CUET UG Agriculture Sample Paper - 2

Duration: 1 Hour **Maximum Marks: 250**

Instructions

- This paper contains a total of **50** Multiple Choice Questions.
- Each correct answer carries **+5 marks**.
- Each incorrect answer carries **-1 mark**.
- No negative marking for unattempted questions.

Q1. A breeder observes that certain genes tend to be inherited together more frequently than expected by independent assortment. If the distance between two genes on a chromosome is 15 centimorgans (cM), what is the expected frequency of recombinant gametes?

(A) 30%

(B) 15%

(C) 7.5%

(D) 85%

Q2. In the context of DNA replication, the enzyme responsible for relieving the torsional strain (supercoiling) ahead of the replication fork is:

(A) DNA Helicase

(B) DNA Primase

(C) DNA Topoisomerase (Gyrase)

(D) DNA Ligase

Q3. Which of the following breeding methods is most effective for improving a highly productive variety that is susceptible to a single race-specific pathogen, using a dominant resistance gene?

(A) Pedigree Method

(B) Bulk Method

(C) Backcross Method

(D) Mass Selection

Q4. During the "Hardening" phase of micropropagation/tissue culture, plantlets are transitioned from the lab to the field primarily to:

(A) Increase the rate of photosynthesis

(B) Reduce the transpiration rate by developing the cuticle

(C) Induce somatic embryogenesis

(D) Increase the concentration of auxins

Q5. Which soil microorganism is specifically responsible for the "earthy smell" of soil after the first rain, often contributing to the decomposition of complex organic polymers like cellulose?

(A) Nitrobacter

(B) Azotobacter

(C) Actinomycetes

(D) Mycorrhiza

Q6. Identify the correct statement regarding Agrometeorology: "Lapse rate" refers to the:

(A) Decrease in temperature with increase in altitude

(B) Increase in pressure with decrease in altitude

(C) Change in wind speed due to topography

(D) Rate of evaporation from a water body

Q7. In Livestock Management, a "Balanced Ration" for a milch cow must ensure that the Nutritive Ratio (NR) is approximately:

(A) 1:2 to 1:3

(B) 1:5 to 1:6

(C) 1:10 to 1:12

(D) 1:15 to 1:20

Q8. Which of the following is an exotic breed of poultry known for producing the highest number of white-shelled eggs annually?

(A) Rhode Island Red

(B) White Leghorn

(C) Australorp

(D) Plymouth Rock

Q9. The metabolic disease in high-yielding dairy cows caused by a sudden drop in blood calcium levels shortly after calving is:

(A) Ketosis

(B) Milk Fever

(C) Bloat

(D) Acidosis

Q10. In Artificial Insemination (AI), the most common cryoprotectant used for freezing bovine semen in liquid nitrogen is:

(A) Ethanol

(B) Glycerol

(C) Formaldehyde

(D) Sodium Chloride

Q11. The process of "Homogenization" in milk processing is primarily aimed at:

(A) Killing pathogenic bacteria

(B) Breaking down fat globules to prevent cream separation

(C) Increasing the Vitamin D content

(D) Removing sediment and dirt

Q12. If a soil has a pH of 4.5, which of the following elements is most likely to reach toxic levels for most field crops?

(A) Phosphorus

(B) Calcium

(C) Aluminum

(D) Molybdenum

Q13. The "Critical Period of Weed Competition" for most upland Rice varieties generally occurs during:

(A) 0–10 days after sowing

(B) 15–45 days after sowing

(C) 60–90 days after sowing

(D) At the time of physiological maturity

Q14. Precision Farming utilizes which technology to apply inputs like fertilizers and water at variable rates based on site-specific needs?

(A) Genetic Engineering

(B) Geographic Information System (GIS)

(C) Traditional Tillage

(D) Flood Irrigation

Q15. Which fruit propagation method involves joining a scion with a rootstock where the scion remains attached to the mother plant until the union is successful?

(A) T-Budding

(B) Inarching (Approach Grafting)

(C) Veneer Grafting

(D) Cleft Grafting

Q16. According to Mendel's Law of Independent Assortment, the 9:3:3:1 phenotypic ratio in a dihybrid cross is a result of:

(A) Linkage between the two genes

(B) Random alignment of homologous chromosomes during Metaphase I

(C) Crossing over during Prophase II

(D) Epistatic interaction between non-allelic genes

Q17. In plant biochemistry, which enzyme is considered the most abundant protein on Earth and is responsible for the initial fixation of CO_2 in the C3 cycle?

(A) PEP Carboxylase

(B) RuBisCO

(C) Carbonic Anhydrase

(D) ATP Synthase

Q18. The "Law of Minimum," which states that plant growth is limited by the nutrient in shortest supply relative to the plant's needs, was proposed by:

(A) Justus von Liebig

(B) V.V. Dokuchaev

(C) Jethro Tull

(D) G.H. Shull

Q19. Which type of microbial cell wall contains a thick layer of peptidoglycan and teichoic acids, causing it to retain the crystal violet stain during Gram staining?

(A) Gram-negative bacteria

(B) Gram-positive bacteria

(C) Cyanobacteria

(D) Archaebacteria

Q20. An "Isotherm" on a weather map connects points having the same:

(A) Atmospheric Pressure

(B) Relative Humidity

(C) Temperature

(D) Rainfall intensity

Q21. The term "Steaming up" in livestock management refers to:

(A) Cleaning the animal with hot water vapor

(B) Feeding extra concentrates to pregnant cows 3-4 weeks before calving

(C) Increasing the temperature of the poultry house during winters

(D) Medicated inhalation given to animals suffering from pneumonia

Q22. Which exotic cattle breed, originating from Switzerland, is known for being a sturdy, dual-purpose breed with a light brown or silver-gray coat?

(A) Jersey

(B) Holstein Friesian

(C) Brown Swiss

(D) Ayrshire

Q23. The causative agent of "Ranikhet Disease" (Newcastle Disease) in poultry is a:

(A) Gram-positive bacterium

(B) Protozoan parasite

(C) Virus (Paramyxovirus)

(D) Fungus (Aspergillus)

Q24. In the context of milk products, "Paneer" is classified as a:

(A) Fermented milk product

(B) Acid-coagulated heat-precipitated product

(C) Concentrated milk product

(D) Fat-rich dairy product

Q25. The "Cation Exchange Capacity" (CEC) of a soil is generally highest in soils dominated by which type of clay mineral?

