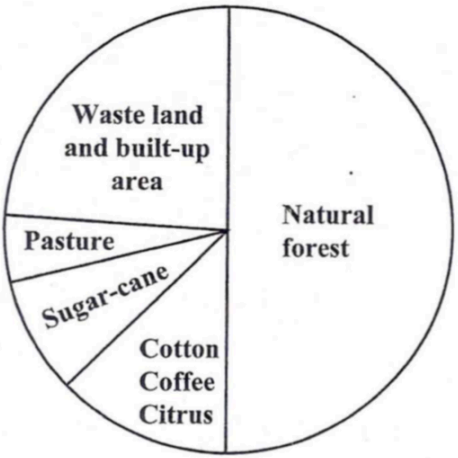


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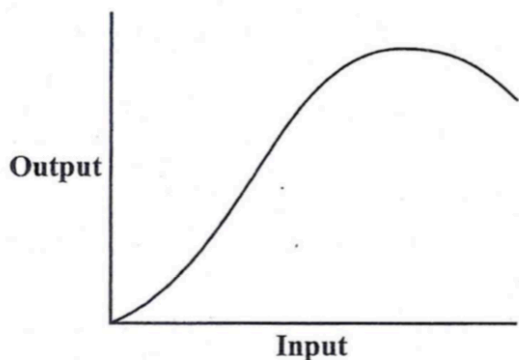
<p>1. A person whose job is to design, modify and maintain agricultural buildings and equipment has a career as</p> <p>(A) an engineer (B) an educator (C) a manager (D) a journalist</p>	<p>Answer: A</p> <p>An agricultural engineer designs and maintains agricultural businesses and equipment.</p>
<p>2. Which of the following is a regional agricultural institution?</p> <p>(A) CBI (B) OAS (C) IDB (D) CARDI</p>	<p>Answer: D</p> <p>The CBI (Caribbean Basin Initiative) was a trade agreement between the US and Caribbean countries; it no longer exists. The OAS (organization of American states) is a Caribbean region political organization, not an agricultural organization. The IDB (Inter-American Development Bank) is an international financial institution that operates in the Caribbean. CARDI (Caribbean Agricultural Research and Development Institute) is a Caribbean agricultural research and development organization.</p>
<p>3. A lack of rural infrastructure in an area could promote</p> <p>(A) rural - urban drift (B) urban - rural drift (C) environmental issues (D) interest in agriculture</p>	<p>Answer: A</p> <p>Rural urban drift is migration of people from rural to urban areas to live. This is usually due to a lack of infrastructure in rural areas e.g. poor roads, no public utilities such as electricity, pipe-borne water, phone service, etc. This causes agricultural lands in rural areas to be abandoned since there is no one to farm them.</p>
<p>Item 4 refers to the pie chart below which shows land use in a certain Caribbean country.</p>  <p>4. Approximately how much of the land is actually used for agriculture?</p> <p>(A) 75% (B) 50% (C) 25% (D) 20%</p>	<p>Answer: C</p> <p>Pasture is land used for grazing livestock. Sugarcane is a crop. Cotton, coffee and citrus are also crops. These uses collectively take up approximately 25% (one quarter) of the land.</p>
<p>5. Which of the following can be classified as a fixed cost?</p> <p>(A) Renting the land used (B) Preparing the land (C) Transporting fertilisers (D) Harvesting the crop</p>	<p>Answer: A</p> <p>Fixed costs (FC) are costs that do not increase or decrease with the level of production. Examples include land rental, machinery, buildings, insurance premiums (the amount of money paid for an insurance policy), taxes, loan installments and depreciation (a reduction in the value of an asset over time, due in particular to wear and tear). No matter how much or little production occurs, these costs do not change, e.g. suppose a farmer buys a tractor and is paying \$5,000 per month. That monthly payment is his loan installment. Regardless of how much or little production happens, the farmer still has to pay that money every month; it does not change.</p>

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<p>6. Which of the following may be the result of global warming?</p> <p>I. Drought II. Flooding III. Dehydration and death of animals</p> <p>(A) I only (B) I and II only (C) II and III only (D) I, II and III</p>	<p>Answer: D</p> <p>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.</p>
<p>7. In food safety, the abbreviation, G.M.P., stands for</p> <p>(A) Good Marketing Practices (B) Good Manufacturing Practices (C) Gross Marginal Products (D) Gross Marketing Products</p>	<p>Answer: B</p> <p>G.M.P. means good manufacturing practices. Good manufacturing practice (G.M.P.) is a system for ensuring that products are consistently produced and controlled according to quality standards. It is designed to minimize the risks involved in any production that cannot be eliminated through testing the final product.</p>
<p>8. Which of the following are principles governing organic farming?</p> <p>I. Use of crop rotation II. Environmentally friendly practices III. Maintenance of soil fertility IV. Use of toxic chemicals</p> <p>(A) I and II only (B) III and IV only (C) I, II and III only (D) II, III and IV only</p>	<p>Answer: C</p> <p>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.</p>
<p>9. The economic function which satisfies the wants of people is</p> <p>(A) marketing (B) production (C) consumption (D) management</p>	<p>Answer: A</p> <p>Marketing, production and consumption are the 3 economic functions. Management is an economic <i>factor</i> or production, not an economic function. The other economic factors of production are land, labor and capital. Production is the process of combining various material inputs (raw materials, labor etc.) with relevant plans and expertise in order to make a product or service; for example combining water, yeast and flour (inputs) to make bread (output). Marketing is the economic function that satisfies the wants of people. It is all of the activities involved in moving goods and services from the producer to the consumer. Marketing links production and consumption. Consumption is is the purchase and use of goods and services by clients and customers, known as <i>consumers</i>.</p>
<p>10. A graduate from your school wants to start a broiler project. He can obtain a loan from the</p> <p>(A) Agricultural Credit Union (B) World Trade Organisation (C) University of the West Indies (D) Food and Agriculture Organisation</p>	<p>Answer: A</p> <p>Agricultural credit unions are one of the sources of <i>capital</i> used to purchase agricultural inputs e.g. land, seeds, fertilizer, fuel etc. The graduate can join an agricultural credit union and get a loan to start his broiler project. The WTO (World Trade Organization) is an international trade regulation and dispute settlement body; it works with countries, not individuals, and it does not give loans. The University of the West Indies (UWI) is a regional educational institution; its Faculty of Agriculture provides agricultural education; it does not give loans. The Food and Agriculture Organization (FAO) is an international agricultural research and development institution; it does not give loans.</p>

