CUET UG Agriculture Sample Paper - 10

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. According to the concept of 'Crossing Over', if two genes are located very close to each other on the same chromosome, they are said to be:

(A) Highly linked with low recombination frequency

(B) Independently assorting

(C) Showing high recombination frequency

(D) Located on different homologous chromosomes

Q2. The 'Double Helix' model of DNA, as proposed by Watson and Crick, is stabilized primarily by which type of chemical bonding between nitrogenous bases?

(A) Covalent bonds

(B) Ionic bonds

(C) Hydrogen bonds

(D) Phosphodiester bonds

Q3. In Plant Breeding, the process of 'Emasculation' is a critical step in hybridization. It refers to:

(A) Removal of the stigma before pollination

(B) Removal of anthers from a bisexual flower before they dehiscence

(C) Application of pollen to the receptive stigma

(D) Bagging the flower to prevent cross-pollination

Q4. The 'Synthetic Variety' in plant breeding is developed by crossing:

(A) Two specific inbred lines

(B) A number of inbred lines that combine well in all possible combinations

(C) A single plant with a mass of others

(D) Two genetically identical clones

Q5. Which of the following enzymes is responsible for the 'Fixation' of nitrogen in the soil by free-living bacteria like Azotobacter?

(A) Amylase

(B) Nitrogenase

(C) Cellulase

(D) Invertase

Q6. The 'Lock and Key' hypothesis, which explains the specificity of enzyme-substrate interaction, was proposed by:

(A) Louis Pasteur

(B) Emil Fischer

(C) Robert Koch

(D) Alexander Fleming

Q7. Microbial 'Soil Flora' that are capable of decomposing lignin and other complex organic matter are primarily:

(A) Algae

(B) Protozoa

(C) Fungi and Actinomycetes

(D) Virus

Q8. The instrument used for the continuous recording of atmospheric pressure over time is the:

(A) Barograph

(B) Hygrometer

(C) Pyranometer

(D) Anemometer

Q9. A 'Rain Shadow' area is typically found on:

(A) The windward side of a mountain range

(B) The leeward side of a mountain range

(C) The peak of the mountain

(D) Coastal regions only

Q10. Which of the following is an 'Exotic' breed of cattle known for its extremely high milk production and originating from the Netherlands?

(A) Jersey

(B) Holstein Friesian

(C) Sahiwal

(D) Red Sindhi

Q11. The 'Karan Swiss' is a cross-bred cattle developed at NDRI, Karnal, by crossing:

(A) Sahiwal $\times$ Brown Swiss

(B) Red Sindhi $\times$ Jersey

(C) Tharparkar $\times$ Holstein Friesian

(D) Gir × Brown Swiss

Q12. In livestock management, 'Culling' refers to:

(A) Feeding extra ration to pregnant animals

(B) Removal of unproductive or diseased animals from the herd

(C) Training the young calves for draft work

(D) Milking the animal twice a day

Q13. The 'Colostrum' is the first milk produced after calving and is essential for the newborn calf because it is rich in:

(A) Fat and Carbohydrates

(B) Antibodies (Immunoglobulins) and Vitamins

(C) Water and Minerals

(D) Lactose and Casein

Q14. 'Black Quarter' is a serious bacterial disease of cattle caused by:

(A) Bacillus anthracis

(B) Clostridium chauvoei

(C) Pasteurella multocida

(D) Brucella abortus

Q15. The 'Coccidiosis' disease in poultry is caused by a:

(A) Virus

(B) Bacterium

(C) Protozoan (Eimeria)

(D) Fungus

Q16. The process of 'In vitro' fertilization in livestock breeding is technically part of:

(A) Natural Mating

(B) Assisted Reproductive Technology (ART)

(C) Mass Selection

(D) Culling

Q17. The 'Gerber Method' is commercially used in dairy plants to determine the percentage of:

(A) Protein in milk

(B) Fat in milk

(C) Lactose in milk

(D) Water in milk

Q18. A soil with a 'Silty Clay' texture has a high proportion of:

(A) Sand and Silt

(B) Silt and Clay

(C) Sand and Gravel

(D) Organic matter only

Q19. Which of the following is a 'Complex Fertilizer' that provides both Nitrogen and Phosphorus to the crop?

