CUET-UG Agriculture Sample Paper-15

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 soil has a bulk density of 1.50 g/cm^3 and a particle density of 2.65 g/cm^3. The percentage of pore space (porosity) in this soil is approximately:

(A) 43.4%

(B) 56.6%

(C) 35.2%

(D) 40.0%

Q2. In the context of Mendelian genetics, if a test cross of a dihybrid (AaBb) results in a progeny ratio of 1 : 1 : 1 : 1, it confirms that:

(A) The genes are completely linked.

(B) The genes are located on different chromosomes and assort independently.

(C) The genes show epistasis.

(D) The genes are located very close on the same chromosome.

Q3. Which of the following irrigation methods involves the application of water at a rate less than the intake rate of soil, often used for row crops on sloping lands?

(A) Check Basin Irrigation

(B) Border Strip Irrigation

(C) Furrow Irrigation

(D) Flood Irrigation

Q4. The physiological disorder 'Bitter Pit' in Apple, characterized by small brown necrotic spots on the skin and flesh, is primarily caused by the deficiency of:

(A) Boron

(B) Calcium

(C) Magnesium

(D) Potassium

Q5. A farmer wants to apply 120 kg of Nitrogen using Urea (46% N). The amount of Urea required for a one-hectare field is:

(A) 260.8 kg

(B) 55.2 kg

(C) 120 kg

(D) 460 kg

Q6. In livestock management, the process of heating milk to 63°C for 30 minutes followed by rapid cooling is known as:

(A) HTST Pasteurization

(B) LTLT Pasteurization

(C) UHT Treatment

(D) Sterilization

Q7. Which of the following bio-fertilizers is a symbiotic nitrogen fixer found in the root nodules of non-leguminous plants like Alnus?

(A) Rhizobium

(B) Azotobacter

(C) Frankia

(D) Azospirillum

Q8. The 'Norin-10' gene, which was instrumental in the Green Revolution for developing semi-dwarf wheat varieties, was originally introduced from:

(A) Mexico

(B) Japan

(C) USA

(D) Philippines

Q9. Which atmospheric layer contains the maximum concentration of Ozone (O_3), which protects the earth from harmful UV radiation?

(A) Troposphere

(B) Stratosphere

(C) Mesosphere

(D) Thermosphere

Q10. The removal of male buds in a banana bunch after the completion of female phase to improve fruit development is called:

(A) Desuckering

(B) Denavelling

(C) Propping

(D) Mattocking

Q11. In a DNA molecule, if the percentage of Guanine is 22%, then the percentage of Thymine according to Chargaff's rule will be:

(A) 22%

(B) 44%

(C) 28%

(D) 56%

Q12. Which of the following is a 'Non-selective' and 'Translocated' herbicide used for the control of perennial weeds in non-cropped areas?

(A) Paraquat

(B) Glyphosate

(C) Atrazine

(D) 2,4-D

Q13. The practice of 'Flushing' in sheep management refers to:

(A) Cleaning the wool before shearing.

(B) Providing extra nutritious feed to ewes 2-3 weeks before breeding.

(C) Removing internal parasites using anthelmintics.

(D) Separating lambs from their mothers.

Q14. Which of the following crops is most sensitive to soil salinity during its germination and early seedling stage?

(A) Barley

(B) Cotton

(C) Rice

(D) Sugarbeet

Q15. The chemical used as a 'Firming Agent' in the commercial canning of fruits and vegetables to maintain texture is:

(A) Sodium Benzoate

(B) Calcium Chloride

(C) Citric Acid

(D) Potassium Metabisulphite

Q16. The process of 'Retting' in Jute cultivation, which involves the use of anaerobic microorganisms to loosen fibers from the woody stalk, is best carried out in stagnant water at an optimum temperature of:

(A) 20°C to 25°C

(B) 34°C to 36°C

(C) 45°C to 50°C

(D) 10°C to 15°C

Q17. In genetics, when a single gene influences multiple, seemingly unrelated phenotypic traits, the phenomenon is known as:

(A) Epistasis

(B) Polygenic Inheritance

(C) Pleiotropy

(D) Co-dominance

Q18. The 'Black Cotton Soils' (Vertisols) of Central India are characterized by their self-ploughing nature. This property is primarily due to the presence of which clay mineral?

(A) Kaolinite

(B) Illite

(C) Montmorillonite

(D) Vermiculite

Q19. A livestock farmer observes 'Rice water stools' and rapid dehydration in a poultry flock. These symptoms are characteristic of which protozoan disease?

(A) Coccidiosis

(B) Ranikhet Disease

(C) Fowl Cholera

(D) Infectious Coryza

Q20. The instrument used to measure the rate of 'Evapotranspiration' from a cropped field under field conditions is:

(A) Piezometer

(B) Lysimeter

(C) Tensiometer

(D) Psychrometer

Q21. According to the 1st Law of Thermodynamics in Agrometeorology, the net radiation (R_n) at the crop surface is partitioned into:

(A) Sensible heat, Latent heat, and Soil heat flux

(B) Albedo, Reflection, and Transmission

(C) Evaporation and Transpiration only

(D) Conduction and Convection only

Q22. The critical stage of irrigation in Wheat, which occurs approximately 21 days after sowing and is most sensitive to water stress, is:

(A) Tillering Stage

(B) Flowering Stage

(C) Crown Root Initiation (CRI) Stage

(D) Jointing Stage

Q23. In plant breeding, the 'Bulk Method' is most suitable for handling which type of populations?

(A) Cross-pollinated crops

(B) Segregating generations of self-pollinated crops

(C) Asexually propagated plants

(D) Pure-line selection

Q24. Which of the following vitamins is synthesized by the rumen microorganisms in cattle, making its dietary supplementation generally unnecessary for adults?

(A) Vitamin A

(B) Vitamin D

(C) Vitamin B-complex

(D) Vitamin E

Q25. The concentration of CO_2 in the soil air is generally:

(A) Equal to the atmospheric air

(B) Lower than the atmospheric air

(C) 10 to 100 times higher than the atmospheric air

(D) Zero due to microbial consumption

Q26. Which of the following chemicals is used as an 'Ethylene absorbent' inside fruit packaging to delay the ripening process during transport?

(A) Potassium Permanganate ($KMnO_4$)

(B) Calcium Carbide

(C) Silver Nitrate

(D) Sodium Hypochlorite

Q27. The cross between an F_1 hybrid and its homozygous recessive parent is termed as:

(A) Back Cross

(B) Test Cross

(C) Reciprocal Cross

(D) Top Cross

Q28. The process of 'Puddling' in Rice cultivation is primarily done to:

(A) Increase soil aeration

(B) Decrease deep percolation of water

(C) Increase soil temperature

(D) Help in easy harvesting

Q29. Which of the following is an example of an 'In-situ' method of soil moisture conservation?

(A) Farm Pond

(B) Mulching

(C) Percolation Tank

(D) Check Dam

Q30. In honeybees, the 'Waggle Dance' is a specialized communication method used to inform other members about:

(A) The arrival of a predator

(B) The direction and distance of a food source

(C) The death of the Queen

(D) The need for swarming

Q31. The process of 'Hardening off' in nursery management, which prepares young seedlings for transplanting into the main field, primarily involves:

(A) Increasing the application of nitrogenous fertilizers.