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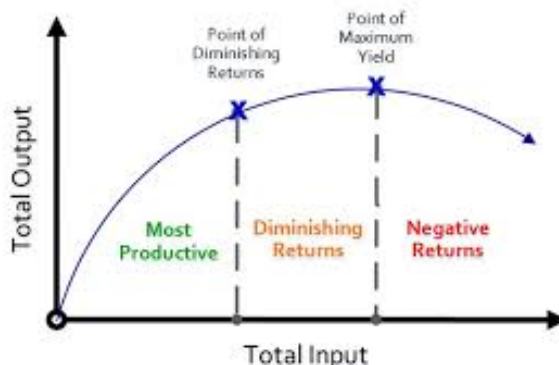
Item 11 refers to the following diagram.



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

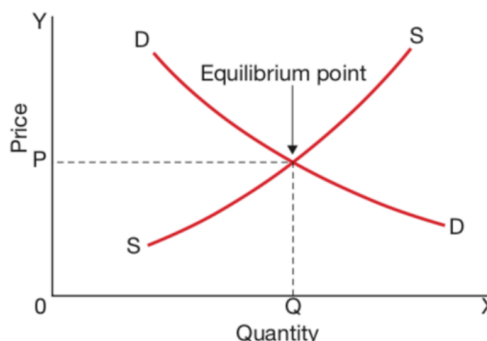
Answer: D

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.



Answer: B

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 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.



12. The point at which the demand curve intersects the supply curve indicates the
- (A) selling price
  - (B) equilibrium point
  - (C) break even point
  - (D) point of profit maximization

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.

13. Biodiversity refers to the
- (A) sum of all the species in a habitat
  - (B) size of the species in different habitats
  - (C) height of all the species in a habitat
  - (D) weight of the species in different habitats

Answer: C

A budget is necessary to obtain a loan to demonstrate the projected profitability of the enterprise, giving confidence to the lending institution that the borrower will be able to repay the loan. Collateral is necessary to obtain a loan to provide property which the bank can legally seize and sell if the loan is not repaid; this is called loan security. A proposal is necessary to obtain a loan in order to give the lending institution confidence that the enterprise is realistic, which directly affects profitability; an unrealistic enterprise will make no profit and thus repayment will prove impossible. Subsidies are not loans, nor do they have anything to do with loans; they are incentives given by the government to encourage agricultural production, such as money to assist in purchasing inputs.

14. Which of the following is NOT required when applying for a loan?
- (A) Budget
  - (B) Collateral
  - (C) Subsidies
  - (D) Proposal

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<p>15. The use of living agents, for example, natural or man-made pathogens to attack people and animals is known as</p> <p>(A) biology (B) bioterrorism (C) bioengineering (D) biotechnology</p>	<p>Answer: B</p> <p>Bioterrorism is terrorism involving the use of harmful biological agents, e.g. the release of pathogens (disease-causing organisms) to intentionally cause outbreaks of disease among people and livestock.</p>
<p>16. When farmers are paid a guaranteed price for their produce whether there is a decrease or increase in supply, this is known as</p> <p>(A) tariffs (B) tax incentives (C) tax exemptions (D) price supports</p>	<p>Answer: D</p> <p>Price support is government assistance in maintaining the levels of market prices regardless of supply or demand. Farmers can be guaranteed minimum prices by the government, referred to as guaranteed prices, for selected crops or commodities. The commodities may be export-oriented or for domestic consumption. These guaranteed prices are incentives to production. The guaranteed prices show that the government is committed to helping farmers.</p> <p>Tariffs are taxes on imports. Tax incentives are tax reductions intended to encourage production e.g. reduced value-added tax (VAT) on agricultural inputs.</p> <p>Tax exemptions are removals of taxes on commodities, e.g. removal of VAT on agricultural inputs. Tax incentives and tax exemptions are both intended to encourage agricultural production.</p>
<p>17. Farmer Joe reared his second batch of 200 broiler chicks. He made a loss for the second time, and did not know why. He needed to</p> <p>(A) do a different kind of business (B) rear fewer chicks than the first time (C) keep records so he could identify weaknesses (D) rear more chickens than the first time</p>	<p>Answer: C</p> <p>Farm records store essential data about all the agricultural enterprises on a farm. The data includes records of production, transactions, costs, information and observations, and is essential in determining &amp; tracking the economic performance of the farm.</p>
<p>18. Which of the following should be included in a costing of the variable expenses of a broiler project?</p> <p>(A) Feed, medication and labour (B) Pens, waterers and feeders (C) Plucking machine and bio-injector (D) Birds, feed and pens</p>	<p>Answer: D</p> <p>Variable costs are costs that increase and decrease with the level of production. The farmer can increase or cut back on them depending on his level of production; they are within his control. Examples of variable costs are seeds, labor, fertilizers, fuel, seedlings, medication etc. Fixed costs are costs that do not change with the level of production. No matter how much or how little his production, the farmer cannot increase or cut back on these costs; they are outside of his control. Examples are land, machinery buildings, rent, taxes, and insurance premiums.</p>
<p>19. In which of the following ways can a cooperative benefit a farmer?</p> <p>I. Cheaper transportation costs II. Reduced cost of inputs III. Better bargaining power with government</p> <p>(A) I and II only (B) I and III only (C) II and III only (D) I, II and III</p>	<p>Answer: D</p> <p>A cooperative helps its members reduce their operating costs and increase their levels of production, and therefore their income. Operating costs include transport costs and costs of inputs. Cooperatives also 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.</p>