(A) Urea

(B) Muriate of Potash (MOP)

(C) Diammonium Phosphate (DAP)

(D) Single Super Phosphate (SSP)

Q20. The 'Available Water' in the soil for plants is the water held between:

(A) Field Capacity and Permanent Wilting Point

(B) Saturation and Field Capacity

(C) Permanent Wilting Point and Hygroscopic Coefficient

(D) Saturation and Oven Dry weight

Q21. 'Drip Irrigation' is also known as:

(A) Overhead irrigation

(B) Trickle irrigation

(C) Sub-surface irrigation

(D) Flood irrigation

Q22. The 'Critical period of weed competition' in a crop usually falls during:

(A) The first one-third of its total duration

(B) The last month of growth

(C) The flowering stage only

(D) Throughout the crop life

Q23. Which of the following herbicides is a 'Non-selective' and 'Translocated' herbicide used for general weed clearance?

(A) 2,4-D

(B) Atrazine

(C) Glyphosate

(D) Butachlor

Q24. 'Gheru' or 'Rust' is a major fungal disease affecting which of the following field crops?

(A) Rice

(B) Wheat

(C) Sugarcane

(D) Cotton

Q25. The 'Parboiling' of rice is a hydrothermal treatment that helps in:

(A) Reducing the nutritional value

(B) Improving the milling quality and vitamin retention

(C) Increasing the breakage during milling

(D) Reducing the storage life

Q26. 'Precision Farming' relies heavily on which of the following spatial technologies?

(A) Traditional plow

(B) Global Positioning System (GPS)

(C) Animal power

(D) Hand weeding

Q27. 'Organic Farming' prohibits the use of:

(A) Vermicompost

(B) Synthetic pesticides and fertilizers

(C) Crop rotation

(D) Bio-fertilizers

Q28. The 'Amrapali' variety of Mango is a hybrid between:

(A) Neelum × Dashehari

(B) Dashehari × Neelum

(C) Ratna × Alphonso

(D) Alphonso × Neelum

Q29. 'Solanum tuberosum' is the botanical name of:

(A) Tomato
(B) Potato
(C) Brinjal
(D) Chilli

Q30. In Horticulture, 'Air Layering' is also commonly known as:

(A) Gootee
(B) Inarching
(C) Shield budding
(D) Tongue grafting

Q31. The 'Tongue Grafting' is a modification of:

(A) Budding
(B) Whip grafting
(C) Cleft grafting
(D) Bark grafting

Q32. 'Pectin' is the most important constituent required for the preparation of high-quality:

(A) Tomato Ketchup
(B) Fruit Jam
(C) Fruit Jelly
(D) Pickles

Q33. Which preservative is used in the preparation of colorless fruit juices and squashes?

(A) Sodium Benzoate

(B) Potassium Metabisulphite (KMS)

(C) Vinegar

(D) Citric Acid

Q34. The 'Central Dogma' of genetics involves the flow of information from:

(A) Protein → RNA → DNA

(B) DNA → RNA → Protein

(C) RNA → DNA → Protein

(D) DNA → Protein → RNA

Q35. A 'Mutation' that occurs in the germ cells (gametes) is:

(A) Not heritable

(B) Heritable to the next generation

(C) Always lethal

(D) Occurs only in somatic tissues

Q36. 'Heterosis' or Hybrid Vigor is defined as:

(A) Superiority of F1 over its parents

(B) Inferiority of F1 over its parents

(C) Equality of F1 to its parents

(D) Sudden change in genotype

Q37. Which of the following is a 'Water Soluble' vitamin?

(A) Vitamin A

(B) Vitamin D

(C) Vitamin C

(D) Vitamin K

Q38. The enzyme 'Pepsin' is primarily involved in the digestion of:

(A) Carbohydrates

(B) Fats

(C) Proteins

(D) Minerals

Q39. 'Nitrification' in soil is the biological process of converting:

(A) Nitrate to Nitrogen gas

(B) Ammonia to Nitrites and then to Nitrates

(C) Organic matter to Ammonia

(D) Nitrogen gas to Ammonia

Q40. The 'Relative Humidity' of the air is expressed in:

(A) Degrees Celsius

(B) Percentage (%)

(C) Millimeters

(D) Millibars

Q41. The 'Lapse Rate' in the atmosphere refers to the decrease in temperature with:

(A) Increase in longitude

(B) Increase in altitude

(C) Increase in latitude

(D) Decrease in altitude

Q42. 'Ranikhet' disease is the most common and devastating disease of:

