CUET UG Agriculture Sample Paper - 8

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 plant breeder is working with a crop where the distance between two linked genes A and B is 25 cM. If a dihybrid cross is performed between $AaBb$ and $aabb$, what is the expected percentage of recombinant progeny?

(A) 12.5%

(B) 25%

(C) 50%

(D) 75%

Q2. The process of synthesis of a polypeptide chain from an mRNA template, involving ribosomes and tRNA molecules, is technically known as:

(A) Transcription

(B) Replication

(C) Translation

(D) Transformation

Q3. In Plant Breeding, the 'Bulk Method' is most advantageous over the 'Pedigree Method' because it:

(A) Allows for early generation testing

(B) Maintains high records for every single plant

(C) Is highly effective for characters with low heritability

(D) Handles large populations with less labor and record-keeping

Q4. Which of the following is a fat-soluble vitamin synthesized in the presence of sunlight and essential for calcium absorption in livestock?

(A) Vitamin A

(B) Vitamin B12

(C) Vitamin C

(D) Vitamin D

Q5. The 'Unit' of the fungal body, consisting of a network of thread-like structures called hyphae, is known as:

(A) Spore

(B) Mycelium

(C) Rhizosphere

(D) Bacteriophage

Q6. Identify the weather element that is measured using a 'Stevenson Screen' to ensure protection from direct solar radiation:

(A) Wind Speed

(B) Rainfall

(C) Air Temperature

(D) Solar Intensity

Q7. Which Indian cattle breed is characterized by a massive hump, long pendulous ears, and is highly regarded for its heat tolerance and disease resistance in tropical climates?

(A) Holstein Friesian

(B) Sahiwal

(C) Gir

(D) Tharparkar

Q8. In poultry management, the 'Brooding' period typically refers to the first few weeks of a chick's life when they require:

(A) High fiber diet

(B) Artificial heat and protection

(C) Extensive grazing area

(D) Liquid nitrogen storage

Q9. The viral disease 'Ranikhet' (Newcastle Disease) in poultry primarily affects which of the following systems?

(A) Circulatory system

(B) Nervous and respiratory systems

(C) Skeletal system

(D) Reproductive system only

Q10. A 'Balanced Ration' for a dry cow should ideally contain a Crude Protein (CP) percentage of approximately:

(A) 5 – 7%

(B) 10 – 12%

(C) 18 – 22%

(D) 25 – 30%

Q11. Soil texture is a permanent property of the soil. Which of the following soil separates has a diameter range of 0.02 to 0.002 mm according to the ISSS system?

(A) Coarse Sand

(B) Fine Sand

(C) Silt

(D) Clay

Q12. The amount of water remaining in the soil after the excess gravitational water has drained away is called:

(A) Permanent Wilting Point

(B) Field Capacity

(C) Hygroscopic Coefficient

(D) Maximum Water Holding Capacity

Q13. Which of the following herbicides is most commonly used for the selective control of broad-leaved weeds in cereal crops like Wheat?

(A) Glyphosate

(B) Paraquat

(C) 2,4-D

(D) Atrazine

Q14. The 'System of Rice Intensification' (SRI) is a method of rice cultivation that emphasizes:

(A) Continuous flooding of the field

(B) High seed rate and close spacing

(C) Use of young seedlings and alternate wetting and drying

(D) Heavy application of synthetic nitrogen

Q15. In Horticulture, the 'Graft Union' is the point where which two parts are joined together?

(A) Two different roots

(B) Scion and Rootstock

(C) Two different fruits

(D) Pollen and Ovule

Q16. The term 'Somaclonal Variation' in plant tissue culture refers to the genetic variations that occur in:

(A) Plants produced through sexual hybridization

(B) Plants regenerated from in vitro cell cultures

(C) Wild relatives of cultivated crops

(D) Progeny of chemically induced mutants

Q17. In Microbiology, the conversion of Ammonia (NH_3) to Nitrite (NO_2^-) is primarily carried out by which group of specialized soil bacteria?

(A) Nitrobacter

(B) Rhizobium

(C) Nitrosomonas

(D) Azotobacter

Q18. According to the 'Lapse Rate' in Agrometeorology, for every 1000 meters increase in altitude in the troposphere, the temperature generally decreases by:

(A) 3.5°C

(B) 6.5°C

(C) 9.8°C

(D) 1.2°C

Q19. The 'Jersey' breed of cattle is highly valued in dairy farming primarily because it:

(A) Produces the highest volume of milk among all breeds

(B) Is a heavy draught breed used for plowing

(C) Has the highest fat content in its milk among dairy breeds

(D) Is resistant to Foot and Mouth Disease (FMD)

Q20. In Artificial Insemination (AI), the semen is typically stored in liquid nitrogen at a temperature of:

(A) $-79°C$

(B) $-196°C$

(C) $0°C$

(D) $-4°C$

Q21. The disease 'Coccidiosis' in poultry and livestock is caused by which type of pathogen?

(A) Virus

(B) Gram-positive Bacteria

(C) Protozoa

(D) Fungus

Q22. In the context of milk processing, the 'HTST' (High Temperature Short Time) pasteurization method requires heating milk to:

(A) $63°C$ for 30 minutes

(B) $72°C$ for 15 seconds

(C) $100°C$ for 1 minute

(D) $140°C$ for 2 seconds

Q23. Which soil structure is considered most ideal for crop production because it offers a balance of macro and micropores for air and water?

(A) Platy

(B) Prismatic

(C) Crumb or Granular

(D) Columnar

Q24. The primary nutrient deficiency that causes 'Interveinal Chlorosis' in older leaves of a plant is:

(A) Nitrogen

(B) Phosphorus

(C) Magnesium

(D) Zinc

Q25. Which irrigation method is most suitable for undulating (uneven) topography and sandy soils where water infiltration is high?

(A) Furrow Irrigation

(B) Check Basin Irrigation

(C) Sprinkler Irrigation

(D) Border Strip Irrigation

Q26. The 'Critical Period of Weed Competition' for most upland field crops generally occurs during:

(A) The first 1/3 of the crop's total duration

(B) The flowering stage only

(C) The last 15 days before harvest

(D) Throughout the entire lifecycle

Q27. 'Golden Rice' is a genetically modified crop engineered to biosynthesize which of the following nutrients?

(A) Iron

(B) Vitamin B12

(C) Beta-carotene (Pro-vitamin A)

(D) Essential Amino Acids

Q28. In Sugarcane cultivation, the process of 'Wrapping and Propping' is primarily done to:

(A) Increase the sugar content in the internodes

(B) Protect the crop from pests like Pyrilla

(C) Prevent lodging of the heavy canes

(D) Accelerate the ripening process

Q29. 'Precision Farming' relies heavily on which technology to apply inputs like fertilizers and water at the right place and time?