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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

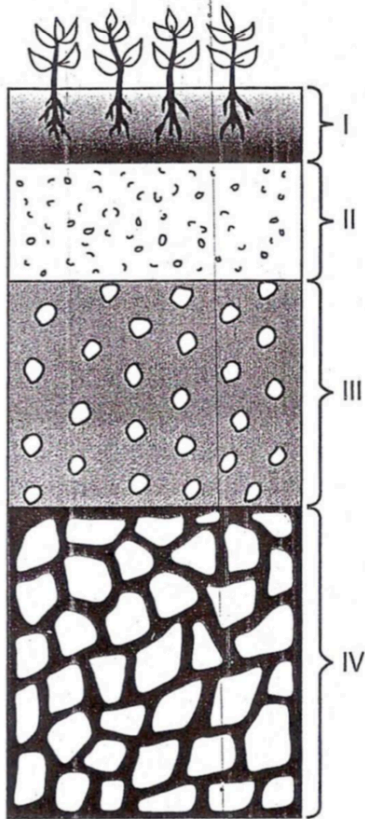
A complete budget is also known as a total budget or a whole farm budget. A complete budget is prepared for a farm that has a new owner or new management. It can also be used when there is a major change in the resources and enterprises of a farm, or when a complete re-organisation is undertaken. It 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. Which of the following is composed MAINLY of organic material?
- (A) Silt
  - (B) Clay
  - (C) Sand
  - (D) Humus

Answer: D

Soil organic matter consists of fresh or decaying plant and animal residues and humus. Humus is the end product of the decomposition of organic matter by micro-organisms. It is black or dark brown. In the tropics and sub-tropics, organic matter is broken down rapidly to humus by soil micro-organisms.

Item 22 refers to the following diagram of a typical soil profile.



22. A farmer wants to improve the structure of his soil. Which horizon(s) should he plough?
- (A) I only
  - (B) I and II only
  - (C) I, II and III only
  - (D) I, II, III and IV

Answer: A

I, II, III and IV are the horizons in the soil profile. In a soil profile, a horizon is any of the profile's distinct layers. I is horizon A - the topsoil. This is the horizon that is most important to farmers because it contains most of the nutrients needed by plants & it supplies the plants with water. Therefore to improve soil structure, this is the horizon that a farmer should plough. II is horizon B - the subsoil. The only instance in which a farmer has to plough the subsoil is if a layer called a hardpan develops in it. This is an impermeable layer; water cannot penetrate it. Therefore if left intact, water accumulates above it, waterlogging the topsoil. In waterlogging, soil becomes saturated with water. This drives air out of the soil. Without soil air, plant roots cannot get oxygen to respire; they thus die, killing the plants. A tractor attachment called a subsoiler or chisel plough is used to break up hardpans. However, subsoiling is expensive. Hardpans are mainly caused by excessive traffic on topsoil, causing soil compaction. If the farmer wishes to avoid hardpan development, he therefore needs to limit traffic on the soil. III is horizon C - weathered rock. This is weathered bedrock that formed the soil. In soil formation, weathering is the breakdown of rocks by physical, chemical and biological agents. IV - is parent rock or bedrock. This is the unweathered rock that formed the soil over thousands of years via weathering.

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<p>23. What is the function of bacteria in the carbon cycle?</p> <p>(A) Combustion of fossil fuels (B) Assist with photosynthesis (C) Release of oxygen into the air (D) Decomposition of organic matter</p>	<p>Answer: D</p> <p>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.</p>
<p>24. Which of the following plants is NOT usually propagated by either grafting or budding?</p> <p>(A) Banana (B) Mango (C) Avocado (D) Grapefruit</p>	<p>Answer: A</p> <p>Grafting and budding are two processes used to artificially propagate plants vegetatively. Vegetative propagation is the production of new plants without seeds. Artificial vegetative production is vegetative production that is induced by humans. Mangoes, avocados and grapefruit are all artificially propagated vegetatively. Bananas also propagate vegetatively, but this is <i>natural</i> vegetative propagation, as opposed to artificial; the plant naturally reproduces vegetatively; it does so by producing genetic copies, or <i>clones</i>, of itself called <i>suckers</i>. Bananas are not usually propagated via artificial vegetative propagation, therefore they are not usually propagated by grafting or budding.</p>
<p>25. The site for a rain gauge must be</p> <p>I. under a shed II. in an open area III. above ground level</p> <p>(A) I and II only (B) I and III only (C) II and III only (D) I, II and III</p>	<p>Answer: C</p> <p>A rain gauge is a device for collecting and measuring the amount of rain which falls. Rainfall is an important consideration in agricultural production, especially crop production. It should be sited in an open area above ground level; it should obviously not be sited under a shed.</p>

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

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

Answer: C

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).