(B) Gradually reducing watering and exposing plants to direct sunlight.

(C) Increasing the frequency of irrigation and providing shade.

(D) Application of growth hormones like Gibberellins.

Q32. Which of the following describes the 'Crassulacean Acid Metabolism' (CAM) pathway, an adaptation found in certain succulent plants to conserve water in arid environments?

(A) CO_2 fixation occurs during the day using RuBisCO only.

(B) Stomata remain open during the day and close at night.

(C) Initial CO_2 fixation occurs at night forming Malic acid, which is decarboxylated during the day.

(D) They lack the Calvin Cycle and only use the Hatch-Slack pathway.

Q33. In the context of 'Organic Farming', which of the following is an 'allowed' input for managing soil fertility according to NPOP guidelines?

(A) Diammonium Phosphate (DAP)

(B) Rock Phosphate

(C) Urea (Coated)

(D) Muriate of Potash (MOP)

Q34. The term 'Breaking Strength' or 'Tenacity' in cotton fiber refers to:

(A) The length of the individual fiber.

(B) The amount of force required to rupture a bundle of fibers.

(C) The degree of cellulose deposition in the fiber wall.

(D) The resistance of the fiber to microbial decay.

Q35. A soil with a pH of 4.5 is considered strongly acidic. To raise the pH and neutralize the acidity for crop production, which of the following amendments is most commonly applied?

(A) Gypsum ($CaSO_4 \cdot 2H_2O$)

(B) Agricultural Lime ($CaCO_3$)

(C) Elemental Sulphur

(D) Pyrites (FeS_2)

Q36. In Agrometeorology, the 'Wet Bulb Depression' is defined as:

(A) The sum of Dry Bulb and Wet Bulb temperatures.

(B) The difference between Dry Bulb and Wet Bulb temperatures.

(C) The temperature at which air becomes saturated.

(D) The ratio of actual vapor pressure to saturation vapor pressure.

Q37. Which of the following poultry breeds is a famous Indian game bird known for its high-quality meat and fighting spirit?

(A) Leghorn

(B) Aseel

(C) Kadaknath

(D) Rhode Island Red

Q38. The physiological disorder 'Hen and Chicken' in Grapes, where the bunch contains both large and very small seedless berries, is caused by the deficiency of:

(A) Zinc

(B) Boron

(C) Iron

(D) Manganese

Q39. In plant tissue culture, the mass of unorganized, undifferentiated cells produced from an explant is called:

(A) Callus

(B) Somaclone

(C) Protoplast

(D) Hybridoma

Q40. The 'Critical Period of Weed Competition' in most upland crops like Maize and Soybean generally occurs during:

(A) The first 15 days after sowing.

(B) 15 to 45 days after sowing.

(C) During the flowering and grain filling stage.

(D) Just before harvesting.

Q41. Which of the following livestock diseases is 'Zoonotic' in nature, meaning it can be naturally transmitted from animals to humans?

(A) Foot and Mouth Disease (FMD)

(B) Anthrax

(C) Ranikhet Disease

(D) Milk Fever

Q42. The 'Albedo' of a surface in agrometeorology refers to:

(A) The fraction of solar radiation absorbed by the crop.

(B) The fraction of solar radiation reflected by the surface.

(C) The heat energy conducted into the soil.

(D) The long-wave radiation emitted by the Earth.

Q43. In Mendel's dihybrid cross, what is the expected phenotypic ratio in the F_2 generation?

(A) 3 : 1

(B) 1 : 2 : 1

(C) 9 : 3 : 3 : 1

(D) 1 : 1 : 1 : 1

Q44. Which of the following is a 'Short Day Plant' (SDP) that requires long nights to initiate flowering?

(A) Wheat

(B) Rice

(C) Radish

(D) Sugarbeet

Q45. The process of 'Curing' in Onion and Garlic after harvest is primarily done to:

(A) Increase the size of the bulbs.

(B) Develop the characteristic color and dry the outer scales for better storage.

(C) Remove the pungent smell.

(D) Convert starch into sugar.

Q46. Which irrigation system is most efficient for water use, especially in areas with severe water scarcity and for high-value orchard crops?

(A) Sprinkler Irrigation

(B) Drip Irrigation

(C) Basin Irrigation

(D) Surge Irrigation

Q47. A 'Balanced Ration' for livestock is defined as a feed that:

(A) Contains only green fodder.

(B) Provides all essential nutrients in the correct proportion for 24 hours.

(C) Consists of only concentrates like grains.

(D) Is fed only during the lactation period.

(E)

Q48. The herbicide '2,4-D' is most effective for the control of which group of weeds?

(A) Narrow-leaved weeds (Grasses)

(B) Broad-leaved weeds (Dicots)

(C) Sedges only

(D) Aquatic weeds only

Q49. In genetics, the physical location of a gene on a chromosome is called its:

(A) Allele

(B) Genotype

(C) Locus

(D) Phenotype

Q50. Which of the following is a primary macronutrient required by plants for energy transfer (ATP formation)?

(A) Potassium

(B) Phosphorus

(C) Calcium

(D) Magnesium

Detailed Solutions

Q1.

Solution

Concept: Porosity or pore space refers to the volume of the soil not occupied by solids. It is calculated using the relationship between Bulk Density (BD) and Particle Density (PD):

$$\text{Porosity (\%)} = \left(1 - \frac{\text{Bulk Density}}{\text{Particle Density}}\right) \times 100$$

Solution: 1. Given: Bulk Density (BD) = 1.50 g/cm^3 and Particle Density (PD) = 2.65 g/cm^3. 2. Substitute the values into the formula:

$$\text{Porosity} = \left(1 - \frac{1.50}{2.65}\right) \times 100$$

3. Calculate the ratio: $1.50/2.65 \approx 0.566$. 4. Subtract from 1: $1 - 0.566 = 0.434$. 5. Convert to percentage: $0.434 \times 100 = 43.4\%$.

Final Answer: The percentage porosity is 43.4%.

Answer: (A)

Q2.

Solution

Concept: A test cross involves crossing an individual with an unknown genotype (or a dihybrid) with a homozygous recessive individual (aabb). According to Mendel's Law of Independent Assortment, if genes are on different chromosomes, they segregate independently.

Solution: 1. A dihybrid (AaBb) produces four types of gametes in equal proportions: AB, Ab, aB, and ab. 2. The homozygous recessive parent (aabb) produces only one type of gamete: ab. 3. The resulting progeny genotypes will be AaBb, Aabb, aaBb, and aabb in a 1 : 1 : 1 : 1 ratio. 4. This ratio is the hallmark of independent assortment, indicating that the two genes are not linked and are located on different chromosomes.

Final Answer: The genes are located on different chromosomes and assort independently.

Answer: (B)

Q3.

Solution

Concept: Surface irrigation methods are selected based on the topography of the land, the nature of the crop, and the soil's infiltration characteristics. For row crops grown on uneven or sloping terrain, it is essential to manage water flow to ensure maximum absorption while preventing soil erosion and water wastage.