(A) CRISPR-Cas9

(B) Global Positioning System (GPS)

(C) Hydroponics

(D) Polyhouse technology

Q30. The 'Amrapali' variety of Mango is a hybrid between which two parent varieties?

(A) Neelum $\times$ Alphonso

(B) Dashehari $\times$ Neelum

(C) Ratna $\times$ Alphonso

(D) Neelum $\times$ Dashehari

Q31. In vegetable preservation, the main preservative used in the preparation of Tomato Ketchup is:

(A) Potassium Metabisulphite (KMS)

(B) Sodium Benzoate

(C) Citric Acid

(D) Acetic Acid only

Q32. The 'Air Layering' method of propagation is most commonly and successfully practiced in which fruit crop?

(A) Mango

(B) Guava

(C) Litchi

(D) Banana

Q33. If a farmer applies 100 kg of Urea to his field, how many kilograms of actual Nitrogen (N) is he providing to the soil?

(A) 100 kg

(B) 18 kg

(C) 46 kg

(D) 60 kg

(E) 46 kg

Q34. The hormonal disorder 'Milk Fever' in high-yielding dairy cows is caused by a sudden drop in the blood levels of:

(A) Glucose

(B) Calcium

(C) Magnesium

(D) Phosphorus

Q35. Which of the following is a 'C4' plant, known for its higher photosynthetic efficiency and water use efficiency under high temperatures?

(A) Rice

(B) Wheat

(C) Maize

(D) Potato

Q36. In Genetics, the term 'Aneuploidy' refers to a condition where:

(A) The entire set of chromosomes is doubled

(B) There is an addition or loss of one or a few chromosomes

(C) Only the sex chromosomes are affected

(D) Genes are transferred between non-homologous chromosomes

Q37. The 'Kjeldahl Method' is the standard laboratory procedure used to determine the content of which element in soil and plant samples?

(A) Phosphorus

(B) Potassium

(C) Nitrogen

(D) Organic Carbon

Q38. Which part of the plant is used as an 'Explant' in tissue culture to produce virus-free plants?

(A) Mature Leaf

(B) Anther

(C) Meristem (Apical or Axillary)

(D) Pollen grain

Q39. The 'White Revolution' in India, associated with milk production, was spear-headed by:

(A) M.S. Swaminathan

(B) Verghese Kurien

(C) Norman Borlaug

(D) B.P. Pal

Q40. The TSS (Total Soluble Solids) of a finished Jelly should be approximately:

(A) 45%

(B) 65%

(C) 75%

(D) 55%

Q41. The 'Mendelian Ratio' of 9 : 3 : 3 : 1 is expected in the F_2 generation of a dihybrid cross only when the two genes involved:

(A) Are located on the same chromosome very close to each other

(B) Show complete linkage

(C) Assort independently of each other

(D) Are influenced by the environment

Q42. Which of the following microbial processes in the soil involves the conversion of Nitrates (NO_3^-) back into atmospheric Nitrogen gas (N_2)?

(A) Nitrification

(B) Denitrification

(C) Ammonification

(D) Nitrogen Fixation

Q43. In Agrometeorology, the 'Albedo' of a surface refers to:

(A) The amount of heat absorbed by the soil

(B) The ratio of reflected solar radiation to incident solar radiation

(C) The total duration of bright sunshine in a day

(D) The moisture content of the atmosphere

Q44. The indigenous cattle breed 'Sahiwal' is primarily found in its purest form in which region of the Indian subcontinent?

(A) Kathiawar, Gujarat

(B) Montgomery, Pakistan

(C) Rohtak, Haryana

(D) Malwa, Madhya Pradesh

Q45. Which of the following poultry diseases is characterized by the swelling of the head, sulfur-colored droppings, and is caused by a protozoan parasite *Histomonas meleagridis*?

(A) Ranikhet

(B) Fowl Pox

(C) Blackhead (Histomoniasis)

(D) Coccidiosis

Q46. According to the concept of Soil pH, a soil with a pH value of 8.5 is classified as:

(A) Strongly Acidic

(B) Neutral

(C) Alkaline/Basic

(D) Highly Saline

Q47. The 'Drip Irrigation' system is also known as 'Trickle Irrigation'. What is the typical operating pressure of a standard drip system?

(A) 0.5 to 1.5 kg/cm^2

(B) 5.0 to 10.0 kg/cm^2

(C) 10 to 20 kg/cm^2

(D) 0.1 kg/cm^2

Q48. In organic farming, the 'Green Manuring' practice involves:

(A) Applying dried forest leaves to the field

(B) Growing and plowing under green leguminous crops in the same field

(C) Using chemical urea with green dye

(D) Applying compost made from kitchen waste

Q49. The process of 'Puddling' in Rice cultivation is primarily done to:

(A) Increase the soil temperature

(B) Reduce the infiltration rate of water

(C) Kill all the beneficial microbes in the soil

(D) Help in the drying of the field

Q50. The 'Pusa Nanha' is a famous variety of which fruit crop, known for being dioecious and suitable for high-density planting?

(A) Mango

(B) Citrus

(C) Papaya

(D) Guava

Detailed Solutions

Q1.

Solution

Concept:

Linkage refers to the tendency of genes located on the same chromosome to be inherited together. The distance between two genes is measured in centimorgans (cM), where 1 cM equals a 1% recombination frequency. In a test cross ($AaBb \times aabb$), the frequency of recombinant offspring directly corresponds to the map distance between the genes.

Solution:

1. The distance between genes A and B is given as 25 cM. 2. By definition, 1 cM = 1% recombination frequency. 3. Therefore, 25 cM corresponds to a 25% recombination frequency. 4. In the progeny of the cross $AaBb \times aabb$, the recombinants ($Aabb$ and $aaBb$) will constitute 25% of the total population. 5. The remaining 75% will be parental types ($AaBb$ and $aabb$).

Final Answer: The expected percentage of recombinant progeny is 25%.

Answer: (B)

Q2.

Solution

Concept:

The Central Dogma of molecular biology describes the flow of genetic information: DNA → RNA → Protein. This process involves two main stages: Transcription (DNA to RNA) and Translation (RNA to Protein).

Solution:

1. **Transcription** is the process where a DNA sequence is copied into a complementary mRNA strand. 2. **Translation** is the subsequent step where the genetic code carried by mRNA is "decoded" to produce a specific sequence of amino acids in a polypeptide chain. 3. This process occurs in the ribosomes and requires tRNA (transfer RNA) to bring the correct amino acids based on the mRNA codons. 4. **Replication** is the duplication of DNA, and **Transformation** is the genetic alteration of a cell resulting from the uptake of foreign DNA.

Final Answer: The process of polypeptide synthesis from mRNA is Translation.

Answer: (C)

Q3.