However, burning vegetation also has negative effects:

- It destroys organic matter that took many years to accumulate.
- Humus in the soil is 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.

27. The purpose of the furrow wheel on a disc plough is to

- (A) compress the soil in the furrow
- (B) give the plough independent suspension
- (C) allow the plough to ride over any obstructions in the soil
- (D) stabilise the plough so that it maintains course

Answer: D

A disc plough is a primary tillage tractor attachment. Primary tillage is breaking up the surface of the soil by ploughing (plowing in American English). The purpose of the furrow wheel on a disc plough is to stabilize the plough as the tractor pulls it. The image below shows the position of the furrow wheel.



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

- (A) Stomata
- (B) Guard cells
- (C) Epithelial cells
- (D) Mesophyll cells

Answer: B

The stomata of a leaf are pores on the underside of the leaf through which carbon dioxide enters the leaf (carbon dioxide is used for photosynthesis) and through which water vapor leaves the leaf via transpiration.

Stomata are opened and closed by cells called guard cells. Therefore they determine the rate of water loss from a leaf by controlling the amount of water lost by transpiration. High air temperatures increase transpiration. High humidity (high water vapor content in the air) decreases transpiration. High air movement (windspeed) increases transpiration. High light intensity (brightness) increases transpiration.

Epithelial cells are found in animals, not plants. Mesophyll cells are found in leaf tissue. There are two types: palisade and spongy. Palisade mesophyll tissue is where most photosynthesis occurs. Spongy mesophyll allows diffusion of carbon dioxide through the leaf from the stomata into the palisade mesophyll.

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<p>29. An advantage of sexual reproduction in plants is</p> <p>(A) elimination of polyembryony          (B) immunity to pests and diseases          (C) variation and adaptability of plants          (D) speed and ease of replication of plants</p>	<p>Answer: C</p> <p>There are two types of reproduction in living organisms: sexual and asexual. Sexual reproduction involves gametes (sex cells). In plants, these are produced by flowers. The male parts of a flower are collectively called the androecium; they are the flower's anthers and stamens. Anthers produce pollen, which contains male gametes. The female parts of a flower are collectively called the gynoecium: the stigma, style, ovaries and ovules. Ovules carry female gametes. In pollination, pollen is transferred from anther to stigma. Once transferred thusly, a pollen grain produces a tube called a pollen tube, which grows down the style into the ovary and into an ovule. The male gamete passes through the pollen tube from the pollen grain to the ovule. The male and female gamete nuclei fuse; this is called fertilization. The ovary becomes a fruit, and the ovule becomes a seed containing a plant embryo, which grows into a new plant when the seed germinates. Asexual reproduction in plants is reproduction that does not involve seed production. Parts of some plants can naturally grow into new plants. This is called vegetative propagation. A major advantage of sexual reproduction is that it produces adaptability and variation in new plants of the species. This allows the species to evolve characteristics that allow it to survive gradual generational changes in the environment.</p>
<p>30. Which of the following is the BEST sequence in a four-crop rotation?</p> <p>(A) Lettuce, bodi beans (bora), spinach, pigeon peas          (B) Bodi beans (bora), pigeon peas, spinach, lettuce          (C) Pigeon peas, lettuce, spinach, bodi beans (bora)          (D) Spinach, lettuce, pigeon peas, bodi beans (bora)</p>	<p>Answer: A</p> <p>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.</p>
<p>31. Food produced during photosynthesis moves from the leaves to other parts of the plant by a process called</p> <p>(A) absorption          (B) respiration          (C) translocation          (D) transpiration</p>	<p>Answer: C</p> <p>In translocation, phloem vessels transport the glucose produced by photosynthesis &amp; other manufactured substances to other parts of the plant for use or storage. In plants, absorption is process by which water and mineral ions enter plants through their roots from soil. Respiration is the process by which all cells, including plant cells, release energy from food, typically glucose; they use this energy to maintain their life functions. In plants, the glucose is manufactured via photosynthesis. Transpiration is the evaporation of water out of the stomata of a plant's leaves.</p>
<p>32. The part of the sweet potato which is harvested is the</p> <p>(A) bulb          (B) fruit          (C) tuber          (D) flower</p>	<p>Answer: C</p> <p>There are two types of tubers: stem tubers and root tubers. A root tuber, tuberous root or storage root, is a modified lateral (horizontal) root, enlarged to function as a storage organ. Examples are sweet potato and cassava. A stem tuber is a thickened underground stem. An example is Irish potato. Both types of tubers store food, particularly carbohydrates.</p>



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33. Genes are arranged in order along the

- (A) DNA
- (B) gametes
- (C) genotype
- (D) chromosomes

Answer: D

A cell's nucleus contains chromosomes. Chromosomes carry genes. Genes are made of DNA.

34. If tallness (T) is dominant to shortness (t), what will be the possible genotypes 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 be 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, which means that in any genotype with T will show its characteristic in the phenotype: the organism will be tall. If genotype TT is crossed with genotype tt, the offspring will all have genotype Tt; all will be tall.