Solution: 1. Furrow Irrigation involves creating small, parallel channels (furrows) along the direction of the field's slope. The crop is usually planted on the ridges between these furrows. 2. In this method, water is applied at a controlled rate that is intentionally kept lower than the soil's maximum intake (infiltration) rate. This ensures that the water moves steadily down the length of the furrow without overflowing or causing significant surface runoff and erosion. 3. Comparison with other methods: - **Check Basin:** The field is divided into small level plots surrounded by bunds. It is not suitable for sloping lands. - **Border Strip:** The field is divided into long strips; while it can handle slight slopes, it requires a higher volume of water flow compared to furrows. - **Flood Irrigation:** Water is applied over the entire surface without any control, which on sloping lands would lead to severe erosion and uneven distribution. 4. Therefore, Furrow Irrigation is the most efficient choice for row crops on sloping lands under the specified conditions.

Final Answer: Furrow Irrigation

Answer: (C)

Q4.

Solution

Concept: Micronutrient and secondary nutrient deficiencies lead to specific physiological disorders. Calcium is essential for cell wall stability and signaling. Its lack of mobility within the plant often affects the fruit.

Solution: 1. Bitter Pit is a common disorder in apples related to low levels of Calcium in the fruit tissue. 2. Symptoms include small, dark, corky (necrotic) lesions just under the skin. 3. This occurs because Calcium is moved primarily via the transpiration stream to the leaves, often bypassing the fruit during dry periods or high-growth phases. 4. Management involves foliar sprays of calcium salts.

Final Answer: Calcium.

Answer: (B)

Q5.

Solution

Concept: To calculate the amount of fertilizer required, use the formula:

$$\text{Fertilizer quantity} = \frac{\text{Nutrient required}}{\%\ \text{Nutrient in fertilizer}} \times 100$$

Solution: 1. Nutrient required (Nitrogen) = 120 kg. 2. Fertilizer used = Urea, which contains 46% Nitrogen. 3. Substitute the values:

$$\text{Urea quantity} = \frac{120}{46} \times 100$$

4. Calculate: $120/46 \approx 2.608$. 5. $2.608 \times 100 = 260.8$ kg.

Final Answer: 260.8 kg.

Answer: (A)

Q6.

Solution

Concept: Pasteurization is a heat-treatment process that destroys pathogenic microorganisms in beverages. There are two primary methods used in the dairy industry: High Temperature Short Time (HTST) and Low Temperature Long Time (LTLT).

Solution: 1. The LTLT (Low Temperature Long Time) method, also known as the "Batch method," involves heating milk to 63°C (145°F). 2. The milk is held at this constant temperature for exactly 30 minutes. 3. This is followed by immediate cooling to below 5°C to prevent the growth of thermophilic bacteria. 4. In contrast, HTST (High Temperature Short Time) involves heating milk to 72°C for only 15 seconds. 5. Since the question specifies 63°C for 30 minutes, it refers to the LTLT process.

Final Answer: LTLT Pasteurization.

Answer: (B)

Q7.

Solution

Concept: Biological Nitrogen Fixation (BNF) is a process where certain microorganisms convert atmospheric nitrogen (N_2) into ammonia (NH_3), which plants can readily absorb. While the most well-known symbiotic relationship is between *Rhizobium* and leguminous plants, there exists another group of symbiotic nitrogen fixers that associate with non-leguminous woody plants.

Solution: 1. Frankia is a genus of nitrogen-fixing bacteria known as actinomycetes. It forms a symbiotic relationship with several groups of non-leguminous plants, collectively called actinorhizal plants. 2. A classic example of such a plant is **Alnus** (Alder). *Frankia* induces the formation of root nodules on these plants, similar to how *Rhizobium* works with legumes, allowing the plant to thrive in nitrogen-poor soils. 3. Comparison with other options: - **Rhizobium:** A symbiotic nitrogen fixer, but it is specific to leguminous plants (like peas, beans, and lentils). - **Azotobacter:** A free-living (non-symbiotic) aerobic nitrogen-fixing bacterium found in the soil. - **Azospirillum:** An associative symbiotic nitrogen fixer that lives in close proximity to the roots of cereal crops but does not form specialized nodules. 4. Therefore, *Frankia* is the correct bio-fertilizer that fits the description of a symbiotic fixer for non-leguminous plants like *Alnus*.

Final Answer: Frankia

Answer: (C)

Q8.

Solution

Concept: The Green Revolution was driven by the introduction of high-yielding, semi-dwarf varieties. These varieties were created by incorporating specific dwarfing genes that allowed plants to support heavy grain loads without lodging (falling over).

Solution: 1. The 'Norin-10' gene is a dwarfing gene in wheat. 2. It was discovered in Japan in the 1930s. 3. After World War II, it was taken to the USA and eventually used by Dr. Norman Borlaug in Mexico to develop the Mexican semi-dwarf wheat varieties. 4. These varieties were later introduced to India and Pakistan, leading to a massive increase in wheat production.

Final Answer: Japan.

Answer: (B)

Q9.

Solution

Concept: The Earth's atmosphere is divided into layers based on temperature gradients. The "Ozone Layer" is a region of high ozone concentration that acts as a shield against ultraviolet (UV) radiation.

Solution: 1. The Troposphere is the lowest layer where weather occurs, but it contains "bad ozone" (pollutant). 2. The Stratosphere extends from about 10 km to 50 km above the Earth's surface. 3. Approximately 90% of the Earth's ozone is located in the lower portion of the Stratosphere (the Ozonosphere). 4. This ozone absorbs the majority of the sun's medium-frequency ultraviolet light (200 nm to 315 nm), which would otherwise damage living tissues at the surface.

Final Answer: Stratosphere.

Answer: (B)

Q10.

Solution

Concept: Cultural practices in Horticulture are designed to maximize yield and quality. In Banana cultivation, several specialized terms describe specific operations like desuckering, propping, and denavelling.

Solution: 1. A banana inflorescence has both female flowers (which turn into fruit) and male flowers (the purple bud at the end). 2. After the fruit (hands) have finished forming, the male bud continues to grow, consuming nutrients and energy without contributing to the yield. 3. Denavelling is the removal of this male bud (the "navel") once the female phase is complete. 4. This practice helps in increasing the weight of the fruit fingers and results in an earlier harvest. 5. For comparison, Mattocking is the cutting down of the pseudostem after harvest, and Desuckering is the removal of unwanted side shoots.

Final Answer: Denavelling.

Answer: (B)

Q11.

Solution

Concept: Chargaff's Rules state that in a double-stranded DNA molecule, the amount of Purines equals the amount of Pyrimidines. Specifically, the amount of Adenine (A) is equal to Thymine (T), and the amount of Guanine (G) is equal to Cytosine (C). Therefore:

$$\%A + \%G + \%C + \%T = 100\%$$

$$\%A = \%T \text{ and } \%G = \%C$$

Solution: 1. Given: Percentage of Guanine (G) = 22%. 2. According to the rule, if G = 22%, then C must also be 22%. 3. Total G + C = 22% + 22% = 44%. 4. The remaining percentage for A + T is: 100% – 44% = 56%. 5. Since A = T, the percentage of Thymine is: 56%/2 = 28%.
Final Answer: 28%.

Answer: (C)

Q12.

