces the number of other bacteria that could cause spoilage, but it does not kill spores. Most pasteurization is carried out by heating to 72 °C for 15 seconds. During the process, milk is passed through pipes that are surrounded by water kept at just above 72 °C. This heats the milk, which is kept at this temperature for the correct amount of time and then cooled rapidly to 3 °C. Pasteurized milk and pasteurized juices should be kept refrigerated between 1 °C and 4 °C. The benefits of pasteurization are that the nutritional content and flavor are not altered by being exposed to these temperatures.
60. The live weight of a goat is 50 kg. The dressed carcase weight is 30 kg. What is the dressing percentage? (A) 30 (B) 40 (C) 50 (D) 60	Answer: D Dressing percentage is the percentage of the live animal weight that becomes the carcass weight after dressing. Liveweight is the weight of the live animal. Dressing is the removal of the parts or the carcass that are unwanted e.g. with broilers, these parts are the feathers, head, all internal organs except the gizzard and liver (unwanted internal organs are collectively called the offal), the uppermost layer of the skin covering the feet, and the toes. Dressed weight is the weight of the carcass after dressing. Equations: 1. Dressing percentage = (Dressed weight ÷ Live weight) × 100 2. Live weight = (Dressed weight × 100) ÷ Dressing percentage 3. Dressed weight = (Live weight × Dressing percentage) ÷ 100 If this goat has a liveweight of 50 kg and its dressed carcass weighs 30 kg, then according to equation 1, its dressing percentage = (30 ÷ 50) × 100 = 0.6 × 100 = 60