(A) Kaolinite

(B) Illite

(C) Montmorillonite (Vermiculite)

(D) Quartz

Q26. Which irrigation method is characterized by the highest water-use efficiency (90-95%) as it provides water directly to the root zone drop by drop?

(A) Sprinkler Irrigation

(B) Drip Irrigation

(C) Furrow Irrigation

(D) Check Basin Irrigation

Q27. Identify the "Systemic Herbicide" among the following, which is translocated through the plant's vascular system to kill the entire weed:

(A) Paraquat

(B) Glyphosate

(C) Diquat

(D) Propanil

Q28. The "SRI" (System of Rice Intensification) technique primarily focuses on:

(A) Continuous flooding of the field

(B) High seed rate and close spacing

(C) Transplanting young (8-12 day old) single seedlings with wide spacing

(D) Application of heavy chemical fertilizers

Q29. Which bio-fertilizer is most suitable for fixing atmospheric nitrogen in symbiotic association with the roots of Leguminous crops like Groundnut or Soybean?

(A) Azotobacter

(B) Rhizobium

(C) Azospirillum

(D) Blue Green Algae

Q30. In Horticulture, "Pinching" is a practice commonly performed in flowers like Marigold to:

(A) Induce early flowering

(B) Remove apical dominance and encourage lateral branching

(C) Increase the size of a single terminal flower

(D) Protect the plant from frost

Q31. The "Khaira" disease of Rice is caused by the deficiency of:

(A) Iron

(B) Zinc

(C) Boron

(D) Nitrogen

Q32. Which of the following is a climacteric fruit, meaning it continues to ripen and shows a respiratory burst after being harvested?

(A) Grape

(B) Citrus

(C) Mango

(D) Pomegranate

Q33. In food preservation, the "Cold point" during the canning of food refers to:

(A) The temperature at which the food starts to freeze

(B) The area in the can that is slowest to heat up

(C) The temperature of the cooling water used after sterilization

(D) The point where microbial growth is completely stopped

Q34. What is the primary objective of "Mulching" in field crops?

(A) To increase the soil pH

(B) To conserve soil moisture and suppress weeds

(C) To increase the rate of transpiration

(D) To reduce the population of soil bacteria

Q35. Which vitamin is essential for the normal clotting of blood in livestock and its deficiency leads to "Sweet Clover Disease"?

(A) Vitamin A

(B) Vitamin D

(C) Vitamin K

(D) Vitamin E

Q36. The "Noble Canes" refers to the species of sugarcane known as:

(A) Saccharum spontaneum

(B) Saccharum officinarum

(C) Saccharum barberi

(D) Saccharum sinense

Q37. A soil texture characterized by an equal balance of sand, silt, and clay is termed as:

(A) Sandy Soil

(B) Clayey Soil

(C) Loamy Soil

(D) Silty Soil

Q38. Which Indian breed of buffalo is world-famous for its high fat content (up to 13%) in milk?

(A) Murrah

(B) Mehsana

(C) Bhadawari

(D) Surti

Q39. The process of "Degreening" in citrus fruits is achieved by exposing the harvested fruits to:

(A) Carbon dioxide

(B) Ethylene gas

(C) Nitrogen gas

(D) Oxygen gas

Q40. Which of the following is a "C4 plant" known for its high photosynthetic efficiency under high temperature and light intensity?

(A) Wheat

(B) Rice

(C) Maize

(D) Potato

Q41. Which type of layering, often used in propagation of Jasmine, involves bending a flexible branch to the ground and covering a portion of it with soil while the terminal end remains exposed?

(A) Air Layering

(B) Simple Layering

(C) Trench Layering

(D) Serpentine Layering

Q42. The mobilization of nutrients from older leaves to younger leaves is highly efficient for mobile elements. Consequently, deficiency symptoms of which of the following elements appear first on older leaves?

(A) Calcium

(B) Iron

(C) Nitrogen

(D) Boron

Q43. In livestock nutrition, the "Maintenance Ration" is defined as the amount of feed required to:

(A) Support rapid weight gain in meat animals

(B) Keep the animal's body weight constant without gain, loss, or production

(C) Increase the milk fat percentage in dairy cows

(D) Provide energy specifically for work in draft animals

Q44. Which horticultural practice involves the removal of dead, diseased, or criss-crossed branches to improve light penetration and air circulation within the tree canopy?

(A) Training

(B) Pruning

(C) Thinning

(D) Heading back

Q45. Which irrigation efficiency parameter accounts for the losses due to evaporation and deep percolation during the transit of water from the source to the field?

(A) Water Application Efficiency

(B) Water Conveyance Efficiency

(C) Water Storage Efficiency

(D) Water Distribution Efficiency

Q46. Which functional group of enzymes is responsible for the hydrolysis of peptide bonds in proteins during the process of digestion in livestock?

(A) Lipases

(B) Amylases

(C) Proteases

(D) Isomerases

Q47. The "Puffy Fruit" disorder in Tomato, characterized by hollow cavities inside the fruit and lack of seed development, is primarily associated with:

(A) Excessive Nitrogen and high temperature

(B) Potassium deficiency

(C) Over-irrigation

(D) Viral infection

Q48. In Agrometeorology, the instrument used to measure the rate of evaporation from a free water surface is the:

(A) Anemometer

(B) Stevenson Screen

(C) Open Pan Evaporimeter

(D) Pyranometer

Q49. Which of the following is a "Physical Method" of weed control that involves turning the soil to bury weed seeds and uproot existing weeds?

(A) Herbicides

(B) Tillage

(C) Biological control

(D) Crop rotation

Q50. What is the total cost of purchasing 500 kg of Urea if the market price is 6 per kg and a subsidy of 10% is applied to the total amount?

(A) 3000

(B) 2700

(C) 3300

(D) 2500

Detailed Solutions

Q1.

Solution

Concept:

Linkage and Recombination frequency are key concepts in genetics. The distance between two genes on a chromosome is measured in map units or centimorgans (cM). By definition, 1 cM is equal to 1% recombination frequency.

Solution:

1. The user provides a genetic distance of 15 cM between two genes. 2. According to the relationship established by Alfred Sturtevant, the map distance in centimorgans is numerically equivalent to the percentage of recombination. 3. Therefore, 15 cM = 15% recombination frequency. 4. This percentage represents the proportion of recombinant gametes (non-parental types) produced during meiosis due to crossing over.