Solution

Concept:

The Bulk Method and Pedigree Method are two major breeding strategies for self-pollinated crops. The Bulk Method involves growing the segregating generations (F_2 to F_5) in large plots without individual plant selection until later generations, whereas the Pedigree Method involves strict selection and record-keeping from the F_2 generation onwards.

Solution:

1. In the **Pedigree Method**, every selected plant's ancestry is recorded, which is extremely labor-intensive and requires significant space. 2. The **Bulk Method** allows the breeder to handle very large populations because no individual plant selection or record-keeping is done in the early segregating generations. 3. This makes it more economical and efficient for managing large-scale breeding programs where natural selection can help eliminate less fit genotypes over time. 4. While the Pedigree Method is better for characters with high heritability, the Bulk Method's primary advantage is its simplicity and low labor requirement.

Final Answer: The Bulk Method handles large populations with less labor and record-keeping.

Answer: (D)

Q4.

Solution

Concept:

Vitamins are essential organic compounds required in small quantities for metabolic functions. They are categorized as water-soluble (B, C) or fat-soluble (A, D, E, K). Vitamin D plays a unique role in mineral metabolism.

Solution:

1. **Vitamin D** is known as the "sunshine vitamin" because animals can synthesize it in their skin when exposed to ultraviolet (UVB) radiation from sunlight. 2. Its primary function in livestock is to regulate the absorption of **Calcium and Phosphorus** from the intestinal tract. 3. Deficiency of Vitamin D leads to bone-related disorders such as rickets in young animals and osteomalacia in adults. 4. Vitamin A is for vision/immunity, Vitamin C is an antioxidant, and Vitamin B12 is for RBC formation.

Final Answer: Vitamin D is synthesized in sunlight and essential for calcium absorption.

Answer: (D)

Q5.

Solution

Concept:

Fungi are eukaryotic, multicellular (except yeast) organisms that grow as a mass of tubular filaments. Understanding their structural hierarchy is fundamental to microbiology and soil health studies.

Solution:

1. A single thread-like filament of a fungus is called a **hypha**. 2. A collective network or mass of these hyphae is referred to as the **mycelium**. 3. The mycelium constitutes the vegetative part of the fungus, responsible for nutrient absorption from the soil or organic matter. 4. **Spores** are reproductive units, and the **rhizosphere** is the soil region influenced by root secretions.

Final Answer: The network of thread-like hyphae is known as mycelium.

Answer: (B)

Q6.

Solution

Concept:

A Stevenson Screen is a standard meteorological shelter used to house sensitive weather instruments. Its primary purpose is to provide a standardized environment for measuring ambient air conditions by shielding instruments from direct heat radiation (from the sun and ground) while allowing air to circulate freely.

Solution:

1. The Stevenson Screen is painted white to reflect solar radiation and has louvered (slatted) sides to ensure adequate ventilation. 2. Inside the screen, instruments like the maximum-minimum thermometer, dry-bulb thermometer, and wet-bulb thermometer are kept. 3. If a thermometer were exposed to direct sunlight, it would measure the temperature of the thermometer material itself rather than the **Air Temperature**. 4. Other elements like Wind Speed are measured by Anemometers (outside), and Rainfall is measured by Rain Gauges (placed in open areas).

Final Answer: The weather element measured using a Stevenson Screen is Air Temperature.

Answer: (C)

Q7.

Solution

Concept:

Indian cattle breeds (*Bos indicus*) are known for their distinct physical characteristics, such as the hump and dewlap, which help in thermoregulation. Different breeds have specific phenotypic traits that distinguish them in terms of dairy or draught utility.

Solution:

1. The **Gir** breed, originating from the Gir forests of Gujarat, is world-renowned for its high milk yield and hardiness. 2. Its most striking physical features include a very prominent, bulging forehead (convex), long pendulous ears that resemble a folded leaf, and a massive hump. 3. While Sahiwal is also a top milcher, the Gir's specific ear and forehead structure are unique identifiers. Tharparkar is a dual-purpose breed known for its white/grey coat. 4. Holstein Friesian is an exotic breed (*Bos taurus*) and lacks the hump and long pendulous ears.

Final Answer: The breed described with a massive hump and long pendulous ears is Gir.

Answer: (C)

Q8.

Solution

Concept:

In poultry science, brooding is the period immediately following hatching when the chicks are unable to maintain their body temperature. Since they are not yet fully feathered, they depend on an external heat source for survival and growth.

Solution:

1. Newly hatched chicks have a poorly developed thermoregulatory system. In commercial poultry, this role is played by a "brooder." 2. The **Brooding** phase requires the provision of **artificial heat** (using electric bulbs or gas brooders) and protection from predators and cold drafts. 3. The temperature is usually kept at approximately 95°F (35°C) during the first week and reduced gradually as the chicks grow feathers. 4. Feeding a high fiber diet is avoided at this stage because their digestive systems are fragile; they require high-protein "chick starter" mash instead.

Final Answer: Brooding refers to the period where chicks require artificial heat and protection.

Answer: (B)

Q9.

Solution

Concept:

Ranikhet disease, also known as Newcastle Disease (ND), is a highly contagious and fatal viral disease of poultry caused by a paramyxovirus. It is one of the biggest threats to the poultry industry globally.

Solution:

1. The virus affects multiple organs, leading to a variety of clinical signs. 2. The primary symptoms involve the **Respiratory system**, such as gasping, coughing, and sneezing. 3. As the disease progresses, it attacks the **Nervous system**, leading to tremors, paralyzed wings or legs, and "torticollis" (twisting of the neck). 4. Because it severely impacts both breathing and neurological coordination, it causes high mortality rates. It does not primarily focus on the skeletal or circulatory systems alone.

Final Answer: Ranikhet disease primarily affects the nervous and respiratory systems.

Answer: (B)

Q10.

Solution

Concept:

A balanced ration is the amount of feed allowed to an animal during a 24-hour period which contains all the nutrients in such proportions and amounts that are required for the nourishment of the animal. For dry cows (cows not currently lactating), the nutritional requirement is lower than that of high-yielding lactating cows.

Solution:

1. A dry cow needs nutrients primarily for "maintenance" and the growth of the fetus if she is pregnant. 2. Crude Protein (CP) requirements for maintenance in cattle generally fall in the range of **10 – 12%**. 3. If the protein level is too low (e.g., 5 – 7%), it will not support body functions; if it is too high (e.g., above 18%), it is economically wasteful and can lead to metabolic stress for a non-lactating animal. 4. High-yielding milking cows usually require CP levels in the 16 – 18% range.

Final Answer: A dry cow's balanced ration should contain approximately 10 – 12% Crude Protein.

Answer: (B)

Q11.

Solution

Concept:

Soil texture refers to the relative proportion of various groups of individual soil particles (soil separates). The International Society of Soil Science (ISSS) provides a standard classification system based on the diameter of these particles to ensure uniformity in soil analysis.