35. The MOST appropriate tool for pruning tomato plants is/are

- (A) a hoe
- (B) a knife
- (C) shears
- (D) secateurs

Answer: D

Pruning is trimming a tree, shrub, or bush by cutting away dead or overgrown branches or stems, especially to increase fruitfulness and growth. Secateurs, commonly called pruning shears, are specially designed to cut cleanly through both soft and hard plant tissue, resulting in clean pruning cuts with no unnecessary tissue damage. They are also designed to be used with one hand, making pruning easier. A hoe is used for tillage, not for pruning. A knife is not the best tool to use for pruning because it may not cut cleanly; this leads to unnecessary damage to plant tissue. Both hands may also be needed to make the cut. Shears other than secateurs are not designed for cutting cleanly through all types of plant tissue; they therefore damage tissue unnecessarily. Both hands may also be needed.

36. Farmer Khan observed his tomato crop turning yellow. He uprooted a few and saw root knots. This is a sign of infestation by

- (A) virus
- (B) fungus
- (C) bacteria
- (D) nematodes

Answer: D

Nematodes are very small, slender worms: typically about 5 to 100 micrometers thick, and 0.1 to 2.5 mm long. Root-knot nematodes are plant-parasitic nematodes. They exist in soil in areas with hot climates or short winters. Root-knot nematode larvae infest plant roots, causing the development of root knots called *galls* that drain the plant's nutrients and the sugars it synthesizes via photosynthesis. This is lethal to the plant. Affected plants have an unhealthy appearance and often are stunted, wilted or chlorotic (their leaves turn yellow); chlorosis is yellowing of leaves. Control of root-knot nematodes is by soil nematicides, which are chemical substances that kill nematodes.

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<p>37. For which of the following reasons is a farmer MOST likely to operate his farm <b>without</b> machines?</p> <p>I. The farm is located on steep terrain.          II. The size of the farm is too small for mechanization.          III. It is cheaper to do large-scale production with manual labour.</p> <p>(A) I and II only          (B) II and III only          (C) II and IV only          (D) III and IV only</p>	<p>Answer: A</p> <p>Agricultural machinery is difficult to use on steep terrain, as the machines may topple over. A farm may be too small to effectively use machinery. However, in a farm large enough to use machinery, especially on very large farms, machines are more economically viable than hiring large numbers of workers for labor.</p>
<p>38. A selective herbicide destroys</p> <p>(A) flowering weeds          (B) all types of weeds          (C) the chlorophyll in leaves          (D) some plants but has no effect on others</p>	<p>Answer: D</p> <p>A herbicide is any substance that is toxic to plants. They are usually used to control weeds. 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.</p> <p>Herbicides can be classified in different ways. Pre-emergent herbicides kill weeds before they emerge from the soil. Post-emergent herbicides kill weeds after they emerge from the soil. Contact herbicides kill only the part of the plant on which they are sprayed. The root system is not killed and the weed may grow back from the roots. Systemic herbicides are absorbed by the plants and taken into the root system, so the whole weed is killed and thus does not re-emerge. Grass-specific herbicides kill only weeds of the <i>Graminae</i> (grass) family. Broadleaf herbicides kill weeds <i>except</i> those of the <i>Graminae</i> (grass) family.</p> <p>Selective herbicides kill certain plants as they work on processes that happen in those plants only, while non-selective herbicides kill any plant as they work on processes that happen in all plants.</p>
<p>39. Which of the following indicates the correct sequence of harvest and postharvest operations?</p> <p>(A) Harvest → package → clean → grade          (B) Harvest → clean → grade → package          (C) Package → grade → harvest → clean          (D) Clean → package → harvest → grade</p>	<p>Answer: B</p> <p>After harvesting, produce should be cleaned and graded. Grading is grouping based on specific criteria e.g. size, weight and quality. Grading is necessary because different sizes, weights, qualities etc. command different prices. Sorting may also be necessary. Sorting is removal of produce which is unsuitable for market or storage due to damage etc. Packaging is the final post-harvest step.</p>

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40. Which of the following techniques are used in processing tomatoes?

- I. Chilling
  - II. Drying
  - III. Canning
- (A) I and II only
  - (B) I and III only
  - (C) II and III only
  - (D) I, II and III

Answer: C

After being harvested and cleaned, tomatoes can be dried, e.g. to produce sun-dried tomatoes. Tomatoes can also be canned. Chilling damages tomatoes, so tomatoes are not chilled.

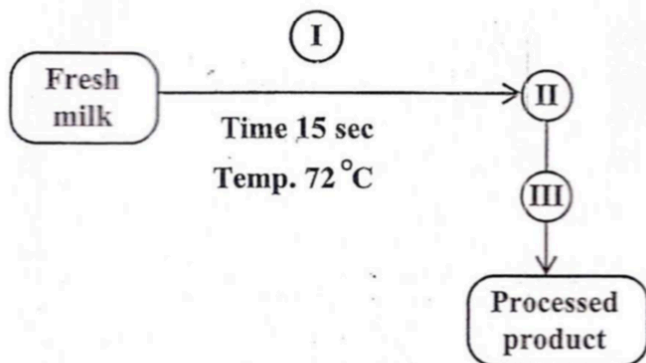
41. In the digestive system of a bird, which part stores food immediately after swallowing?

- (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 juices 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 grinding up the food. The food then passes to the small intestine, where nutrients are absorbed from it into the birds' body.

Item 42 refers to the following diagram.



42. What is the outcome at I?

- (A) Reduction in shelf life
- (B) Death of bacteria
- (C) Improvement in flavour
- (D) Reduction in butterfat content

Answer: B

I is pasteurization. This process destroys pathogenic organisms in milk, thus protecting public health. It prolongs the storage life of milk and maintains the nutritional value, taste and color. It is achieved by heating the milk to 63 °C for 30 minutes or to 72 °C for 15–20 seconds. The milk is then rapidly cooled to about 3 °C.