Final Answer: The expected frequency of recombinant gametes is 15%.

Answer: (B)

Q2.

Solution

Concept:

During DNA replication, the double helix must be unwound. This unwinding by Helicase creates physical tension (positive supercoiling) in the DNA strand further down the line.

Solution:

1. As the replication fork moves forward, the DNA ahead of it becomes tightly twisted. 2. DNA Topoisomerases are enzymes that regulate the overwinding or underwinding of DNA. 3. Specifically, DNA Gyrase (a Type II Topoisomerase in prokaryotes) cuts the DNA strands, rotates them to release the tension, and then reseals them. 4. Without this enzyme, the DNA would become too tangled for replication to continue.

Final Answer: The enzyme responsible is DNA Topoisomerase (Gyrase).

Answer: (C)

Q3.

Solution

Concept:

Breeding for disease resistance often requires transferring a specific gene from a donor parent into a high-yielding, well-adapted variety (recurrent parent) without losing the recurrent parent's original characteristics.

Solution:

1. The Backcross Method is specifically designed to transfer one or a few genes (like dominant disease resistance) into an elite variety. 2. In this process, the hybrid is repeatedly crossed back to the recurrent parent. 3. After several generations of backcrossing and selection for the resistance gene, the resulting line is genetically identical to the recurrent parent except for the added resistance. 4. This is much faster and more precise than Pedigree or Bulk methods for this specific objective.

Final Answer: The most effective method is the Backcross Method.

Answer: (C)

Q4.

Solution

Concept:

Plants grown in tissue culture (in vitro) exist in a high-humidity, low-light, and heterotrophic environment. They lack a well-developed cuticle and functional stomatal regulation.

Solution:

1. Hardening (Acclimatization) is the process of gradually exposing in vitro-grown plants to natural environmental conditions. 2. The primary goal is to make the plant "autotrophic" (capable of photosynthesis) and physically hardy. 3. During this stage, the plant develops a thicker waxy cuticle on its leaves and improves its stomatal mechanism to control water loss. 4. This reduces the transpiration rate, preventing the plant from wilting when moved to the soil.

Final Answer: Transitioning is done to reduce the transpiration rate by developing the cuticle.

Answer: (B)

Q5.

Solution

Concept:

Soil microbiology involves various organisms that break down organic matter. Certain bacteria produce volatile organic compounds that give soil its characteristic scent.

Solution:

1. Actinomycetes are a group of gram-positive bacteria that grow in thread-like filaments, resembling fungi. 2. They play a vital role in decomposing complex organic materials like cellulose, chitin, and lignin in the soil. 3. When these organisms are active, they produce a compound called "Geosmin." 4. When rain hits dry soil, Geosmin is released into the air, creating the pleasant, earthy aroma known as petrichor.

Final Answer: The microorganism responsible is Actinomycetes.

Answer: (C)

Q6.

Solution

Concept:

The Environmental Lapse Rate (ELR) is a fundamental principle in Agrometeorology and Atmospheric Science. It describes the vertical temperature gradient of the atmosphere. In the troposphere, the air temperature generally decreases as one moves higher away from the earth's surface (which acts as the primary heat source).

Solution:

1. As altitude increases, the atmospheric pressure decreases, causing air parcels to expand. 2. This expansion leads to a decrease in temperature (adiabatic cooling). 3. On average, the normal lapse rate is approximately $6.5^\circ C$ per $1,000$ meters (1 km). 4. Understanding this rate is crucial for agriculturalists to predict frost occurrence in hilly regions and to understand vertical air stability, which affects cloud formation and rainfall.

Final Answer: "Lapse rate" refers to the decrease in temperature with increase in altitude.

Answer: (A)

Q7.

Solution

Concept:

In livestock feeding, the Nutritive Ratio (NR) is the ratio between the Digestible Crude Protein (DCP) and the non-nitrogenous nutrients (Carbohydrates + Fat $\times 2.25$). It indicates the "richness" of the protein in the diet.

Solution:

1. A "Narrow NR" (1:3 to 1:5) contains more protein and is used for growing animals and heavy milk producers. 2. A "Medium NR" (1:5 to 1:8) is suitable for general production and maintenance. 3. For a productive milch cow, the ration must provide sufficient protein for milk synthesis. 4. A ratio of 1:5 to 1:6 is considered ideal to maintain body weight while ensuring consistent milk yield without being overly expensive or causing metabolic stress.

Final Answer: The Nutritive Ratio (NR) for a milch cow should be approximately 1:5 to 1:6.

Answer: (B)

Q8.

Solution

Concept:

Poultry breeds are categorized based on their utility: Egg-type (Layers), Meat-type (Broilers), and Dual-purpose. High-yielding exotic breeds have been perfected through selection for maximum egg production.

Solution:

1. The White Leghorn, originating from Italy (Mediterranean class), is globally recognized as the most efficient egg-laying breed. 2. It is characterized by its small body size (efficient feed conversion), white feathers, and white earlobes. 3. A single White Leghorn can lay between 280 to 300 eggs per year. 4. Other breeds like Rhode Island Red are dual-purpose and generally lay brown-shelled eggs.

Final Answer: The White Leghorn is known for the highest number of white-shelled eggs.

Answer: (B)

Q9.

Solution

Concept:

Metabolic disorders in cattle often occur during the "transition period" (the time around calving). Milk Fever (Parturient Paresis) is a clinical deficiency of calcium despite adequate skeletal reserves.

Solution:

1. At the onset of lactation, the cow's demand for calcium to produce colostrum and milk increases suddenly and dramatically. 2. If the cow's body cannot mobilize calcium from the bones quickly enough, blood calcium levels (serum calcium) drop sharply. 3. Calcium is vital for muscle contraction and nerve transmission; its deficiency leads to muscle weakness, inability to stand ("downer cow"), and potential circulatory collapse. 4. It is treated with intravenous calcium gluconate.

Final Answer: The disease is known as Milk Fever.

Answer: (B)

Q10.

Solution

Concept:

Cryopreservation involves storing biological materials (like semen) at extremely low temperatures ($-196^{\circ}C$ in liquid nitrogen). Without protection, the formation of ice crystals inside the cells would rupture the cell membranes.