Solution:

1. According to the ISSS classification, soil particles are divided into four main categories: - Coarse Sand: 2.0 to 0.2 mm - Fine Sand: 0.2 to 0.02 mm - **Silt**: 0.02 to 0.002 mm - Clay: Less than 0.002 mm 2. Silt particles feel smooth or floury when dry and slippery when wet, but they do not exhibit the high plasticity or stickiness found in clay. 3. Because the question specifies the range of 0.02 to 0.002 mm, it strictly identifies the Silt fraction.

Final Answer: The soil separate with a diameter of 0.02 to 0.002 mm is Silt.

Answer: (C)

Q12.

Solution

Concept:

Soil water potential and availability are defined by specific "constants" or "milestones" that describe how much water is held against the force of gravity or how much is available to plants.

Solution:

1. When a soil is saturated (all pores filled), water first drains out of the large macropores due to gravity. This is called gravitational water. 2. After approximately 24 to 48 hours of drainage, the rate of water movement downwards becomes very slow. The moisture content at this stage is called **Field Capacity**. 3. At Field Capacity, the soil moisture tension is usually around -0.1 to -0.33 bar. 4. This water is held in the capillary pores and is the upper limit of the "Available Water" range for plants. 5. Permanent Wilting Point is the lower limit where plants can no longer extract water, and Hygroscopic Coefficient refers to water held so tightly that it is only in the vapor phase.

Final Answer: The amount of water remaining after gravitational drainage is Field Capacity.

Answer: (B)

Q13.

Solution

Concept:

Herbicides are chemicals used to manipulate or interrupt weed growth. Selective herbicides kill certain targets while leaving the desired crop relatively unharmed, often through metabolic differences.

Solution:

1. **2,4-D** (2,4-Dichlorophenoxyacetic acid) is one of the oldest and most widely used systemic herbicides in the world. 2. It mimics the plant growth hormone auxin. Cereal crops (monocots) like Wheat can metabolize and detoxify 2,4-D rapidly, whereas broad-leaved weeds (dicots) cannot. 3. This leads to uncontrolled, distorted growth in broad-leaved weeds, eventually killing them without harming the Wheat crop. 4. Glyphosate and Paraquat are non-selective (they kill all green vegetation), and Atrazine is primarily used in Maize or Sugarcane.

Final Answer: 2,4-D is used for selective control of broad-leaved weeds in Wheat.

Answer: (C)

Q14.

Solution

Concept:

The System of Rice Intensification (SRI) is a climate-smart, agro-ecological 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 requires continuous flooding (submergence), SRI uses **Alternate Wetting and Drying (AWD)**. This keeps the soil moist but aerated, encouraging massive root growth. 2. SRI involves transplanting very **young seedlings** (usually 8 to 12 days old) with just two leaves, whereas traditional methods use 25 to 30 day old seedlings. 3. It also emphasizes wide spacing (single seedlings in a square pattern) to reduce competition and allow for easier mechanical weeding, which incorporates organic matter back into the soil. 4. This method reduces water requirements by up to 50% and seed requirements by 90%.

Final Answer: SRI emphasizes the use of young seedlings and alternate wetting and drying.

Answer: (C)

Q15.

Solution

Concept:

Grafting is an artificial vegetative propagation technique where tissues of plants are joined so as to continue their growth together. This is widely used in fruit trees to combine a strong root system with a high-yielding shoot system.

Solution:

1. The upper part of the graft is called the **Scion**. It is chosen for its superior fruit or flower qualities (the desired variety). 2. The lower part, which provides the root system, is called the **Rootstock** (or stock). It is chosen for its vigor, soil adaptation, or disease resistance. 3. The **Graft Union** is the physical site where the cambium layers of the Scion and Rootstock must make intimate contact to allow for the vascular tissues (xylem and phloem) to fuse and grow together. 4. Successful healing of the graft union ensures the flow of nutrients and water between the two different plant parts.

Final Answer: The Graft Union is the point where the Scion and Rootstock are joined.

Answer: (B)

Q16.

Solution

Concept:

Somaclonal variation describes the genetic diversity generated during the process of plant regeneration from tissue culture. Even though the goal of micropropagation is often to produce clones, the stress of the *in vitro* environment can lead to unexpected changes.

Solution:

1. Tissue culture involves taking an explant (a small piece of plant tissue) and growing it in a nutrient medium under sterile conditions. 2. During the callus phase (disorganized cell growth) or the regeneration phase, cells undergo rapid divisions. 3. Errors in DNA replication, chromosomal rearrangements, or epigenetic changes can occur during these stages. 4. Consequently, the **plants regenerated from these *in vitro* cultures** may exhibit different traits (phenotypic or genotypic) than the parent plant. 5. This is a significant concern for mass-multiplication but can be a useful tool for plant breeders looking for new sources of variation.

Final Answer: Somaclonal variation occurs in plants regenerated from *in vitro* cell cultures.

Answer: (B)

Q17.

Solution

Concept:

Nitrification is a two-step biological process in the nitrogen cycle where ammonia is oxidized into nitrites and then into nitrates. This process is essential for making nitrogen available to plants in the form of nitrate (NO_3^-).

Solution:

1. The first step of nitrification involves the oxidation of ammonia (NH_3 or NH_4^+) into nitrite (NO_2^-). 2. This specific chemical reaction is performed by chemoautotrophic bacteria, most notably **Nitrosomonas**. 3. In the second step, the nitrite (NO_2^-) is further oxidized into nitrate (NO_3^-) by another group of bacteria called **Nitrobacter**. 4. Rhizobium and Azotobacter are involved in nitrogen fixation (converting atmospheric N_2 to ammonia), not the nitrification process itself.

Final Answer: Nitrosomonas converts ammonia to nitrite.

Answer: (C)

Q18.

Solution

Concept:

The Environmental Lapse Rate (ELR) is the rate at which the atmospheric temperature decreases with an increase in altitude within the troposphere. This is a fundamental concept in agrometeorology for understanding microclimates in hilly regions.

Solution:

1. As we move away from the Earth's surface (which is heated by solar radiation), the air becomes less dense and the temperature drops. 2. The standard or average lapse rate is recorded as **6.5°C per kilometer** (or 1000 meters). 3. This can also be expressed as 0.65°C for every 100 meters. 4. Understanding this rate helps agriculturalists determine suitable crops for different elevations (e.g., temperate fruits like apples at high altitudes vs. tropical crops at sea level).

Final Answer: The temperature decreases by 6.5°C for every 1000 meters increase in altitude.

Answer: (B)

Q19.

Solution

Concept:

Different dairy breeds are specialized for different production goals. While some breeds are known for the volume of milk, others are prized for the chemical composition (quality) of the milk.