II is homogenization: In this process, butterfat globules are broken up into minute particles. The milk is heated to 72 °C for 15–20 seconds to pasteurize it. It is then subjected to high pressure and forced through a valve. Cream formation on the surface is prevented.

III is sterilization. Sterilization is used to produce ultra-high temperature (UHT) milk. The milk is heated to 140 °C for 3–5 seconds. This destroys all the micro-organisms in the milk but maintains the taste, color and nutritional value of the milk. This process extends the storage life of the milk considerably.

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Answer: A

43. Which section of the ruminant's stomach is the **largest**?

- (A) Rumen
- (B) Omasum
- (C) Reticulum
- (D) Abomasum

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 returned 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 through the anus.

44. In which of the following parts of the rabbit's digestive system does **MOST** cellulose digestion take place?

- (A) Colon
- (B) Caecum
- (C) Stomach
- (D) Small intestine

Answer: B

Rabbits are pseudo-ruminants. A pseudo-ruminant is an animal that is able to live entirely on cellulose (from vegetation), but does not have a rumen. Instead of a rumen, pseudo-ruminants have a digestive organ called a cecum that performs the same function as a rumen: digestion of cellulose.

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

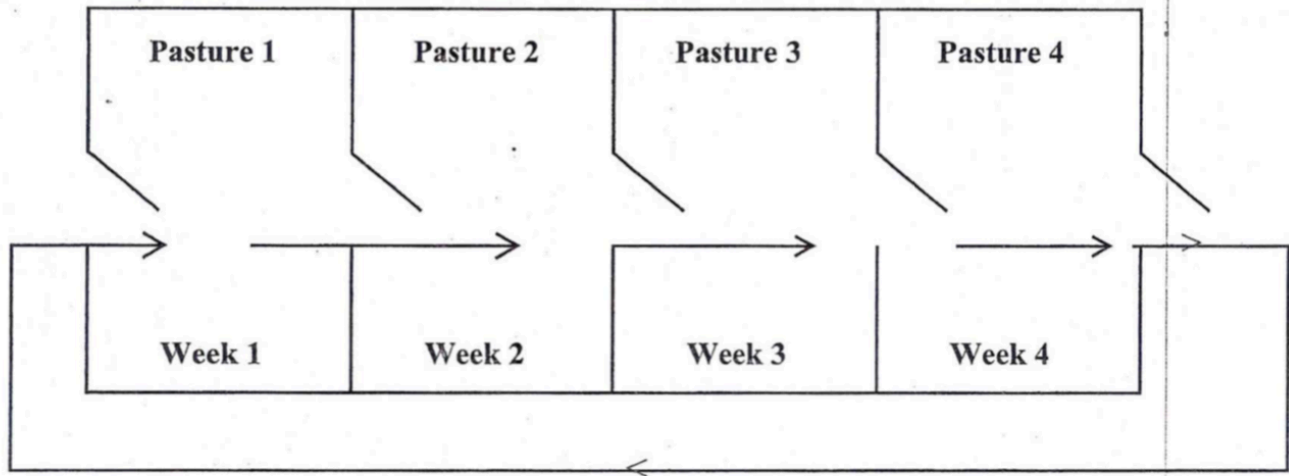
- (A) Soybean, acacia, kudzu, gliricidia
- (B) Fish meal, bagasse, rice bran, corn
- (C) Coconut meal, cocoa meal, fish meal, citrus meal
- (D) Broken rice, wheat middlings, brewer's grain, molasses

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.

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Item 46 refers to the following representation of a grazing system.



46. The management practice illustrated above demonstrates

- (A) zero grazing
- (B) cyclical grazing
- (C) rotational grazing
- (D) continuous grazing

Answer: C

There are 5 types of grazing systems used by Caribbean farmers: zero, traital, strip, continuous and deferred.

Zero grazing refers to the cutting, chopping and feeding of forage crops to animals housed in pens or stalls. The animals feed on grass without having to graze, hence the term zero grazing. Grass or leafy plants raised as feed for fenced-in livestock is called soilage. Examples of the soilage or legume mixtures used in this system include elephant grass, guinea grass, also known kudzu, Guatemala grass and pangola grass.

In rotational grazing, the pasture area is subdivided into six or eight paddocks. Each paddock is systematically grazed in sequence, with the animals being moved from one paddock to another. The stocking rate (the number of animals present in the paddock) is usually high, e.g. 20 –25 cows per hectare. Each paddock is grazed for three to seven days, depending on the stocking rate and herbage growth. After that time, the paddock is rested and the animals are moved to another paddock. The system continues until the last paddock has been grazed and the cycle is then repeated. When paddocks are not being grazed they undergo pasture management.

Strip grazing is a variation of the rotational system. A single paddock is grazed progressively, strip by strip, using movable electric fences to restrict the animals. The fences can be moved forwards once or twice daily, offering the animals a strip of fresh pasture for grazing.

In continuous grazing, animals are allowed to graze on the same pasture area for a very long period. This system is normally practiced on expansive range lands only, where fencing is absent and probably impractical. The stocking rate is usually low.

In deferred grazing, certain paddocks of pasture grass or legumes are withheld for later use. In tropical countries, it is the called the practice of conserving 'standing hay'. The forage that is withheld usually matures, loses its succulence (juiciness), palatability and some nutritive value, but it is important as a maintenance ration, especially in the dry season. Leafier grasses and legumes, such as Guinea grass or kudzu, and giant star grass, are most suitable for this type of grazing.