Solution

Concept: Herbicides are classified by their mode of action (contact vs. translocated) and selectivity. A non-selective herbicide kills all vegetation it comes into contact with, while a translocated (systemic) herbicide moves through the plant's vascular system to kill it from the roots up.
Solution: 1. Paraquat is non-selective but is a 'contact' herbicide; it only kills the parts of the plant it touches. 2. Glyphosate (commercially known as Roundup) is both 'non-selective' and 'translocated'. 3. When applied to leaves, Glyphosate is absorbed and moves to the roots and storage organs, making it highly effective against tough perennial weeds like *Cynodon dactylon* (Dub grass). 4. Atrazine and 2,4-D are selective herbicides used in specific crops like maize or for broadleaf weed control.
Final Answer: Glyphosate.

Answer: (B)

Q13.

Solution

Concept: In livestock management, particularly in sheep and goat farming, 'Flushing' is a specialized nutritional practice. It is designed to improve the physiological condition of the female animal (ewe) just prior to the breeding season to maximize reproductive efficiency.

Solution: 1. Flushing involves increasing the plane of nutrition by providing extra high-quality succulent pasture or concentrate feed (250–500 grams per day) to ewes. 2. This practice is typically started 2 to 3 weeks before the breeding season (tupping). 3. The sudden increase in nutrient intake triggers a hormonal response that increases the ovulation rate (the number of eggs released during heat). 4. Benefits: The primary goal is to increase the twinning rate (multiple births) and ensure that the ewes are in a gaining state of body weight, which improves the chances of successful conception. 5. **Comparison with other options:** - **Cleaning wool:** This is called "Dagging" or "Scouring" depending on the context. - **Removing parasites:** This is known as "Drenching." - **Separating lambs:** This is known as "Weaning."

Final Answer: Providing extra nutritious feed to ewes 2-3 weeks before breeding.

Answer: (B)

Q14.

Solution

Concept: Crops vary in their ability to tolerate salts in the soil. Salinity tolerance often changes during different growth stages, with the germination and early seedling stages usually being the most vulnerable.

Solution: 1. Barley and Sugarbeet are known as highly salt-tolerant crops. 2. Cotton is also considered fairly tolerant once established. 3. Rice, however, is classified as a salt-sensitive to moderately sensitive crop, especially during the transplanting and early seedling stages. 4. High salinity interferes with the osmotic uptake of water by the young rice roots, leading to "physiological drought" and poor crop stand.

Final Answer: Rice.

Answer: (C)

Q15.

Solution

Concept: In food processing, firming agents are added to maintain the structural integrity of fruits and vegetables that might otherwise become too soft or mushy during the high-heat sterilization process of canning.

Solution: 1. Calcium ions react with the pectin in the plant cell walls to form calcium pectate. 2. Calcium pectate acts like a "glue" that reinforces the cell structure, keeping the product firm. 3. Calcium Chloride ($CaCl_2$) is the most commonly used chemical for this purpose in products like canned tomatoes or apple slices. 4. Sodium Benzoate and KMS (Potassium Metabisulphite) are preservatives, not firming agents.

Final Answer: Calcium Chloride.

Answer: (B)

Q16.

Solution

Concept: Retting is a biochemical process used to separate the fiber from the bark and woody core of the jute stem. It involves the action of water and microorganisms (mostly bacteria like *Clostridium*) that dissolve the pectins and gums holding the fibers.

Solution: 1. Temperature plays a critical role in the activity of retting bacteria. 2. If the water is too cold, the process takes too long; if too hot, the fiber quality degrades. 3. The optimum temperature range for efficient retting is 34°C to 36°C. 4. Under these conditions, retting is usually completed in 8 to 15 days, resulting in high-quality, lustrous fiber.

Final Answer: 34°C to 36°C.

Answer: (B)

Q17.

Solution

Concept: The relationship between genes and traits is often complex. While the basic Mendelian model suggests that one gene controls one specific trait, genetic research has identified instances where a single gene can have a widespread impact on an organism's physiology, affecting several different morphological or functional characteristics simultaneously.

Solution: 1. **Pleiotropy** is the genetic term used to describe the phenomenon where one single gene influences two or more seemingly unrelated phenotypic traits. This usually happens because the gene codes for a product (like an enzyme or protein) that is used in multiple biochemical pathways or is active in different types of tissues. 2. **Example:** A classic example in plants is the gene for seed coat color in peas, which also influences the color of the flowers and the presence of spots in the leaf axils. In humans, the gene for Phenylketonuria (PKU) affects mental development as well as hair and skin pigmentation. 3. **Comparison with other options:** - **Epistasis:** This occurs when the expression of one gene is masked or modified by the presence of another entirely different gene. - **Polygenic Inheritance:** This is the opposite of pleiotropy; it is when multiple different genes work together to control a single trait (like human height or skin color). - **Co-dominance:** This is a relationship between two alleles of the same gene where both are fully expressed in the phenotype (like AB blood group). 4. Therefore, the term for a single gene affecting multiple traits is Pleiotropy.

Final Answer: Pleiotropy

Answer: (C)

Q18.

Solution

Concept: The physical properties of soil, such as swelling and shrinking, are determined by the dominant type of clay minerals present in the soil matrix.

Solution: 1. Black Cotton Soils (Vertisols) are rich in 2:1 expanding-type clay minerals. 2. Montmorillonite is the primary mineral in these soils. It has a high capacity to absorb water between its layers, causing the soil to swell significantly when wet. 3. When dry, the soil loses water and shrinks, creating deep, wide cracks. 4. As surface soil falls into these cracks, the soil essentially "mixes itself," a process known as "self-ploughing" or pedoturbation.

Final Answer: Montmorillonite.

Answer: (C)

Q19.

Solution

Concept: Poultry health management requires the ability to distinguish between viral, bacterial, and protozoan diseases based on clinical signs. Digestive tract infections often manifest through changes in fecal consistency and color, which are indicative of the specific pathogen's site of action within the intestine.

Solution: 1. Coccidiosis is a major protozoan disease in poultry caused by various species of the genus *Eimeria*. These parasites invade the epithelial cells of the intestinal lining, causing severe tissue damage, inflammation, and hemorrhage. 2. The characteristic clinical signs include the passing of **"rice water" stools** or blood-stained droppings. This occurs because the damaged intestinal wall can no longer absorb nutrients or water effectively, leading to rapid fluid loss and severe **dehydration**. 3. Comparison with other options: - **Ranikhet Disease (Newcastle Disease):** A highly contagious viral disease characterized by respiratory distress (gasping), nervous symptoms (twisted neck), and greenish diarrhea, but it is not a protozoan infection. - **Fowl Cholera:** A bacterial disease caused by *Pasteurella multocida* that typically causes sudden death or chronic swelling of the wattles and greenish-yellow diarrhea. - **Infectious Coryza:** A bacterial respiratory infection characterized by swelling of the face and discharge from the eyes and nostrils. 4. Since the question specifically asks for a **protozoan disease** associated with rice water stools and dehydration, Coccidiosis is the only correct match.

Final Answer: Coccidiosis

Answer: (A)

Q20.

Solution

Concept: Evapotranspiration (ET) is the sum of evaporation from the soil surface and transpiration from plants. Measuring it accurately is vital for calculating crop water requirements.

Solution: 1. A Lysimeter is a large container buried in the field, filled with soil and planted with the crop. 2. It measures the water balance of the system by recording the weight change (for weighing lysimeters) or the amount of water added vs. drained. 3. Change in weight indicates water lost through ET. 4. A Piezometer measures groundwater level, a Tensiometer measures soil moisture tension, and a Psychrometer measures relative humidity.