Solution:

1. A cryoprotectant is a substance used to protect biological tissue from freezing damage. 2. Glycerol is the most widely used cryoprotectant for bovine semen. 3. It works by replacing water inside the sperm cells and lowering the freezing point, which prevents the formation of large, sharp ice crystals. 4. This ensures that the sperm remains viable and motile after thawing for insemination.

Final Answer: The most common cryoprotectant used is Glycerol.

Answer: (B)

Q11.

Solution

Concept:

Homogenization is a mechanical process used in the dairy industry. It does not involve heat or chemicals but relies on high pressure to alter the physical structure of milk.

Solution:

1. Raw milk contains fat in the form of large globules of varying sizes. Because fat is lighter than water, these globules naturally float to the top to form a layer of cream. 2. During homogenization, milk is forced through extremely small valves at very high pressure. 3. This mechanical force shears the large fat globules into much smaller, uniform particles (usually less than 2 microns in diameter). 4. These tiny particles are small enough to remain suspended throughout the milk due to Brownian motion, preventing the cream from separating and giving the milk a whiter appearance and a creamier mouthfeel.

Final Answer: The process is aimed at breaking down fat globules to prevent cream separation.

Answer: (B)

Q12.

Solution

Concept:

Soil pH significantly influences the chemical form and availability of essential plant nutrients and toxic elements. Acidic soils (low pH) increase the solubility of certain metallic elements.

Solution:

1. In soils with a pH below 5.0, aluminum-containing minerals begin to dissolve, releasing Al^{3+} ions into the soil solution. 2. Aluminum is not a plant nutrient; instead, it is highly toxic to root systems, inhibiting root elongation and nutrient uptake. 3. Similarly, Iron and Manganese also become more soluble and can reach toxic levels, while essential nutrients like Phosphorus, Calcium, and Magnesium become less available (fixed or leached). 4. Molybdenum is unique because its availability decreases as pH drops, which is why it is often deficient in acidic soils.

Final Answer: Aluminum is most likely to reach toxic levels at pH 4.5.

Answer: (C)

Q13.

Solution

Concept:

The "Critical Period of Weed Competition" (CPWC) is the specific window during the crop growth cycle when weeds must be controlled to prevent significant yield loss. Controlling weeds before or after this period is less economically beneficial.

Solution:

1. In Rice (especially upland or direct-seeded), the crop grows slowly during the early vegetative stage, allowing weeds to establish quickly and compete for light, water, and nutrients. 2. Research shows that for most upland rice varieties, the most damage is done between 15 and 45 days after sowing (DAS). 3. Weeds emerging after 45 days are usually shaded out by the established crop canopy and do not reduce yield as significantly. 4. Therefore, Integrated Weed Management (IWM) strategies focus heavily on keeping the field clean during this specific 15–45 day window.

Final Answer: The critical period occurs during 15–45 days after sowing.

Answer: (B)

Q14.

Solution

Concept:

Precision Farming (or Satellite Agriculture) involves using information technology to ensure that crops and soil receive exactly what they need for optimum health and productivity, rather than treating an entire field uniformly.

Solution:

1. One of the core technologies in Precision Farming is the Geographic Information System (GIS). 2. GIS is used to create detailed digital maps of a farm, showing variations in soil type, nutrient levels, and pest infestations across different zones. 3. When combined with GPS (Global Positioning System) on tractors, GIS allows for "Variable Rate Technology" (VRT), which automatically adjusts the amount of fertilizer or water applied based on the specific coordinates in the field. 4. This reduces waste, lowers costs, and minimizes environmental impact.

Final Answer: Precision Farming utilizes Geographic Information System (GIS).

Answer: (B)

Q15.

Solution

Concept:

Grafting and Layering are vegetative propagation methods. In most grafting techniques, a detached scion is joined to a rootstock. However, "Approach Grafting" follows a different principle.

Solution:

1. Inarching, also known as Approach Grafting, is unique because both the scion (the desired top part) and the rootstock remain attached to their respective mother plants (own root systems) during the union process. 2. The bark and a small piece of wood are removed from both stems, and the wounded areas are tied together. 3. Only after a successful vascular union is formed is the scion cut off from its original mother plant and the top of the rootstock removed. 4. This method is highly successful for difficult-to-graft species like Mango and Guava because the scion continues to receive water and nutrients from its own roots while the graft heals.

Final Answer: The method is Inarching (Approach Grafting).

Answer: (B)

Q16.

Solution

Concept:

Mendel's second law, the Law of Independent Assortment, states that the alleles of two (or more) different genes get sorted into gametes independently of one another. This occurs because of the physical behavior of chromosomes during meiosis.

Solution:

1. During Metaphase I of meiosis, homologous chromosome pairs line up along the metaphase plate. 2. The orientation of each pair is random; the maternal chromosome of one pair may face one pole, while the maternal chromosome of another pair faces the opposite pole. 3. This "Random Alignment" ensures that the inheritance of a gene on one chromosome pair does not affect the inheritance of a gene on a different chromosome pair. 4. This results in the four types of gametes (RY, Ry, rY, ry) in equal proportions, leading to the 9:3:3:1 phenotypic ratio in the F2 generation.

Final Answer: The ratio is a result of the random alignment of homologous chromosomes during Metaphase I.

Answer: (B)

Q17.

Solution

Concept:

Biochemistry in agriculture focuses on carbon fixation. In C3 plants (like rice and wheat), the first stable product is a 3-carbon compound, and the reaction is catalyzed by a specific carboxylase enzyme.

Solution:

1. RuBisCO (Ribulose-1,5-bisphosphate carboxylase/oxygenase) is the enzyme that incorporates CO_2 into ribulose-1,5-bisphosphate (RuBP). 2. It is arguably the most abundant protein on Earth because it is present in every green leaf. 3. While highly important, it is also somewhat inefficient because it can also bind with Oxygen (photorespiration), which reduces the efficiency of photosynthesis in C3 plants.

Final Answer: The enzyme is RuBisCO.

Answer: (B)

Q18.

Solution

Concept:

The "Law of Minimum" is a principle developed in agricultural science that explains how nutrients affect plant growth.

Solution:

1. Justus von Liebig, a German chemist, proposed that if one of the essential plant nutrients is deficient, plant growth will be restricted even if all other nutrients are abundant. 2. This is often illustrated by "Liebig's Barrel," where the shortest stave (the limiting nutrient) determines how much water (yield) the barrel can hold. 3. This principle is the basis for balanced fertilization in modern soil science.