47. Forage grasses are cut and left in the field to dry.  
This is one stage in the making of

- (A) hay
- (B) silage
- (C) herbage
- (D) concentrate

Answer: A

Hay-making has two requirements: young grass with an abundance of leafy materials and weather conditions that are sunny and windy.

Hay-making steps:

- The grass is cut before the flowering stage when its nutritive value, palatability and yield are high.
- Sunshine and wind are used to dry the grass quickly. The cut grass is spread out in rows on the open field and turned at regular intervals for quick and uniform drying. This process continues until the moisture content has been reduced from 80% to 15–20%.
- When the moisture content is right, the hay is collected in small bundles and stacked. It is then stored in a cool dry area of the barn until it is needed to feed ruminant livestock. The stored hay should be unblemished, unbleached and have a pleasant aroma

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<p>48. When siting an apiary it should be positioned</p> <p>(A) downwind of any building (B) well away from any building (C) on the leeward side of any building (D) on the windward side of any building</p>	<p>Answer: B</p> <p>Principles in siting an apiary:</p> <ul style="list-style-type: none"><li>• It must be away from any residential areas for public safety.</li><li>• It must be far from the residence of the apiarist (beekeeper) for his and his family's safety.</li><li>• There must be an absence of pollutants &amp; pesticides, which would kill the bees.</li><li>• There must be a clear path to the apiary.</li><li>• Bees should have access to a source of clean drinking water.</li><li>• The hives must have protection from direct sunlight except during morning and evening.</li><li>• The hives must be protected from strong wind, as this disrupts bees' activity.</li><li>• There must be protection from pests and predators; while the bees can defend the hive, many of them will die in the process of stinging the predator.</li><li>• There must be protection from domestic animals that may damage hives.</li></ul>
<p>49. The equipment used to provide artificial heat to baby chicks is a</p> <p>(A) brooder (B) waterer (C) candler (D) feeder</p>	<p>Answer: A</p> <p>Brooding is the special care given to day-old chicks for the first 2–3 weeks of their lives. It provides comfort for the chicks, confines the chicks to an area in which they are as safe as possible, and allows for easy record-keeping e.g. of chick survival. There are two types of brooding: natural and artificial.</p> <p>In natural brooding, the hen incubates a clutch of eggs and produces a brood of chicks. She provides protection and warmth for the newly hatched chicks. She keeps them under her wings and feathered body until they develop feathers and are able to withstand colder weather conditions. If the area around the poultry house is securely fenced, the hen may roam freely with her chicks. Alternatively, she may be confined to a coop, which protects her and the chicks from rain, hot sun, draughts and predators such as rats, mongooses and stray cats. The farmer ensures that both the hen and the chicks have sufficient feed and water at all times.</p> <p>In artificial brooding, the day-old chicks are housed in a specially prepared area, usually a corner of the poultry house, where they are protected, kept warm and provided with litter, feed and water.</p> <p>A lamp called a brooding lamp, ideally an infra-red or heating bulb, is used to keep the chicks warm. If the temperature is too low, they huddle below the light and all will make loud, insistent 'peep-peep' noises. If the temperature is too high, they silently pant and scatter as far from the light as they can get. If the temperature is suitable, they will disperse evenly &amp; eat and drink normally; some will 'peep' contentedly and others will not.</p>

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. 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 to 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.

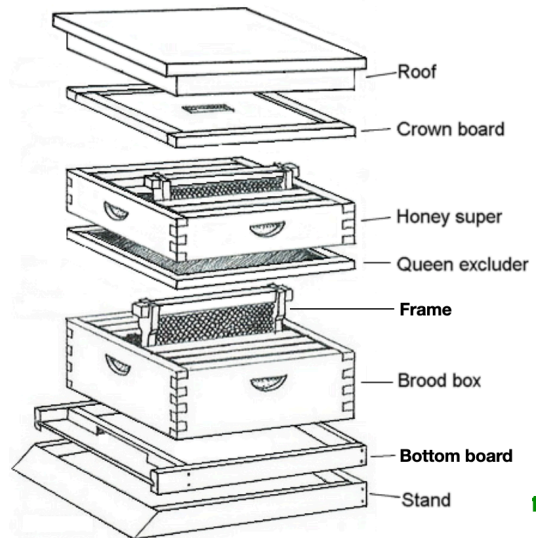
The honey super is a honey storage compartment. Only the workers get in here, to make and store honey; the queen excluder keeps the queen out.

The crown board is the ceiling of the hive. It allows the roof to be removed without disrupting the hive.

Above the crown board is the roof of the hive.

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



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

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

Answer: C

The White Leghorn is a layer chicken breed. Layers are chickens raised for eggs. Peterson, Shaver and Vantress Cross are broiler chicken breeds. Broilers are chickens raised for meat.

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Answer: D

A breeding system is a system of breeding animals or plants within a species or species group. In breeding systems, parents are chosen for desirable characteristics. In animal breeding, these may be rapid weight gain, high dressing percentage, high milk production, high milk fat content, high offspring survival, increased disease resistance, high pest tolerance, or other such desirable characteristics.

Four animal breeding systems are crossbreeding, upgrading, backcrossing and inbreeding.

Crossbreeding is mating an animal with another animal of the same species but of a different breed, such as Jersey and Zebu cattle. Back-crossing is crossing a hybrid organism with one of its parents. A hybrid animal is an offspring from crossbreeding. Crossbreeding provides the following advantages:

- Hybrid vigor (heterosis), or increased vitality, in offspring
- Disease resistance in offspring
- Improved production in offspring

Upgrading is a form of crossbreeding in which is native, or local, breeds are crossed with breeds from other countries or regions of the world.