Final Answer: Lysimeter.

Answer: (B)

Q21.

Solution

Concept: Energy balance at the Earth's surface is a fundamental principle of Agrometeorology. The Net Radiation (R_n) is the total energy available at the surface after accounting for incoming and outgoing shortwave and longwave radiation.

Solution: 1. According to the principle of conservation of energy (1st Law of Thermodynamics), the energy reaching the crop canopy must be used or stored. 2. The partitioning equation is generally given as: $R_n = G + H + LE$. 3. Sensible Heat (H): Energy used to change the temperature of the air. 4. Latent Heat (LE): Energy used for the phase change of water (Evapotranspiration). 5. Soil Heat Flux (G): Energy conducted into the soil profile. 6. Therefore, the net radiation is primarily partitioned into these three fluxes.

Final Answer: Sensible heat, Latent heat, and Soil heat flux.

Answer: (A)

Q22.

Solution

Concept: Critical stages of irrigation are specific growth periods during which the plant is most sensitive to moisture stress. Water deficiency at these stages causes the most significant reduction in yield.

Solution: 1. For Wheat, the most critical stage is the Crown Root Initiation (CRI) stage. 2. This occurs approximately 21 days after sowing (DAS). 3. At this stage, the transition from seminal roots to crown roots takes place. 4. If the soil is dry during CRI, the crown roots will not develop properly, leading to poor tillering and a drastic reduction in the number of grains per ear. 5. While tillering and flowering are also important, CRI is the top priority for the first irrigation.

Final Answer: Crown Root Initiation (CRI) Stage.

Answer: (C)

Q23.

Solution

Concept: The Bulk Method (or Mass-Pedigree method) is a specific plant breeding technique used to manage hybrid populations during the segregating generations (from F_2 to F_5 or F_6). It relies on the principle of natural selection to favor the most adapted genotypes while the population reaches a high level of homozygosity through continuous selfing.

Solution: 1. In this method, the seeds from the F_2 and subsequent generations are harvested in a mass (bulk) and used to grow the next generation without individual plant selection. 2. The population is grown in a large plot, often for several years. During this time, "natural selection" acts as a filter, eliminating plants that are poorly adapted to environmental stresses, pests, or diseases. 3. Because the goal is to achieve homozygosity before starting artificial selection, this method is specifically designed for **self-pollinated crops** (like wheat, rice, or barley). 4. Once the population becomes sufficiently homozygous (usually by the F_6 generation), individual plant selection is performed to develop pure lines. 5. **Comparison with other options:** - **Cross-pollinated crops:** These are usually managed through recurrent selection or synthetic/hybrid breeding rather than the bulk method. - **Asexually propagated plants:** These are handled through clonal selection since they do not segregate in the same manner. - **Pure-line selection:** This is a method used to isolate the best line from an existing traditional variety, not for managing segregating hybrid populations.

Final Answer: Segregating generations of self-pollinated crops

Answer: (B)

Q24.

Solution

Concept: Ruminant animals, such as cattle, sheep, and goats, possess a complex four-compartment stomach. The largest compartment, the rumen, functions as a massive fermentation vat inhabited by billions of beneficial microorganisms, including bacteria, protozoa, and fungi.

Solution: 1. These rumen microorganisms break down complex carbohydrates like cellulose from fodder and, in the process, synthesize several essential nutrients. 2. Specifically, the rumen microflora are capable of synthesizing the entire **Vitamin B-complex** (including B_1, B_2, B_6, B_{12}, Niacin, etc.) and Vitamin K. 3. Because the microbes produce these vitamins in quantities that usually meet or exceed the animal's daily requirements, adult cattle do not need these vitamins to be supplemented in their feed. 4. **Comparison with other options:** - **Vitamin A:** Must be provided through green fodder (as carotene). - **Vitamin D:** Synthesized in the skin upon exposure to sunlight. - **Vitamin E:** Must be obtained through the diet (grains and green feed). 5. Therefore, the Vitamin B-complex is the group of vitamins synthesized by the rumen microbes, making dietary intake unnecessary for healthy adult ruminants.

Final Answer: Vitamin B-complex

Answer: (C)

Q25.

Solution

Concept: Soil air composition differs from the atmospheric air due to the biological activities of soil microorganisms and plant roots.

Solution: 1. Both plant roots and microbes undergo respiration, which consumes Oxygen (O_2) and releases Carbon Dioxide (CO_2). 2. Because the exchange of gases between the soil and the atmosphere (diffusion) is restricted by soil pores and moisture, CO_2 tends to accumulate in the soil. 3. While the atmosphere contains about 0.04% CO_2, the soil air typically contains 0.25% to 5% CO_2. 4. This means the concentration in the soil is 10 to 100 times higher than in the atmosphere.

Final Answer: 10 to 100 times higher than the atmospheric air.

Answer: (C)

Q26.

Solution

Concept: Fruit ripening is a physiological process regulated by the hormone ethylene (C_2H_4). To extend the shelf life of fruits during long-distance transport, it is necessary to remove or neutralize the ethylene produced by the fruits themselves.

Solution: 1. Potassium Permanganate ($KMnO_4$) is a strong oxidizing agent. 2. When ethylene gas comes into contact with $KMnO_4$, it is oxidized into ethylene glycol and then further into carbon dioxide and water. 3. In commercial packaging, $KMnO_4$ is often impregnated into sachets or porous carriers (like alumina beads). 4. By absorbing the "ripening hormone," the chemical effectively delays the onset of senescence and keeps the fruit firm for a longer duration. 5. Calcium carbide, conversely, is used to *accelerate* ripening by releasing acetylene.

Final Answer: Potassium Permanganate ($KMnO_4$).

Answer: (A)

Q27.

Solution

Concept: In Mendelian genetics, specific terms are used to describe crosses involving the first filial generation (F_1). A back cross refers to any cross between an F_1 individual and either of its original parents. However, a specific type of back cross is used as a diagnostic tool to determine the zygosity of an individual displaying a dominant phenotype.

Solution: 1. A **Test Cross** is a cross between an F_1 hybrid (which shows the dominant phenotype but has an unknown or heterozygous genotype, e.g., Tt) and its **homozygous recessive parent** (tt). 2. The primary purpose of this cross is to "test" whether the dominant individual is homozygous (TT) or heterozygous (Tt). 3. If the F_1 is heterozygous (Tt), the resulting progeny will show a 1 : 1 ratio of dominant to recessive phenotypes. If the F_1 is homozygous (TT), 100% of the progeny will show the dominant phenotype. 4. **Comparison with other options:** - **Back Cross:** A broader term including crosses with either the dominant or recessive parent. - **Reciprocal Cross:** A pair of crosses where the phenotypes of the male and female parents are reversed to check for sex-linked inheritance. - **Top Cross:** A cross between an inbred line and an open-pollinated variety.

Final Answer: Test Cross

Answer: (B)

Q28.

Solution

Concept: Rice is a semi-aquatic crop that thrives in submerged conditions. To maintain standing water in the field efficiently, the soil must be physically modified to reduce its hydraulic conductivity. This is achieved through a specialized primary tillage operation known as puddling.