Final Answer: The law was proposed by Justus von Liebig.

Answer: (A)

Q19.

Solution

Concept:

Microbiology categorizes bacteria based on the structure of their cell walls through a differential staining technique called Gram Staining.

Solution:

1. Gram-positive bacteria have a very thick layer of peptidoglycan (up to 90% of the cell wall) and contain teichoic acids. 2. This thick layer traps the primary stain (Crystal Violet) and prevents it from being washed away by alcohol. 3. Consequently, these bacteria appear purple under a microscope. 4. Gram-negative bacteria have a much thinner peptidoglycan layer and an outer lipopolysaccharide membrane, which does not retain the violet stain.

Final Answer: Gram-positive bacteria possess this cell wall structure.

Answer: (B)

Q20.

Solution

Concept:

Weather maps use lines called "isopleths" to connect geographic locations that share identical values of a particular meteorological variable.

Solution:

1. The prefix "Iso-" means equal, and "therm" refers to heat or temperature. 2. Therefore, an Isotherm is a line connecting points with the same temperature. 3. Similarly, Isobars connect points of equal pressure, and Isohyets connect points of equal rainfall. 4. These maps are essential for agrometeorologists to track cold waves or heat waves that may affect crop health.

Final Answer: An Isotherm connects points having the same Temperature.

Answer: (C)

Q21.

Solution

Concept:

Livestock management involves specific feeding practices during critical physiological stages. "Steaming up" is a specialized nutritional strategy used for pregnant animals in the final stages of gestation.

Solution:

1. During the last 3-4 weeks of pregnancy, the fetus grows rapidly, increasing the nutrient demand on the mother. 2. "Steaming up" involves providing extra concentrate feed (grain/protein mix) to the pregnant cow or buffalo over and above her maintenance requirements. 3. This practice serves multiple purposes: it helps the animal build up body reserves for the upcoming lactation, ensures the birth of a healthy, vigorous calf, and acclimates the rumen microbes to the high-energy diet she will receive after calving. 4. It also helps in preventing metabolic diseases like ketosis and milk fever by ensuring the animal is in a positive energy balance.

Final Answer: The term refers to feeding extra concentrates to pregnant cows 3-4 weeks before calving.

Answer: (B)

Q22.

Solution

Concept:

Exotic cattle breeds are categorized by their origin and utility. Some are specialized for high milk volume (dairy), while others are "dual-purpose" (milk and work/meat).

Solution:

1. The Brown Swiss is one of the oldest dairy breeds, originating from the alpine regions of Switzerland. 2. It is physically larger and sturdier than the Jersey, making it well-adapted to various climates. 3. Their coat color ranges from a very light brown to a dark silver-gray. 4. While recognized for high milk production with good protein content, their physical strength also makes them suitable for draft work in their home country, hence the dual-purpose classification.

Final Answer: The breed described is the Brown Swiss.

Answer: (C)

Q23.

Solution

Concept:

Ranikhet disease, also known internationally as Newcastle Disease (ND), is one of the most devastating diseases in the poultry industry worldwide, characterized by high mortality and respiratory/nervous symptoms.

Solution:

1. Ranikhet is a highly contagious disease caused by a virus. 2. The specific pathogen is a variant of the Avian Paramyxovirus type 1 (AMPV-1). 3. It affects the digestive, nervous, and respiratory systems of birds. Symptoms include gasping for air, nasal discharge, and "torti-collis" (twisted neck). 4. Since it is viral, there is no direct cure, and management relies strictly on vaccination protocols (e.g., Lasota or F1 strain vaccines).

Final Answer: The causative agent is a Virus (Paramyxovirus).

Answer: (C)

Q24.

Solution

Concept:

Milk products are classified based on the technology used in their production, such as fermentation, concentration, or coagulation.

Solution:

1. Paneer is a fresh cheese common in South Asia. 2. The production process involves heating milk to approximately 85–90°C. 3. Once heated, an organic acid (like citric acid or lactic acid) is added to the milk. 4. This causes the milk proteins (casein) to coagulate and precipitate out of the whey. 5. Unlike Dahi (fermented), Paneer does not use bacterial cultures; it is strictly an acid-coagulated, heat-precipitated product.

Final Answer: Paneer is an acid-coagulated heat-precipitated product.

Answer: (B)

Q25.

Solution

Concept:

Cation Exchange Capacity (CEC) is a measure of a soil's ability to hold and release essential nutrients (cations like K^+, Ca^{2+}, Mg^{2+}). It is determined by the surface area and negative charge of soil colloids.

Solution:

1. Clay minerals are categorized as 1:1 type (Kaolinite) or 2:1 type (Montmorillonite, Illite). 2. Montmorillonite (part of the Smectite group) is an expanding 2:1 clay with a very high internal and external surface area. 3. Due to significant "isomorphous substitution" during its formation, it carries a high negative charge. 4. Consequently, Montmorillonite soils have a CEC ranging from 80 to 150 cmol(+)/kg, which is significantly higher than Kaolinite (3-15 cmol(+)/kg).

Final Answer: CEC is highest in soils dominated by Montmorillonite.

Answer: (C)

Q26.

Solution

Concept:

Water-use efficiency (WUE) is the ratio of water used by the plant to the total water applied. Irrigation systems vary significantly in their efficiency based on evaporation, runoff, and deep percolation losses.

Solution:

1. Drip Irrigation (also known as Trickle Irrigation) is a method where water is delivered at very low rates (2–20 liters/hour) through a network of plastic pipes and emitters. 2. Because water is applied directly to the soil surface or the root zone, evaporation losses from the soil surface are minimized. 3. Since the application is precise and controlled, there is virtually no surface runoff or deep percolation below the root zone. 4. This results in a water-use efficiency of over 90%, compared to 60–70% for sprinkler systems and 30–50% for traditional surface methods like furrow or flood irrigation.

Final Answer: Drip Irrigation is characterized by the highest water-use efficiency (90-95%).

Answer: (B)

Q27.

Solution

Concept:

Herbicides are classified by their mode of action and movement within the plant. "Contact" herbicides kill only the tissue they touch, while "Systemic" herbicides move throughout the plant.