Solution:

1. The **Jersey** breed, originating from the Island of Jersey, is a small-sized dairy cow. 2. While it produces less total volume of milk compared to the Holstein Friesian, its milk is exceptionally rich in nutrients. 3. Specifically, Jersey milk has the **highest fat content** (typically $5.0 - 5.5\%$) and high Solids-Not-Fat (SNF) among the major dairy breeds. 4. This makes their milk ideal for the production of butter and cream. They are also known for their heat tolerance compared to other temperate breeds.

Final Answer: The Jersey breed is valued for having the highest fat content in its milk.

Answer: (C)

Q20.

Solution

Concept:

Cryopreservation is the process of cooling and storing cells or tissues at very low temperatures to maintain their viability over long periods. In livestock breeding, this is essential for storing superior germplasm (semen).

Solution:

1. To stop all biological activity and prevent the decay of sperm cells, extreme cold is required. 2. **Liquid Nitrogen** (LN_2) is the most common cryogen used for this purpose. 3. The boiling point of liquid nitrogen at atmospheric pressure is **-196°C** (or 77 Kelvin). 4. Storing semen straws in LN_2 tanks at this temperature allows them to remain viable for decades, facilitating the widespread use of Artificial Insemination.

Final Answer: Semen is stored in liquid nitrogen at -196°C.

Answer: (B)

Q21.

Solution

Concept:

Coccidiosis is a parasitic disease of the intestinal tract of animals caused by coccidian protozoa. The disease spreads from one animal to another by contact with infected feces or ingestion of infected tissue. It is one of the most economically significant diseases in poultry and young livestock.

Solution:

1. The causative agents of Coccidiosis are microscopic, single-celled parasites called **Protozoa**, specifically from the genus *Eimeria*. 2. These parasites multiply in the intestinal tract, causing tissue damage that results in the malabsorption of nutrients and blood loss. 3. Common symptoms in poultry include "bloody diarrhea," ruffled feathers, and high mortality if left untreated. 4. It is distinct from viral diseases (like Ranikhet) or bacterial diseases (like Salmonellosis) and requires specific anti-protozoal medications called "coccidiostats" for prevention and treatment.

Final Answer: Coccidiosis is caused by Protozoa.

Answer: (C)

Q22.

Solution

Concept:

Pasteurization is a heat-treatment process that destroys pathogenic microorganisms in milk without significantly affecting its nutritional value or flavor. There are various time-temperature combinations used in the dairy industry.

Solution:

1. The **HTST (High Temperature Short Time)** method is the most common continuous pasteurization system used today. 2. It requires heating the milk to exactly **72°C** (or 161°F) and holding it at that temperature for at least **15 seconds**. 3. This is more efficient than the LTLT (Low Temperature Long Time) method, which involves heating milk to 63°C for 30 minutes. 4. Ultra-High Temperature (UHT) treatment involves heating milk to 140°C for 2 seconds to create shelf-stable milk that does not require refrigeration.

Final Answer: HTST pasteurization requires 72°C for 15 seconds.

Answer: (B)

Q23.

Solution

Concept:

Soil structure refers to the arrangement of primary soil particles (sand, silt, clay) into secondary units called aggregates or peds. The arrangement of these peds determines the pore space available for air and water movement.

Solution:

1. **Crumb or Granular** structures consist of individual peds that are small, non-porous, and strongly held together. 2. These peds are roughly spherical and provide a high proportion of "macropores" between the crumbs for drainage and aeration, while "micropores" within the crumbs hold onto water. 3. This balance is **ideal for crop production** as it allows roots to penetrate easily and ensures that the soil does not become waterlogged or too dry quickly. 4. Platy structures (flat plates) or Columnar structures (vertical pillars) often restrict root growth and water infiltration.

Final Answer: Crumb or Granular structure is most ideal for crop production.

Answer: (C)

Q24.

Solution

Concept:

Plant nutrients are categorized into mobile and immobile nutrients. Mobile nutrients (like N, P, K, Mg) show deficiency symptoms first in older (lower) leaves because the plant moves these elements to the younger, growing parts.

Solution:

1. **Magnesium (Mg)** is a central component of the chlorophyll molecule. It is a highly mobile element within the plant. 2. When a deficiency occurs, the plant translocates Magnesium from the older leaves to the newer growth. 3. This results in **Interveinal Chlorosis** (yellowing between the green veins) specifically in the **older leaves**. 4. Nitrogen deficiency causes uniform yellowing (not interveinal) of older leaves, while Zinc deficiency causes interveinal chlorosis in younger leaves because Zinc is relatively immobile.

Final Answer: Magnesium deficiency causes interveinal chlorosis in older leaves.

Answer: (C)

Q25.

Solution

Concept:

The choice of irrigation method depends on factors such as soil type, topography, water availability, and crop type. Surface irrigation methods (like furrow or basin) are generally inefficient on uneven land.

Solution:

1. In **undulating topography**, leveling the land for surface irrigation is expensive and can remove fertile topsoil. 2. In **sandy soils**, water infiltrates very rapidly. If water is applied through furrows or basins, it will sink deep into the ground before reaching the end of the field, leading to high water loss. 3. **Sprinkler Irrigation** applies water in the form of spray/rain from above. Since it does not rely on the soil surface to transport water, it is perfect for uneven terrain. 4. Sprinklers also allow for controlled application rates, ensuring that water is not lost to deep percolation in sandy soils.

Final Answer: Sprinkler Irrigation is most suitable for undulating topography and sandy soils.

Answer: (C)

Q26.

Solution

Concept:

Weed management is most effective when targeted at the "Critical Period of Weed Competition" (CPWC). This is the specific window during the crop cycle when weed interference causes the maximum reduction in potential yield. If weeds are controlled during this period, the crop can usually tolerate later emerging weeds without significant loss.

Solution:

1. For most upland and seasonal field crops, the CPWC usually falls within the **first 1/3 of the crop's total duration**. 2. For a 120-day crop, this would be roughly the first 30 to 45 days after sowing. 3. During this early stage, crop seedlings are small and grow slowly, making them highly vulnerable to competition for light, water, and nutrients from faster-growing weeds. 4. If weeds are allowed to dominate during this period, the damage to crop yield is often irreversible, even if the field is cleaned later (e.g., at the flowering stage).

Final Answer: The critical period of weed competition is generally during the first 1/3 of the crop's duration.

Answer: (A)

Q27.

Solution

Concept:

Biofortification is the process of increasing the nutritional value of food crops through genetic engineering or selective breeding. Golden Rice is a famous example of a genetically modified (GM) crop designed to address "hidden hunger" or micronutrient deficiencies.