Solution: 1. **Puddling** is the process of churning the soil in a flooded field (usually with 5–10 cm of standing water) using a spade, plough, or power tiller. 2. The physical action of puddling breaks down soil aggregates and destroys the natural macropores. This leads to the formation of a dense, impervious layer called a "plough pan" or "traffic pan" just below the surface. 3. The primary objective of this impervious layer is to **decrease the deep percolation of water**. By sealing the soil, the water stays on the surface longer, which is essential for the growth of paddy. 4. **Additional Benefits:** It also helps in controlling weeds by creating anaerobic conditions and makes the soil soft for easier transplanting of rice seedlings. 5. **Comparison with other options:** - It actually **decreases** soil aeration (creating an anaerobic environment). - It is not done to increase temperature or specifically for harvesting; in fact, the field must be drained before harvest.

Final Answer: Decrease deep percolation of water

Answer: (B)

Q29.

Solution

Concept: Soil and water conservation methods are classified as 'In-situ' (on-site) or 'Ex-situ' (off-site). In-situ methods focus on holding the rainwater exactly where it falls on the field.

Solution: 1. Mulching involves covering the soil surface with organic matter (like straw) or plastic sheets. 2. It acts directly on the field surface to reduce evaporation, slow down surface runoff, and increase the infiltration of rainwater into the soil profile. 3. Because it manages moisture directly within the cropped area, it is a classic 'In-situ' technique. 4. Farm Ponds and Check Dams are 'Ex-situ' methods because they involve collecting and storing runoff water away from its point of origin for later use.

Final Answer: Mulching.

Answer: (B)

Q30.

Solution

Concept: Social insects like honeybees have evolved complex communication systems to maintain the efficiency of the colony. Karl von Frisch was awarded a Nobel Prize for deciphering these "dances."

Solution: 1. When a scout bee finds a rich source of nectar or pollen, she returns to the hive to recruit others. 2. If the food is more than 50–100 meters away, she performs the 'Waggle Dance' (figure-eight pattern). 3. The angle of the waggle run relative to gravity indicates the direction of the food relative to the sun. 4. The duration of the waggle run and the vigor of the dance indicate the distance and the quality of the food source. 5. For food sources very close to the hive, the 'Round Dance' is used instead.

Final Answer: The direction and distance of a food source.

Answer: (B)

Q31.

Solution

Concept: Hardening off is a vital physiological conditioning process in nursery management. Seedlings grown in a nursery are typically maintained under optimal, protected conditions with regular irrigation and shade. If moved directly to the open field, they often suffer from "transplant shock" due to the sudden exposure to high solar radiation, wind, and fluctuating moisture levels.
Solution: 1. The goal of hardening off is to make the plant tissues more robust and accumulate carbohydrates, which helps the seedling survive the transition to the main field. 2. This is achieved by **gradually reducing the frequency of watering** and **increasing the exposure to direct sunlight** over a period of 7 to 14 days before transplanting. 3. These mild environmental stresses cause the plant to slow its soft vegetative growth and develop thicker cell walls and a more efficient cuticle. 4. **Comparison with other options:** - **Nitrogenous fertilizers:** These promote soft, succulent growth, which is the opposite of what is needed for hardening. - **Increasing irrigation and shade:** This maintains the protected environment, making the plants more sensitive to field stress. - **Gibberellins:** These stimulate cell elongation and "stretchy" growth, which does not assist in toughening the plant.
Final Answer: Gradually reducing watering and exposing plants to direct sunlight.

Answer: (B)

Q32.

Solution

Concept: Crassulacean Acid Metabolism (CAM) is a specialized photosynthetic adaptation found in succulent plants (such as Pineapple, Cacti, and Orchids) that live in arid or semi-arid environments. It is a mechanism designed to maximize Water Use Efficiency (WUE) by decoupling the absorption of CO_2 from the light-dependent reactions of photosynthesis.
Solution: 1. In CAM plants, the stomata are **scotoactive**, meaning they open at night to take in CO_2 and close during the day to minimize water loss through transpiration. 2. At night, CO_2 enters the leaves and is fixed into 4-carbon organic acids, primarily **Malic acid**, which is stored in the large vacuoles of the cells. 3. During the following day, the stomata close. The Malic acid is then transported out of the vacuoles and **decarboxylated** to release CO_2 internally. 4. This internally released CO_2 is then utilized by the standard Calvin Cycle (using the enzyme RuBisCO) to synthesize sugars using the energy (ATP and NADPH) generated by the light reactions. 5. **Comparison with other options:** - Option A describes standard C_3 plants. - Option B describes the exact opposite of CAM behavior. - Option D is incorrect because CAM plants do use the Calvin Cycle during the day.
Final Answer: Initial CO_2 fixation occurs at night forming Malic acid, which is decarboxylated during the day.

Answer: (C)

Q33.

Solution

Concept: Organic farming strictly prohibits the use of synthetic chemical fertilizers. The National Programme for Organic Production (NPOP) provides a list of naturally occurring minerals and organic substances that are allowed for soil enrichment.

Solution: 1. Urea, DAP, and MOP (Muriate of Potash) are highly soluble synthetic chemical fertilizers and are completely banned in organic systems. 2. Rock Phosphate is a naturally occurring mineral ore. Because it is used in its raw form without chemical processing (like acidulation), it is allowed as a slow-release phosphorus source. 3. Organic farmers rely on these natural minerals along with compost, green manure, and bio-fertilizers to maintain fertility.

Final Answer: Rock Phosphate.

Answer: (B)

Q34.

Solution

Concept: In the textile industry, the quality and commercial value of cotton are determined by several physical properties of the fiber. 'Tenacity' or 'Breaking Strength' is one of the most critical parameters as it determines the durability of the yarn and the efficiency of the spinning process.

Solution: 1. **Breaking Strength** refers to the maximum load or force a fiber can withstand before it snaps or ruptures. 2. In commercial testing, it is often measured as "Bundle Strength" rather than individual fiber strength, as a bundle of fibers provides a more consistent and practical measure for industrial spinning. 3. It is typically expressed in units such as grams per tex (g/tex). Fibers with higher tenacity produce stronger yarns that are less likely to break during high-speed weaving and knitting. 4. **Comparison with other options:** - **Length:** Referred to as 'Staple Length'. - **Cellulose deposition:** Referred to as 'Maturity'. - **Microbial resistance:** Not a standard measure of physical fiber strength.

Final Answer: The amount of force required to rupture a bundle of fibers.

Answer: (B)

Q35.

Solution

Concept: Soil acidity is caused by a high concentration of Hydrogen (H^+) and Aluminum (Al^{3+}) ions in the soil solution. This condition inhibits the availability of essential nutrients and can be toxic to plant roots. To correct this, "Liming" materials are added to react with the acid and raise the pH toward neutrality (7.0).

Solution: 1. **Agricultural Lime (Calcium Carbonate, $CaCO_3$)** is the most widely used soil amendment for correcting acidity. 2. When applied to moist soil, it reacts to produce bicarbonate ions which neutralize the H^+ ions, effectively raising the soil pH. It also provides essential Calcium (Ca^{2+}) to the plants. 3. **Comparison with other options:** - **Gypsum ($CaSO_4 \cdot 2H_2O$):** Used to reclaim **Sodic (Alkali) soils**, not acidic soils. It does not significantly change the soil pH. - **Elemental Sulphur and Pyrites (FeS_2):** These are **acidifying agents**. They are used to **lower** the pH of alkaline soils, so applying them to an already acidic soil (pH 4.5) would make the condition worse. 4. Therefore, Agricultural Lime is the standard corrective measure for strongly acidic soils.