Solution:

1. Glyphosate is a non-selective, systemic herbicide. 2. When sprayed on the foliage, it is absorbed by the leaves and then translocated through the phloem (the plant's vascular system) to the roots, rhizomes, and growing points (meristems). 3. It works by inhibiting a specific enzyme (EPSPS) involved in the synthesis of essential amino acids. 4. Because it moves to the roots, it is particularly effective against perennial weeds that would otherwise regrow from underground structures. 5. In contrast, Paraquat and Diquat are contact herbicides that only cause "burn-down" of the green tissue they contact.

Final Answer: Glyphosate is the systemic herbicide among the options.

Answer: (B)

Q28.

Solution

Concept:

The System of Rice Intensification (SRI) is a climate-smart methodology for increasing the productivity of irrigated rice by changing the management of plants, soil, water, and nutrients.

Solution:

1. Unlike traditional rice farming which uses older seedlings (21–30 days) and heavy flooding, SRI uses very young seedlings. 2. Seedlings are typically transplanted when they have only two leaves, usually 8 to 12 days old. 3. Only a single seedling is planted per hill, rather than a bunch of 3–4. 4. These are planted in a square pattern with wide spacing (usually 25 cm $\times$ 25 cm), which reduces competition and encourages massive root growth and tillering. 5. Soil is kept moist but not continuously flooded, which saves water and improves soil aeration.

Final Answer: The SRI technique focuses on transplanting young (8-12 day old) single seedlings with wide spacing.

Answer: (C)

Q29.

Solution

Concept:

Biological nitrogen fixation (BNF) is a process where certain microorganisms convert atmospheric nitrogen (N_2) into ammonia (NH_3), which plants can use. This relationship can be free-living or symbiotic.

Solution:

1. Rhizobium is a genus of bacteria that forms a symbiotic relationship with the roots of leguminous plants. 2. The bacteria enter the root hairs and stimulate the formation of "root nodules." 3. Inside these nodules, the bacteria fix nitrogen for the plant, and in return, the plant provides the bacteria with carbohydrates (energy). 4. Specific strains of Rhizobium are required for different crops (e.g., *Rhizobium japonicum* for Soybean). 5. Azotobacter and Azospirillum are generally non-symbiotic or associative, while Blue Green Algae (BGA) is primarily used in rice paddies.

Final Answer: Rhizobium is the bio-fertilizer that fixes nitrogen in symbiotic association with legumes.

Answer: (B)

Q30.

Solution

Concept:

In horticulture and floriculture, plant growth is manipulated through various training and pruning techniques to improve yield, shape, or flower quality.

Solution:

1. "Pinching" (or tipping) is the removal of the terminal growing point (the apical bud) of a young plant. 2. In many plants, the terminal bud produces hormones (auxins) that suppress the growth of lateral buds; this is known as "Apical Dominance." 3. By pinching off the top, apical dominance is broken, which signals the plant to redirect its energy to the side buds. 4. This results in a bushier plant with more lateral branches, which in turn leads to a greater number of flowers, as seen in Marigold and Chrysanthemum.

Final Answer: Pinching is performed to remove apical dominance and encourage lateral branching.

Answer: (B)

Q31.

Solution

Concept:

The Khaira disease of rice is a famous physiological disorder in Indian agriculture, first discovered by Dr. Y.L. Nene at Pantnagar in 1966. It is not caused by a pathogen (virus or bacteria) but by the unavailability of a critical micronutrient.

Solution:

1. Zinc (Zn) is an essential micronutrient required for the synthesis of auxin (a growth hormone) and various enzyme activities in the rice plant. 2. Khaira disease usually appears in the nursery or shortly after transplanting. 3. Symptoms include the appearance of rusty-brown or bronzed spots on the older leaves, stunted plant growth, and poor root development. 4. The disease is common in soils with high pH (calcareous soils) where zinc becomes chemically fixed and unavailable to the plant. 5. It is effectively managed by soil application or foliar spray of Zinc Sulphate ($ZnSO_4$).

Final Answer: Khaira disease is caused by the deficiency of Zinc.

Answer: (B)

Q32.

Solution

Concept:

Fruits are classified into two categories based on their ripening behavior: Climacteric and Non-climacteric.

Solution:

1. Climacteric fruits are those that can be harvested when mature but still green. They continue to ripen off the tree because they produce a large amount of ethylene gas and show a sudden sharp rise in respiration (respiratory burst). 2. Mango is a classic example of a climacteric fruit. Other examples include Banana, Papaya, Guava, and Apple. 3. Non-climacteric fruits, such as Grapes, Citrus, and Pomegranate, do not show a respiratory burst and must be ripened fully on the plant before harvest, as they will not improve in sweetness or quality after being picked.

Final Answer: Mango is a climacteric fruit.

Answer: (C)

Q33.

Solution

Concept:

Canning is a method of food preservation that involves sealing food in airtight containers and heat-processing them to destroy microorganisms.

Solution:

1. During the heating process (sterilization), heat travels from the outside of the can toward the center. 2. The "Cold Point" is the specific location within the can that takes the longest time to reach the required sterilization temperature. 3. In liquid foods (like juice), the cold point is near the bottom because of convection currents. In solid or viscous foods (like meat or thick paste), the cold point is at the geometric center because heat moves by conduction. 4. Processors must ensure the cold point reaches the target temperature for a specific duration to ensure the food is safe from pathogens like *Clostridium botulinum*.

Final Answer: The cold point refers to the area in the can that is slowest to heat up.

Answer: (B)

Q34.

Solution

Concept:

Mulching is a standard practice in both horticulture and field crops. it involves covering the soil surface around the plants with organic or inorganic materials.

Solution:

1. The primary purpose of mulching is to create a physical barrier between the soil and the atmosphere. 2. This barrier significantly reduces the evaporation of water from the soil surface, thus "conserving soil moisture." 3. Additionally, a thick layer of mulch (like straw or black plastic) blocks sunlight from reaching the soil surface, which prevents weed seeds from germinating and growing ("weed suppression"). 4. Mulching also helps in regulating soil temperature and preventing soil erosion.

Final Answer: The primary objective is to conserve soil moisture and suppress weeds.

Answer: (B)

Q35.

Solution

Concept:

Vitamins play vital roles in animal physiology. Some are fat-soluble (A, D, E, K) and others are water-soluble. Vitamin K is specifically linked to the synthesis of blood-clotting factors.