Solution:

1. Standard rice varieties do not contain Vitamin A in the edible part (the endosperm). 2. **Golden Rice** was engineered by inserting genes from maize and a soil bacterium (*Erwinia uredovora*) into the rice genome. 3. These genes complete the biochemical pathway that allows the rice grain to produce **Beta-carotene**, a precursor that the human body converts into **Vitamin A**. 4. The presence of beta-carotene gives the rice its distinctive golden-yellow color, hence the name.

Final Answer: Golden Rice is engineered to biosynthesize Beta-carotene (Pro-vitamin A).

Answer: (C)

Q28.

Solution

Concept:

Intercultural operations in tall-growing crops like Sugarcane are essential for maintaining crop health and structural integrity. As the cane grows tall and heavy, it becomes susceptible to environmental forces.

Solution:

1. **Wrapping** involves tying the leaves of the Sugarcane together, while **Propping** involves using bamboo sticks or tying adjacent rows of cane together for support. 2. These practices are collectively performed to **prevent lodging** (the falling over of the stalks). 3. Lodging is a major problem in Sugarcane because it leads to "bud sprouting," lower sugar recovery (sucrose inversion), and makes harvesting extremely difficult. 4. While earthing up also helps, wrapping and propping provide the final mechanical stability required for high-yielding, heavy canes.

Final Answer: Wrapping and Propping is primarily done to prevent lodging.

Answer: (C)

Q29.

Solution

Concept:

Precision Agriculture (or satellite farming) is a farming management concept based on observing, measuring, and responding to inter and intra-field variability in crops. It aims to optimize returns on inputs while preserving resources.

Solution:

1. To apply inputs precisely, the system must know the exact location within a field. 2. The **Global Positioning System (GPS)** provides the spatial coordinates (latitude and longitude) that allow automated machinery to apply fertilizers or water at variable rates based on digital maps. 3. Other technologies involved include Geographic Information Systems (GIS) and remote sensing, but GPS is the core technology that enables "site-specific" management. 4. CRISPR and Hydroponics are related to biotechnology and soilless culture, respectively, rather than the spatial precision of field management.

Final Answer: Precision Farming relies heavily on Global Positioning System (GPS) technology.

Answer: (B)

Q30.

Solution

Concept:

Mango breeding in India has produced several successful hybrids designed for specific traits like high yield, dwarfism (for high-density planting), and regular bearing (avoiding alternate bearing issues).

Solution:

1. **Amrapali** is a very popular dwarf hybrid developed by IARI (Pusa), New Delhi. 2. It is a cross between the varieties **Dashehari** (female parent) and **Neelum** (male parent). 3. The formula is often remembered as **D × N = A**. 4. Conversely, the hybrid 'Mallika' is produced from the same parents but in reverse order (**Neelum × Dashehari = Mallika**). 5. Amrapali is highly suitable for high-density orcharding because of its compact growth habit.

Final Answer: The Amrapali variety is a hybrid of Dashehari × Neelum.

Answer: (B)

Q31.

Solution

Concept:

Food preservation involves the use of chemical preservatives to inhibit the growth of microorganisms. Different preservatives are used based on the color and acidity of the product. Sodium benzoate is the most common preservative for colored fruit and vegetable products.

Solution:

1. **Sodium Benzoate** (C_6H_5COONa) is used primarily in colored products like Tomato Ketchup, Plum sherbet, and Jamun juice. 2. It is preferred for colored products because **Potassium Metabisulphite (KMS)** releases sulfur dioxide (SO_2), which has a bleaching effect and would destroy the attractive red color of the tomato. 3. Sodium benzoate works best in acidic conditions (low pH), which is naturally provided by the acetic acid (vinegar) and citric acid present in ketchup. 4. It acts by entering the microbial cells and disrupting their metabolic activity, specifically inhibiting the growth of yeasts and molds.

Final Answer: The main preservative used in Tomato Ketchup is Sodium Benzoate.

Answer: (B)

Q32.

Solution

Concept:

Layering is a method of vegetative propagation where roots are induced on a stem while it is still attached to the parent plant. Air layering (also known as Gootee or Marcottage) is a specialized form of layering used for plants with woody stems that cannot be easily bent to the ground.

Solution:

1. In **Litchi**, air layering is the commercial method of propagation because seeds are recalcitrant (lose viability quickly) and grafting is often difficult. 2. A ring of bark is removed from a healthy branch, and the area is covered with a rooting medium (like sphagnum moss) and wrapped in polythene. 3. Litchi responds very well to this method, producing a robust root system within a few months, after which the "layer" is detached and planted. 4. While Guava can also be air-layered, "Stooling" is more common commercially; for Mango, "Inarching" or "Veneer Grafting" is preferred.

Final Answer: Air layering is most commonly and successfully practiced in Litchi.

Answer: (C)

Q33.

Solution

Concept:

Fertilizer grade refers to the guaranteed minimum percentage of plant nutrients (N, P, and K) present in a fertilizer material. To calculate the amount of nutrient supplied, one must know the concentration of the element in the specific fertilizer.

Solution:

1. **Urea** $[CO(NH_2)_2]$ is the most widely used nitrogenous fertilizer in India. 2. The standard concentration of Nitrogen (N) in technical-grade Urea is **46%**. 3. This means that in every 100 kg of Urea, there is 46 kg of actual Nitrogen. 4. Calculation:

$$\text{Amount of } N = \frac{\text{Quantity of Urea} \times \text{Percentage Content}}{100}$$

$$\text{Amount of } N = \frac{100 \text{ kg} \times 46}{100} = 46 \text{ kg}$$

5. The remaining 54 kg consists of carbon, hydrogen, and oxygen which make up the amide structure of Urea.

Final Answer: 100 kg of Urea provides 46 kg of actual Nitrogen.

Answer: (C)

Q34.

Solution

Concept:

Milk Fever (Parturient Hypocalcemia) is a metabolic disease (not a fever) that typically occurs in high-producing dairy cows within 48 hours of calving. It is caused by the sudden heavy demand for minerals for the production of colostrum and milk.

Solution:

1. At the onset of lactation, the cow's body must suddenly transport large amounts of **Calcium** into the mammary glands. 2. If the cow's parathyroid gland cannot mobilize calcium from the bones fast enough to maintain normal levels in the blood, **Hypocalcemia** (low blood calcium) occurs. 3. Calcium is essential for nerve impulse transmission and muscle contraction. Without it, the cow becomes weak, unable to stand (downer cow), and may suffer from circulatory collapse. 4. The condition is treated by the intravenous administration of calcium gluconate.

Final Answer: Milk Fever is caused by a sudden drop in blood Calcium levels.

Answer: (B)

Q35.

Solution

Concept:

Plants are categorized based on their carbon fixation pathways during photosynthesis. C_4 plants have evolved a specialized leaf anatomy (Kranz anatomy) and a biochemical pathway that allows them to minimize photorespiration and perform efficiently in hot, bright environments.