Final Answer: Agricultural Lime ($CaCO_3$)

Answer: (B)

Q36.

Solution

Concept: Humidity measurement in Agrometeorology often involves a psychrometer, which consists of two thermometers: a Dry Bulb (DB) and a Wet Bulb (WB). The difference between these two readings provides insights into the air's moisture content.

Solution: 1. The 'Wet Bulb Depression' is the mathematical difference: Dry Bulb Temperature – Wet Bulb Temperature. 2. The Wet Bulb thermometer is cooled by the evaporation of water from a moist wick. 3. If the air is very dry, evaporation is rapid, causing significant cooling and a large "depression." 4. If the air is saturated (100% relative humidity), no evaporation occurs, the readings are identical, and the depression is zero. 5. This value is used with psychrometric tables to determine relative humidity and dew point.

Final Answer: The difference between Dry Bulb and Wet Bulb temperatures.

Answer: (B)

Q37.

Solution

Concept: Indigenous poultry breeds in India are valued for their hardiness and specific traits. The 'Aseel' is one of the most ancient and famous breeds from the Andhra Pradesh and Chhattisgarh regions.

Solution: 1. Aseel is known globally as a premier "game bird" due to its aggressive nature and fighting spirit. 2. Physically, it has a pea comb, a heavy beak, and a very muscular body with a distinct upright stance. 3. While its egg-laying capacity is low, its meat is considered of high quality (chewy and flavorful), and it is often used in breeding programs to improve the meatiness of other poultry lines. 4. For comparison, Kadaknath is known for its black meat, and Leghorn is a prolific egg-layer.

Final Answer: Aseel.

Answer: (B)

Q38.

Solution

Concept: Nutritional deficiencies in fruit crops often manifest as specific physiological disorders that affect the quality and marketability of the produce. In viticulture (grape cultivation), certain micronutrients are essential for the reproductive success of the vine, particularly for pollen tube growth and fertilization.

Solution: 1. The **'Hen and Chicken'** disorder, also known as millerandage, is a condition where a single grape cluster contains berries of very different sizes. The "Hens" are the normal, large, seeded berries, while the "Chickens" are the tiny, undersized, seedless berries. 2. This disorder is primarily caused by a deficiency of **Boron**. Boron plays a vital role in the germination of pollen grains and the elongation of the pollen tube. 3. When Boron is deficient, fertilization becomes irregular. Some ovules are fertilized normally (Hens), while others fail to fertilize but still develop into tiny berries (Chickens), or fertilization is incomplete. 4. **Comparison with other options:** - **Zinc:** Deficiency typically causes "Little Leaf" or "mottle leaf" in many fruit trees. - **Iron:** Deficiency causes interveinal chlorosis, primarily in young leaves. - **Manganese:** Also relates to chlorosis patterns but does not typically cause this specific berry size disparity in grapes.

Final Answer: Boron

Answer: (B)

Q39.

Solution

Concept: Plant tissue culture (micropropagation) is based on the principle of totipotency, which is the ability of a single plant cell to regenerate into a whole plant. This process begins with a small piece of plant tissue, known as an explant, which is placed on a specialized nutrient medium containing growth regulators.

Solution: 1. When the explant is exposed to the correct balance of Auxins and Cytokinins, the cells undergo rapid and uncontrolled division (mitosis). 2. This results in the formation of a **Callus**, which is defined as an unorganized, undifferentiated mass of parenchyma cells. 3. The callus can later be induced to differentiate into organs (roots and shoots) by adjusting the hormone ratios in the medium. 4. **Comparison with other options:** - **Somaclone:** Refers to the plants derived from tissue culture that are (ideally) genetically identical to the parent. - **Protoplast:** A plant cell that has had its cell wall removed using enzymes. - **Hybridoma:** A technology used in animal biotechnology to produce monoclonal antibodies, not related to plant tissue culture.

Final Answer: Callus

Answer: (A)

Q40.

Solution

Concept: The "Critical Period of Weed Competition" (CPWC) is a fundamental concept in weed science. It represents the specific window of time during a crop's life cycle when weeds cause the maximum reduction in yield potential. If the crop is kept weed-free during this specific interval, the yield will not be significantly affected by weeds that emerge later.

Solution: 1. For most upland (non-submerged) crops like Maize, Soybean, and Pulses, the initial growth is relatively slow compared to aggressive weeds. 2. The critical period generally occurs during the early vegetative phase, specifically between **15 to 45 days after sowing (DAS)**. 3. During this time, the crop is establishing its root system and canopy. If weeds are present, they compete fiercely for sunlight, nutrients, and moisture, leading to permanent stunting of the crop. 4. **Comparison with other options:** - **First 15 days:** The seedlings are usually too small to compete heavily, and soil resources are often still sufficient for both. - **Flowering/Grain filling:** By this stage, a healthy crop has usually developed a canopy that naturally shades out and suppresses new weed growth. - **Before harvesting:** Weeds at this stage might interfere with the machinery but do not significantly "compete" for growth resources to reduce yield.

Final Answer: 15 to 45 days after sowing.

Answer: (B)

Q41.

Solution

Concept: A zoonotic disease (or zoonosis) is an infectious disease that has jumped from a non-human animal to humans. These pathogens can be bacterial, viral, or parasitic and spread through direct contact, food, water, or the environment.

Solution: 1. Anthrax is a severe infectious disease caused by the bacterium *Bacillus anthracis*. It primarily affects herbivores (cattle, sheep, goats). 2. Humans can become infected through contact with infected animals or contaminated animal products (like wool or hides), or by inhaling spores. 3. Because of this animal-to-human transmission pathway, it is classified as a zoonotic disease. 4. Foot and Mouth Disease (FMD) and Ranikhet (Newcastle Disease) are highly contagious among animals but rarely affect humans. Milk Fever is a metabolic nutritional disorder (calcium deficiency), not an infectious disease.

Final Answer: Anthrax.

Answer: (B)

Q42.

Solution

Concept: Albedo is a measure of the reflectivity of a surface. It is the ratio of the radiant flux reflected from a surface to the radiant flux incident upon it. In Agrometeorology, it determines how much solar energy is available for heating the soil and plants.

Solution: 1. Albedo is expressed as a fraction or percentage (ranging from 0 to 1). 2. A surface with a high albedo (like fresh snow, 0.9) reflects most of the radiation, while a surface with a low albedo (like moist black soil, 0.1) absorbs most of it. 3. Most green crop canopies have an albedo in the range of 0.20 to 0.25, meaning they reflect about 20–25% of incoming solar radiation back into the atmosphere. 4. Understanding albedo is crucial for calculating the net radiation available for photosynthesis and evapotranspiration.

Final Answer: The fraction of solar radiation reflected by the surface.

Answer: (B)

Q43.

Solution

Concept: A dihybrid cross involves the study of the inheritance of two pairs of contrasting traits simultaneously. Gregor Mendel used this to formulate the Law of Independent Assortment, which states that alleles for different traits are distributed to gametes independently of one another.