Solution:

1. Vitamin K is essential for the liver to produce prothrombin and other factors required for blood coagulation. 2. "Sweet Clover Disease" occurs when cattle eat spoiled sweet clover hay containing "dicoumarol." 3. Dicoumarol acts as a powerful antagonist to Vitamin K, preventing blood from clotting. Affected animals can bleed to death from minor internal or external injuries. 4. Therefore, maintaining adequate Vitamin K levels or administering it as an antidote is crucial in such toxicity cases.

Final Answer: Vitamin K is essential for blood clotting and its deficiency is linked to Sweet Clover Disease.

Answer: (C)

Q36.

Solution

Concept:

Sugarcane breeding has a rich history of "Cane Hybridization." The term "Noble Canes" refers to the traditional tropical canes that possessed high sugar content and thick stems but were susceptible to diseases.

Solution:

1. *Saccharum officinarum* is the species known as the "Noble Cane." It is native to South East Asia (New Guinea). 2. These canes are characterized by high sucrose content, low fiber, thick juicy stems, and attractive colors. 3. However, they were not hardy and suffered from diseases and pests in subtropical regions like North India. 4. Indian breeders, notably T.S. Venkataraman, performed "Saccharum Spontaneization"—crossing *S. officinarum* with the wild, hardy species *S. spontaneum* (Kans grass) to develop the modern high-yielding, resistant varieties grown today.

Final Answer: "Noble Canes" refers to the species *Saccharum officinarum*.

Answer: (B)

Q37.

Solution

Concept:

Soil texture is defined by the relative proportions of sand, silt, and clay particles. The "Soil Texture Triangle" is used to classify soils based on these percentages.

Solution:

1. Sand particles are the largest (2.00 to 0.05 mm), silt is intermediate (0.05 to 0.002 mm), and clay is the smallest (less than 0.002 mm). 2. A "Loam" or "Loamy Soil" is considered the ideal texture for most agricultural crops. 3. While it doesn't necessarily mean exactly 33.3% of each, it represents a balanced mixture where no single particle size dominates the soil's properties. 4. Loamy soils provide the perfect balance of aeration (from sand), nutrient-holding capacity (from clay), and moisture retention (from silt).

Final Answer: A soil with an equal balance of sand, silt, and clay is termed Loamy Soil.

Answer: (C)

Q38.

Solution

Concept:

India has a diverse range of buffalo breeds, mostly categorized into the Murrah group, Gujarat group, and Central Indian group. Each breed has specific morphological and production traits.

Solution:

1. The Bhadawari buffalo, originating from the Bhadawar estate in the Agra and Etawah districts of Uttar Pradesh, is unique among Indian breeds. 2. It is a medium-sized buffalo with a distinct copper-colored (tawny) coat. 3. While its total milk yield might be lower than the Murrah, it is world-renowned for its exceptionally high milk fat percentage, which typically ranges from 6% to as high as 13%. 4. This makes it an excellent breed for "Ghee" (clarified butter) production.

Final Answer: The Bhadawari buffalo is famous for its high fat content in milk.

Answer: (C)

Q39.

Solution

Concept:

Post-harvest technology in horticulture involves "Degreening," which is the process of removing the green pigment (chlorophyll) from the rind of fully mature fruits to give them their characteristic ripe color.

Solution:

1. In many tropical regions, citrus fruits (like Oranges and Mosambi) reach internal maturity (sweetness) while the skin remains green due to high night temperatures. 2. Consumers typically prefer yellow or orange citrus fruits. 3. To achieve this, harvested fruits are placed in a degreening chamber. 4. Ethylene gas is introduced into the chamber at controlled concentrations (usually 1 to 10 ppm). Ethylene triggers the breakdown of chlorophyll (green) and promotes the synthesis of carotenoids (yellow/orange), mimicking the natural ripening process.

Final Answer: Degreening is achieved by exposing harvested fruits to Ethylene gas.

Answer: (B)

Q40.

Solution

Concept:

Plants are classified as C3, C4, or CAM based on their carbon fixation pathways. C4 plants have evolved a specialized mechanism to minimize photorespiration.

Solution:

1. C4 plants possess "Kranz Anatomy" (specialized bundle sheath cells) and use the enzyme PEP Carboxylase for initial CO_2 fixation. 2. This pathway allows them to maintain high photosynthetic rates even when temperatures are high and CO_2 levels are low inside the leaf. 3. Maize (Corn), Sugarcane, and Sorghum are classic examples of C4 field crops. 4. Wheat, Rice, and Potato are C3 plants, which are generally less efficient in hot, tropical environments compared to C4 plants.

Final Answer: Maize is a C4 plant.

Answer: (C)

Q41.

Solution

Concept:

Layering is a method of vegetative propagation where roots are encouraged to form on a stem while it is still attached to the parent plant. The method used depends on the flexibility of the stem and the growth habit of the plant.

Solution:

1. Simple Layering is used for plants with low-hanging, flexible branches like Jasmine and Bougainvillea. 2. A branch is bent to the ground, and a portion of it is wounded (to interrupt the flow of photosynthates) and then buried under the soil. 3. The tip of the branch is left exposed above the ground. 4. Once roots develop at the buried node, the new plant is cut from the mother plant and transplanted. 5. This differs from Air Layering, where the branch is rooted above the ground using moss and plastic.

Final Answer: The method described is Simple Layering.

Answer: (B)

Q42.

Solution

Concept:

Nutrient mobility within the plant determines where deficiency symptoms first appear. Highly mobile elements can be scavenged from old tissue and moved to new growing points.

Solution:

1. Nitrogen (N), Phosphorus (P), and Potassium (K) are highly mobile elements within the plant. 2. When the soil is deficient in Nitrogen, the plant breaks down chlorophyll and proteins in its older leaves to transport the Nitrogen to the younger, growing leaves. 3. As a result, the older (bottom) leaves turn yellow (chlorosis) first, while the younger leaves stay green. 4. Conversely, immobile elements like Calcium and Iron cannot be moved, so their deficiency symptoms appear first on the new growth.

Final Answer: Deficiency symptoms of Nitrogen appear first on older leaves.

Answer: (C)

Q43.

Solution

Concept:

Livestock rations are formulated based on the physiological state of the animal. A ration is the total amount of feed an animal consumes in a 24-hour period.