Inbreeding is mating closely-related animals with each other. These animals will be genetically similar to each other. Line-crossing is a form of inbreeding. However, there are risks in inbreeding. If inbreeding is used for many generations, there is actually a decrease in desirable characteristics and an increase in undesirable characteristics. This is known as inbreeding depression. Inbred animals may show a decreased resistance to infection, be smaller in size, show physical defects and have a shorter lifespan.

52. A Jersey is bred with a Zebu. This type of breeding is

- (A) inbreeding
- (B) line breeding
- (C) backcrossing
- (D) cross-breeding

Answer: B

Gestation, commonly known as pregnancy, is the period between fertilization and birth of the offspring (parturition). Gestation varies in length with different farm animals. In fertilization, the nuclei of an ovum (female gamete, or female sex cell) and a sperm cell (male gamete, or male sex cell) fuse together to form a new cell called a zygote. The zygote develops into fully-formed offspring, which are birthed (parturition) a certain time after fertilization.

The average gestation period for rabbits is 30 days, with a range of 28 to 32 days (the closest answer to this is B: 29 - 31 days).

The average gestation period for goats is 150 days, with a range of 147 to 152 days.

The average gestation period for pigs is 114 days, with a range of 110 to 117 days.

The average gestation period for sheep is 148 days, with a range of 145 to 151 days.

The average gestation period for cattle is 280 days, with a range of 277 to 283 days.

53. The length of the gestation period in rabbits is

- (A) 19 - 21 days
- (B) 29 - 31 days
- (C) 35 - 37 days
- (D) 40 - 42 days



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<p>54. Which of the following is a balanced ration?</p> <p>(A) A feed which is given to young animals immediately after birth</p> <p>(B) A concentrate feed which has to be weighed, and must be very exact</p> <p>(C) A high protein diet given to pregnant and lactating animals</p> <p>(D) A diet which contains all the food nutrients needed in the correct portions</p>	<p>Answer: D</p> <p>There are 3 types of rations: balanced, maintenance and production.</p> <p>A balanced ration is a ration that contains all the necessary nutrients for growth and production in the right proportion for the animal.</p> <p>A maintenance ration is the amount of food needed to prevent any increase or decrease in the live weight of the animal; this is just enough to supply energy for all metabolic activities.</p> <p>A production ration is a ration that supplies nutrients in excess of maintenance; this excess is used for increased production.</p> <p>Rations are used for 2 processes: steaming up and flushing. Steaming up is feeding a production ration used in the late stages of pregnancy to increase mammary tissues (tissues that produce milk in breasts) and their blood supply. Flushing is feeding a production ration that is used to increase the fertility rate of female livestock.</p>
<p>55. Artificial insemination has become increasingly popular in the Caribbean in recent years because</p> <p>(A) it ensures that conception takes place</p> <p>(B) less trained technicians are now available</p> <p>(C) it is a less costly way to upgrade local animals</p> <p>(D) regional governments have been expanding the service</p>	<p>Answer: C</p> <p>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.</p> <p>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.</p>
<p>56. 'Feather pecking' in layer birds can be prevented by</p> <p>(A) candling</p> <p>(B) debeaking</p> <p>(C) brooding</p> <p>(D) clutching</p>	<p>Answer: B</p> <p>Debeaking is the removal of about 2 mm of the chicken's upper beak using a hot iron. It is no longer generally practiced as it has been found to be cruel.</p> <p>Candling is the process by which eggs are tested for fertility. In this process, a light is shone through them. It gets its name from when candles were used as the light source. The process is carried out on artificially incubated eggs between days 9–15 of incubation so that infertile and bad eggs can be removed.</p> <p>Brooding is the special care given to day-old chicks for the first 2–3 weeks of their lives. It provides comfort for the chicks, confines the chicks to an area in which they are as safe as possible, and allows for easy record-keeping e.g. of chick survival.</p> <p>There is no such term as clutching in poultry production. However, a clutch of eggs is the group of eggs laid by a hen at any one time.</p>
<p>57. Farmer Keith observed that his cows had the following symptoms:</p> <p>I. A dull ruffled coat</p> <p>II. An offensive body odour</p> <p>III. Excessive salivating</p> <p>The farmer concluded that the animals were</p> <p>(A) sick</p> <p>(B) healthy</p> <p>(C) restless</p> <p>(D) in heat</p>	<p>Answer: A</p> <p>A dull coat, an offensive body odor and excessive salivation are among the signs of illness in farm animals, including cattle.</p>

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<p>58. Dead, discoloured, foul smelling larvae in a hive are symptoms of</p> <p>(A) blight (B) nosema (C) foul brood (D) ant attack</p>	<p>Answer: C</p> <p>Three diseases that affect bees are American foulbrood, European foulbrood, sacbrood disease &amp; nosema disease. The term 'brood' refers to bee eggs and larvae. Both forms of foulbrood kill larvae, leaving them discolored and foul-smelling, hence the term 'foulbrood'.</p>
<p>59. Which of the following is a breed of rabbit?</p> <p>(A) Saanen (B) Flemish Giant (C) Vantress Cross (D) Jamaica Hope</p>	<p>Answer: B</p> <p>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.</p>
<p>60. The MAIN reason for grading eggs is to</p> <p>(A) sort by size (B) test for fertility (C) put into egg crates (D) place into incubator</p>	<p>Answer: A</p> <p>Grading is grouping based on specific criteria e.g. size, weight and quality. Grading is necessary because different sizes, weights, qualities etc. command different prices.</p>