Solution:

1. **Maize** (Corn), Sugarcane, and Sorghum are classic examples of **C_4 plants**. 2. In these plants, the first stable product of carbon fixation is a 4-carbon compound (Oxaloacetic acid), whereas in C_3 plants, it is a 3-carbon compound. 3. Rice, Wheat, and Potato are C_3 plants, which are less efficient at high temperatures because they lose energy through the process of photorespiration. 4. C_4 plants like Maize have a higher photosynthetic rate and use water more efficiently, making them better adapted to tropical and sub-tropical climates.

Final Answer: Maize is a C_4 plant.

Answer: (C)

Q36.

Solution

Concept:

Aneuploidy is a type of chromosomal aberration where the total number of chromosomes in a cell is not an exact multiple of the haploid set. This usually happens due to "non-disjunction" during meiosis, where homologous chromosomes or sister chromatids fail to separate properly.

Solution:

1. In a normal diploid organism ($2n$), the addition or loss of specific chromosomes results in **Aneuploidy**. 2. Common types include: - **Nullisomy ($2n-2$):** Loss of a homologous pair. - **Monosomy ($2n-1$):** Loss of a single chromosome. - **Trisomy ($2n+1$):** Addition of a single chromosome (e.g., Down Syndrome in humans). - **Tetrasomy ($2n+2$):** Addition of a homologous pair. 3. This is distinct from **Euploidy** (or Polyploidy), where the entire set of chromosomes is multiplied (e.g., $3n, 4n, 6n$). 4. Aneuploidy often leads to significant phenotypic changes or reduced fertility in plants.

Final Answer: Aneuploidy refers to the addition or loss of one or a few chromosomes.

Answer: (B)

Q37.

Solution

Concept:

The Kjeldahl method is a classical analytical chemistry technique developed by Johan Kjeldahl in 1883. It is the international standard for calculating the protein content in food and the total nitrogen content in soil and plant tissues.

Solution:

1. The process involves three main steps: **Digestion, Distillation, and Titration**. 2. During digestion, the sample is heated with concentrated sulfuric acid (H_2SO_4) in the presence of a catalyst to convert organic nitrogen into ammonium sulfate. 3. In distillation, the ammonium ions are converted to ammonia gas (NH_3) by adding sodium hydroxide and then captured in a receiving flask containing boric acid. 4. Finally, the ammonia is titrated against a standard acid. 5. This allows for the precise measurement of **Total Nitrogen**. Since most proteins contain approximately 16% nitrogen, this value is often multiplied by a factor (usually 6.25) to determine the crude protein content.

Final Answer: The Kjeldahl Method is used to determine the content of Nitrogen.

Answer: (C)

Q38.

Solution

Concept:

Virus-free plants are essential for maintaining the yield and quality of vegetatively propagated crops (like Potato, Sugarcane, and Citrus), which often accumulate viral loads over generations. Tissue culture provides a way to "clean" these plants.

Solution:

1. In an infected plant, the virus moves through the vascular system (phloem). 2. However, the **Meristem** (the actively dividing tip of the shoot or root) is usually free of viruses. 3. This is because: - There are no vascular connections (xylem/phloem) directly into the pro-meristem. - High metabolic activity and rapid cell division outpace the rate of viral replication. - High endogenous auxin levels may inhibit viral multiplication. 4. By using the **Shoot Apical Meristem** as an explant in tissue culture, breeders can regenerate an entire plant that is genetically identical to the parent but completely free of the virus.

Final Answer: The Meristem is used as an explant to produce virus-free plants.

Answer: (C)

Q39.

Solution

Concept:

The 'White Revolution' (Operation Flood) was the world's largest agricultural dairy development program, which transformed India from a milk-deficient nation into the world's largest milk producer.

Solution:

1. **Dr. Verghese Kurien**, known as the "Milkman of India," was the primary architect of the White Revolution. 2. He founded the National Dairy Development Board (NDDB) and spearheaded the "Amul" cooperative model in Anand, Gujarat. 3. His model focused on empowering small-scale farmers by linking them directly to consumers through cooperatives, eliminating middlemen. 4. M.S. Swaminathan is associated with the Green Revolution, Norman Borlaug is the father of the Global Green Revolution, and B.P. Pal was a famous wheat breeder and the first Director-General of ICAR.

Final Answer: The White Revolution was spearheaded by Verghese Kurien.

Answer: (B)

Q40.

Solution

Concept:

Jelly is a semi-solid product prepared by boiling clear fruit extract (pectin juice) with sugar and acid. The success of a jelly depends on the correct balance of pectin, sugar, and acid, and it is measured by its Total Soluble Solids (TSS).

Solution:

1. The TSS is measured using a refractometer in degrees Brix (°B). 2. For a finished **Jelly**, the standard TSS requirement is **65%** (65°B). 3. If the TSS is lower than 65%, the jelly will be too soft and won't set properly; if it is much higher, it may become tough or crystallize. 4. In comparison, Fruit Jams generally have a slightly higher TSS requirement (around 68%). 5. The final boiling point of the jelly is also an indicator, usually reaching 105°C (221°F) when the TSS hits the 65% mark.

Final Answer: The TSS of a finished Jelly should be approximately 65%.

Answer: (B)

Q41.

Solution

Concept:

Mendel's Law of Independent Assortment states that the alleles of two (or more) different genes get sorted into gametes independently of one another. In other words, the allele a gamete receives for one gene does not influence the allele received for another gene.

Solution:

1. A dihybrid cross involves two pairs of contrasting characters (e.g., Seed Shape and Seed Color). 2. The 9 : 3 : 3 : 1 ratio in the F_2 generation is the mathematical result of the independent segregation and random combination of these two pairs of alleles. 3. This ratio is only maintained if the genes are located on different chromosomes or are so far apart on the same chromosome that they undergo frequent crossing over. 4. If the genes are **linked** (located close together on the same chromosome), they will tend to stay together during gamete formation, which distorts the ratio, leading to more parental types and fewer recombinant types.

Final Answer: The 9 : 3 : 3 : 1 ratio occurs when genes assort independently.

Answer: (C)

Q42.

Solution

Concept:

The Nitrogen cycle includes several pathways that move nitrogen between the atmosphere, soil, and living organisms. While some processes "fix" nitrogen into the soil, others return it to the atmosphere to maintain equilibrium.

Solution:

1. **Denitrification** is a microbial process that reduces nitrates (NO_3^-) and nitrites (NO_2^-) to gaseous nitrogen compounds, primarily nitrous oxide (N_2O) and eventually molecular nitrogen (N_2). 2. This is performed by anaerobic bacteria (like *Pseudomonas* and *Bacillus denitrificans*) in oxygen-depleted environments, such as waterlogged soils. 3. It is essentially the opposite of nitrogen fixation. 4. Ammonification is the conversion of organic nitrogen to ammonia, and Nitrification is the conversion of ammonia to nitrate.