Solution:

1. A Maintenance Ration is the minimum amount of feed required to keep an animal alive and in a healthy state without any change in body weight. 2. This energy is used for basic life processes such as breathing, heart function, maintaining body temperature, and limited movement. 3. It does not provide the extra energy required for "Production" (such as milk, meat, or eggs) or "Work" (draft purposes). 4. If an animal receives less than a maintenance ration, it will lose weight as it utilizes its own body fat for energy.

Final Answer: Maintenance ration keeps the body weight constant without gain, loss, or production.

Answer: (B)

Q44.

Solution

Concept:

Horticultural management includes Training and Pruning. While Training focuses on the physical structure and shape of the tree, Pruning focuses on health and productivity.

Solution:

1. Pruning is the systematic removal of specific plant parts like branches, buds, or roots. 2. The removal of dead or diseased wood prevents the spread of pathogens. 3. Removing "criss-crossed" or overcrowded branches opens up the center of the tree (canopy). 4. This increases light penetration to the inner leaves and improves air circulation, which reduces fungal diseases and improves fruit color and quality.

Final Answer: The practice described is Pruning.

Answer: (B)

Q45.

Solution

Concept:

Irrigation efficiency is calculated at different stages of the water delivery process to identify where water loss is occurring.

Solution:

1. Water Conveyance Efficiency (E_c) measures the efficiency of the delivery system from the canal head or well to the field. 2. It accounts for losses such as seepage from unlined canals and evaporation from the water surface during transit. 3. Water Application Efficiency (E_a), on the other hand, measures how much of the water delivered to the field is actually stored in the root zone for plant use. 4. Understanding E_c is vital for improving infrastructure, such as lining canals with cement to prevent seepage.

Final Answer: Water Conveyance Efficiency accounts for losses during transit from source to field.

Answer: (B)

Q46.

Solution

Concept:

Enzymes are biological catalysts that are highly specific to the substrate they act upon. In the digestive system of livestock, complex macronutrients (carbohydrates, proteins, and fats) must be broken down into smaller, absorbable units.

Solution:

1. Proteins are complex chains of amino acids linked by peptide bonds. 2. Proteases (also known as proteolytic enzymes or peptidases) are the specific group of enzymes that catalyze the hydrolysis of these peptide bonds. 3. In the digestive tract of animals, major proteases include pepsin (in the stomach/abomasum) and trypsin and chymotrypsin (secreted by the pancreas). 4. These enzymes break down proteins into peptides and eventually into free amino acids, which are then absorbed into the bloodstream. 5. In contrast, Lipases break down fats, and Amylases break down starches/carbohydrates.

Final Answer: Proteases are responsible for the hydrolysis of peptide bonds.

Answer: (C)

Q47.

Solution

Concept:

Physiological disorders in horticultural crops are often caused by environmental stress or nutritional imbalances rather than by pests or pathogens. Puffy fruit is a common quality issue in greenhouse and field-grown tomatoes.

Solution:

1. "Puffy fruit" (also called hollowness) occurs when the outer wall of the tomato develops normally, but the internal placental tissue and seeds fail to fill the locular cavities. 2. This creates air-filled gaps inside the fruit, making it feel light and soft. 3. The primary cause is an imbalance in growth regulators often triggered by excessive nitrogen fertilization combined with high temperatures or low light intensity. 4. These conditions lead to poor pollination or incomplete seed development, resulting in the failure of the fruit's internal structure to develop fully.

Final Answer: The disorder is associated with excessive Nitrogen and high temperature.

Answer: (A)

Q48.

Solution

Concept:

Agrometeorology relies on standardized instruments to measure the loss of water from the earth's surface to the atmosphere. Evaporation data is critical for determining crop water requirements and irrigation scheduling.

Solution:

1. The Open Pan Evaporimeter (specifically the Class A Pan) is the standard instrument used globally. 2. It consists of a large, shallow cylindrical pan filled with water. The decline in the water level over a 24-hour period (adjusted for any rainfall) represents the "Pan Evaporation" (Ep). 3. An Anemometer measures wind speed, and a Pyranometer measures solar radiation. 4. A Stevenson Screen is a wooden housing used to protect thermometers from direct solar radiation and precipitation while allowing air to circulate.

Final Answer: The Open Pan Evaporimeter is used to measure the rate of evaporation.

Answer: (C)

Q49.

Solution

Concept:

Weed control methods are categorized into physical/mechanical, cultural, biological, and chemical methods. Physical methods involve the use of manual labor or machinery to physically remove or kill weeds.

Solution:

1. Tillage (including plowing, harrowing, and hoeing) is a primary physical method of weed control. 2. By turning the soil, tillage uproots existing weeds, exposing their roots to the sun where they dehydrate and die (desiccation). 3. It also buries weed seeds deep into the soil where they cannot receive enough light to germinate, or brings them to the surface to be destroyed in a subsequent pass. 4. While effective, excessive tillage can sometimes lead to soil erosion or the loss of soil organic matter.

Final Answer: Tillage is the physical method involving turning the soil.

Answer: (B)

Q50.

Solution

Concept:

Agricultural mathematics often involves calculating input costs and accounting for government subsidies. A subsidy is a financial aid provided to reduce the burden of cost on the farmer.

Solution:

1. First, calculate the total market price of the Urea without the subsidy:

$$\text{Total Cost} = \text{Quantity} \times \text{Price per kg}$$

$$\text{Total Cost} = 500\ \text{kg} \times\ 6/\text{kg} =\ 3000$$

2. Next, calculate the value of the 10% subsidy:

$$\text{Subsidy} = 10\%\ \text{of}\ \ 3000 = 0.10 \times 3000 =\ 300$$

3. Finally, subtract the subsidy from the total market price to find the final cost to the farmer:

$$\text{Final Cost} =\ 3000 -\ 300 =\ 2700$$

Final Answer: The total cost after the subsidy is 2700.

Answer: (B)

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	C	3	C	4	B	5	C
6	A	7	B	8	B	9	B	10	B
11	B	12	C	13	B	14	B	15	B
16	B	17	B	18	A	19	B	20	C
21	B	22	C	23	C	24	B	25	C
26	B	27	B	28	C	29	B	30	B
31	B	32	C	33	B	34	B	35	C
36	B	37	C	38	C	39	B	40	C
41	B	42	C	43	B	44	B	45	B
46	C	47	A	48	C	49	B	50	B