Solution: 1. In Mendel's classic experiment, he crossed pure-breeding plants with round yellow seeds (RRYY) and wrinkled green seeds (rryy). 2. The F_1 generation consisted of all heterozygous round yellow plants (RrYy). 3. When F_1 plants are self-pollinated, they produce four types of gametes (RY, Ry, rY, ry), which combine in 16 possible ways in the F_2 generation. 4. The resulting phenotypic classes and their counts are: - Round Yellow (both dominant traits): 9 - Round Green (one dominant, one recessive): 3 - Wrinkled Yellow (one recessive, one dominant): 3 - Wrinkled Green (both recessive traits): 1 5. **Comparison with other options:** - **3:1:** The phenotypic ratio of a monohybrid cross. - **1:2:1:** The genotypic ratio of a monohybrid cross. - **1:1:1:1:** The ratio of a dihybrid test cross.

Final Answer: 9 : 3 : 3 : 1

Answer: (C)

Q44.

Solution

Concept: Photoperiodism is the physiological response of plants to the relative lengths of daylight and darkness. Plants are classified based on the "critical night length" required for them to transition from vegetative growth to the reproductive (flowering) phase.

Solution: 1. **Short Day Plants (SDP)**, or more accurately "Long Night Plants," only flower when the day length is shorter than a critical period, meaning they require a continuous period of darkness longer than a specific threshold. 2. **Rice** is a typical Short Day Plant. It is usually grown during the Kharif season and flowers as the day length decreases during the autumn months. 3. **Comparison with other options:** - **Wheat:** A Long Day Plant (LDP) that requires shorter nights to flower. - **Radish:** A Long Day Plant. - **Sugarbeet:** A Long Day Plant. 4. Therefore, among the choices, Rice is the one that initiates flowering in response to short days/long nights.

Final Answer: Rice

Answer: (B)

Q45.

Solution

Concept: Curing is a critical post-harvest operation for bulb and tuber crops. It is essentially a drying process that takes place under controlled conditions (either in the field or in ventilated sheds) immediately after harvesting.

Solution: 1. In crops like **Onion and Garlic**, the primary purpose of curing is to allow the outer scales (skins) to dry and harden. 2. This process causes the neck of the bulb to constrict and seal, which prevents the entry of rot-causing bacteria and fungi during storage. 3. It also helps the bulb **develop its characteristic surface color** and reduces the moisture content in the outer layers, which significantly minimizes weight loss and sprouting during long-term storage. 4. **Comparison with other options:** - Curing does not increase the size of the bulb; size is determined in the field before harvest. - While it may stabilize the chemistry, it is not primarily done to remove smell or convert starch.

Final Answer: Develop the characteristic color and dry the outer scales for better storage.

Answer: (B)

Q46.

Solution

Concept: Micro-irrigation techniques are designed to deliver water directly to the root zone of plants, minimizing losses due to evaporation, runoff, and deep percolation.

Solution: 1. Drip Irrigation (also known as trickle irrigation) involves the slow application of water through emitters or drippers directly onto or into the soil surface near the plant roots. 2. It is considered the most efficient irrigation system, with water application efficiency often exceeding 90%. 3. Because it keeps the soil moisture at an optimum level without wetting the entire field, it significantly reduces weed growth and saves up to 50–70% water compared to surface methods. 4. It is particularly ideal for wide-spaced orchard crops (like Mango or Citrus) and areas facing acute water scarcity.

Final Answer: Drip Irrigation.

Answer: (B)

Q47.

Solution

Concept: In animal husbandry, the term 'Ration' refers to the total amount of feed allowed to an animal during a 24-hour period. Feeding management aims to fulfill the nutritional requirements of livestock for maintenance, growth, and production (like milk or wool).

Solution: 1. A **Balanced Ration** is defined as a feed mixture that contains all the essential nutrients—including carbohydrates, proteins, fats, minerals, and vitamins—in the proper proportions and amounts required to nourish the animal for **one day (24 hours)**. 2. It is formulated based on the specific needs of the animal, considering its body weight, age, and level of production. 3. **Comparison with other options:** - **Green fodder:** This is only one component (roughage) and lacks the energy and protein density of a full ration. - **Concentrates:** While high in energy, a ration consisting only of grains would lack the fiber necessary for proper rumen function in ruminants. - **Lactation period:** A balanced ration is required throughout an animal's life, including dry periods and growth stages, not just during lactation.

Final Answer: Provides all essential nutrients in the correct proportion for 24 hours.

Answer: (B)

Q48.

Solution

Concept: Herbicides are chemical substances used to control unwanted plants (weeds). Their effectiveness often depends on their selectivity, which is the ability of the chemical to kill certain plant species without significantly injuring the desired crop. 2,4-D (2,4-Dichlorophenoxyacetic acid) was the first successful selective herbicide developed.

Solution: 1. **2,4-D** is a systemic, selective herbicide that mimics the natural plant growth hormone, auxin. 2. It is highly effective against **Broad-leaved weeds (Dicots)**. When applied, it causes rapid, unsustainable, and distorted growth in the stems and leaves of dicot plants, leading to their death. 3. Because most cereal crops (like Wheat, Rice, and Maize) and grasses are monocots (narrow-leaved), they possess a different metabolism and leaf structure that makes them naturally resistant or tolerant to 2,4-D at recommended doses. 4. **Comparison with other options:** - **Narrow-leaved weeds:** These are generally resistant to 2,4-D; specific "graminicides" are used to control them. - **Sedges:** While some sedges may be affected, 2,4-D is primarily recognized for its efficacy against broad-leaved species like *Chenopodium album*.

Final Answer: Broad-leaved weeds (Dicots).

Answer: (B)

Q49.

Solution

Concept: The organization of genetic material is highly structured. Chromosomes are long strands of DNA, and the specific information for various traits is distributed along these strands. To identify or map these genes, scientists use a system of coordinates.

Solution: 1. A **Locus** (plural: loci) is the specific, fixed position on a chromosome where a particular gene or genetic marker is located. 2. Think of the chromosome as a street and the locus as the "house address" of the gene. 3. **Comparison with other options:** - **Allele:** These are the different versions or variants of a gene that can occupy a specific locus (e.g., the gene for height might have "tall" and "short" alleles). - **Genotype:** The total genetic makeup of an individual (e.g., Tt). - **Phenotype:** The observable physical characteristic resulting from the genotype (e.g., being tall).

Final Answer: Locus

Answer: (C)

Q50.

Solution

Concept: Plants require 17 essential elements for healthy growth and development. These are divided into macronutrients (needed in large quantities) and micronutrients. Macronutrients are further divided into Primary (N, P, K) and Secondary (Ca, Mg, S).

Solution: 1. **Phosphorus (P)** is a primary macronutrient and is often referred to as the "energy currency" of the plant. 2. It is a core component of **ATP (Adenosine Triphosphate)**, which is the molecule used by cells to store and transfer energy during vital processes like photosynthesis and respiration. 3. It is also essential for the structure of DNA, RNA, and cell membranes (phospholipids). 4. **Comparison with other options:** - **Potassium (K):** Involved in stomatal opening, enzyme activation, and water regulation. - **Calcium (Ca):** Essential for cell wall structure and signaling. - **Magnesium (Mg):** The central atom of the chlorophyll molecule, essential for light absorption.

Final Answer: Phosphorus

Answer: (B)

Answer Key

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