Final Answer: The conversion of nitrates back to nitrogen gas is Denitrification.

Answer: (B)

Q43.

Solution

Concept:

The energy balance of the Earth is significantly influenced by how much solar radiation is reflected back into space versus how much is absorbed. This reflectivity is quantified as 'Albedo'.

Solution:

1. **Albedo** is defined as the fraction of incident solar radiation that is reflected by a surface. 2. It is expressed as a decimal or a percentage (0 to 1 or 0% to 100%). 3. Surfaces like fresh snow have a very high albedo (reflecting most light), while dark soils or water bodies have a low albedo (absorbing most light). 4. In agriculture, understanding the albedo of different soil types and crop canopies helps in modeling the microclimate and the rate of evapotranspiration.

Final Answer: Albedo is the ratio of reflected solar radiation to incident solar radiation.

Answer: (B)

Q44.

Solution

Concept:

Sahiwal is one of the best dairy breeds of zebu cattle in India and Pakistan. It is known for its high milk production and tolerance to heat and ticks.

Solution:

1. The home tract or place of origin for the **Sahiwal** breed is the **Montgomery** district (now in Pakistan). 2. It is also found in bordering areas of India like Punjab and Rajasthan. 3. It is often called the "Lola" breed because of its loose skin. 4. While Gujarat is famous for the Gir breed and Haryana for the Hariana/Murrah breeds, the ancestral home of the Sahiwal is the dry regions of Montgomery.

Final Answer: Sahiwal is primarily from the Montgomery region.

Answer: (B)

Q45.

Solution

Concept:

Different poultry diseases present with distinct clinical signs that help in field diagnosis. Protozoan diseases, besides Coccidiosis, can also cause significant damage to the digestive and liver systems.

Solution:

1. **Blackhead disease** (Histomoniasis) is caused by the protozoan *Histomonas meleagridis*. 2. It is particularly devastating to turkeys but also affects chickens. 3. The "sulfur-colored droppings" are a classic diagnostic sign of this disease, resulting from liver damage. 4. The name "Blackhead" comes from the cyanosis (bluish/darkening) of the head that sometimes occurs in infected birds due to poor circulation and respiratory distress. 5. Fowl Pox causes scabby lesions, and Ranikhet causes respiratory/nervous distress.

Final Answer: The disease with sulfur-colored droppings is Blackhead.

Answer: (C)

Q46.

Solution

Concept:

Soil pH is a measure of the acidity or alkalinity of the soil solution. It is defined as the negative logarithm of the hydrogen ion concentration. The pH scale ranges from 0 to 14, with 7.0 being neutral. Understanding pH is vital because it determines nutrient availability and microbial activity.

Solution:

1. On the pH scale: - pH < 6.0: Acidic soil. - pH 6.6 to 7.3: Neutral soil. - pH > 7.5: **Alkaline (Basic) soil**. 2. A pH of **8.5** indicates a high concentration of hydroxyl ions (OH^-) relative to hydrogen ions (H^+). 3. Soils with pH 8.5 are often associated with "Sodic" or "Calcareous" conditions where calcium carbonate or exchangeable sodium is high. 4. At this pH level, certain micronutrients like Iron, Manganese, and Zinc become less available to plants, potentially causing deficiencies.

Final Answer: A soil with a pH of 8.5 is classified as Alkaline/Basic.

Answer: (C)

Q47.

Solution

Concept:

Drip irrigation is a pressurized irrigation system that delivers water slowly and precisely to the root zone of plants. To ensure the emitters (drippers) function correctly and provide a uniform flow, the system must maintain a specific range of operating pressure.

Solution:

1. Drip irrigation is a "low-pressure" system compared to sprinkler systems. 2. The standard operating pressure for most commercial drip systems is between **0.5 to 1.5 kg/cm^2** (approximately 7 to 21 PSI). 3. This pressure is sufficient to overcome the friction in the lateral pipes and push water through the narrow orifices of the emitters at a controlled rate (typically 1–8 liters per hour). 4. If the pressure is too high (above 2.0 kg/cm^2), it can cause the pipes to burst or emitters to pop out; if it is too low, the water will not reach the end of the lines.

Final Answer: The typical operating pressure of a drip system is 0.5 to 1.5 kg/cm^2.

Answer: (A)

Q48.

Solution

Concept:

Green manuring is a sustainable agricultural practice used to improve soil fertility and structure. It is a cornerstone of organic farming as it provides a natural source of nitrogen and organic matter without the use of synthetic chemicals.

Solution:

1. The practice involves growing specific crops, usually legumes like Sunnhemp (*Crotalaria juncea*) or Dhaincha (*Sesbania aculeata*). 2. These crops are grown until they reach the flowering stage, at which point they are **plowed back into the soil** while still green and succulent. 3. Because they are legumes, they have fixed atmospheric nitrogen in their root nodules. 4. As the green plants decompose, they release nitrogen and other nutrients into the soil for the subsequent main crop, while also significantly increasing the soil's organic carbon content.

Final Answer: Green manuring involves growing and plowing under green leguminous crops.

Answer: (B)

Q49.

Solution

Concept:

Puddling is the most important mechanical tillage operation in lowland rice cultivation. It involves churning the soil with water using a country plow, tractor-drawn cultivator, or a power tiller until the soil becomes a soft, muddy paste.

Solution:

1. The primary physical goal of puddling is to **reduce the infiltration and percolation rate of water**. 2. By churning the soil, the soil aggregates are broken down, and the clay particles settle into the soil pores, creating an impermeable layer (plow pan). 3. This helps to maintain "standing water" in the rice field, which is essential for aquatic rice growth and for suppressing weed germination. 4. Puddling also makes the soil soft, making it easier to transplant young rice seedlings by hand.

Final Answer: Puddling is done to reduce the infiltration rate of water.

Answer: (B)

Q50.

Solution

Concept:

Papaya (*Carica papaya*) breeding has led to the development of many specialized varieties. Papaya plants can be dioecious (separate male and female plants), gynodioecious (female and hermaphrodite), or hermaphrodite.

Solution:

1. **Pusa Nanha** is a world-famous ultra-dwarf variety developed at IARI, New Delhi. 2. It is a **dioecious** variety, meaning it produces separate male and female plants (usually planted in a 1:10 ratio in the field). 3. Because of its dwarf nature (fruiting starts at just 60–70 cm height), it is highly suitable for **high-density planting** (1.25×1.25 m spacing) and can even be grown in pots or kitchen gardens. 4. Other famous Pusa varieties like Pusa Majesty or Pusa Delicious are gynodioecious.

Final Answer: Pusa Nanha is a famous variety of Papaya.

Answer: (C)

Answer Key

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