(A) Cattle

(B) Sheep

(C) Poultry

(D) Goats

Q43. The 'Artificial Insemination' (AI) technique helps in:

(A) Spreading contagious diseases

(B) Using a superior sire for a large number of females

(C) Reducing the conception rate

(D) Increasing the cost of breeding

Q44. The 'Standardization' of milk involves adjusting the levels of:

(A) Water and Sugar

(B) Fat and Solids-not-fat (SNF)

(C) Vitamins and Minerals

(D) Bacteria and Enzymes

Q45. A 'Saline' soil is characterized by having:

(A) High pH and high sodium

(B) High soluble salts and pH less than 8.5

(C) Low soluble salts and high pH

(D) High organic matter and low salts

Q46. Which of the following is a 'Primary Nutrient' for plants?

(A) Calcium

(B) Magnesium

(C) Phosphorus

(D) Zinc

Q47. The 'Evapotranspiration' (ET) is the sum of:

(A) Rainfall and Runoff

(B) Evaporation from soil and Transpiration from plants

(C) Infiltration and Percolation

(D) Seepage and Leaching

Q48. In 'Integrated Pest Management' (IPM), the priority is given to:

(A) Chemical control only

(B) Biological and Cultural control methods

(C) Mechanical control only

(D) Eradication of all insects

(E) Total elimination of pests

Q49. The 'Noble Cane' refers to which species of Sugarcane?

(A) Saccharum spontaneum

(B) Saccharum barberi

(C) Saccharum officinarum

(D) Saccharum sinense

Q50. 'Zero Tillage' system is characterized by:

(A) Repeated plowing

(B) Sowing seeds directly into the primary tillage residue

(C) Burning the crop residues

(D) Flooding the field before sowing

Detailed Solutions

Q1.

Solution

Concept:

Linkage refers to the physical association of genes on a chromosome. According to Morgan's findings, the closer two genes are on a chromosome, the more likely they are to be inherited together as a unit. The recombination frequency is a measure of the distance between these genes.

Solution:

1. Genes located on the same chromosome are said to be 'linked'. 2. The strength of linkage is inversely proportional to the distance between the genes. 3. If the distance is very small, the chances of crossing over (recombination) between them during meiosis are significantly reduced. 4. Therefore, highly linked genes show a very low recombination frequency, often deviating from the 1:1:1:1 ratio expected in a test cross of a dihybrid.

Final Answer: Highly linked genes show low recombination frequency.

Answer: (A)

Q2.

Solution

Concept:

The DNA double helix consists of two polynucleotide chains where the backbone is made of sugar-phosphate groups and the bases project inward. The stability of this structure is maintained by specific base pairing through weak chemical attractions.

Solution:

1. Adenine (A) pairs with Thymine (T) via two hydrogen bonds. 2. Guanine (G) pairs with Cytosine (C) via three hydrogen bonds. 3. While phosphodiester bonds link the nucleotides within a single strand (the backbone), the two strands are held together by these hydrogen bonds between the complementary base pairs. 4. Hydrogen bonds are weak enough to allow the strands to separate during replication and transcription but strong enough in aggregate to maintain the double helix structure.

Final Answer: The strands are stabilized by hydrogen bonds.

Answer: (C)

Q3.

Solution

Concept:

Emasculation is a fundamental technique in plant breeding used to prevent self-pollination in bisexual (hermaphrodite) flowers when the breeder wants to perform a controlled cross-pollination.

Solution:

1. In hybridization, the goal is to cross two different parent plants. 2. If the female parent flower is bisexual, it contains both male (anthers) and female (stigma) organs. 3. To ensure that the flower is not pollinated by its own pollen, the anthers must be removed before they mature and release pollen. 4. This process of removing the male parts (anthers/stamens) without damaging the female part (pistil) is called emasculation.

Final Answer: Emasculation is the removal of anthers to prevent selfing.

Answer: (B)

Q4.

Solution

Concept:

A synthetic variety is a type of crop variety produced by crossing a specific set of inbred lines or clones that have been previously tested for their general combining ability (GCA).

Solution:

1. Unlike hybrids which involve only two (single cross) or four (double cross) parents, synthetic varieties involve several parents (usually 5 to 10). 2. The selected parents are those that show high general combining ability, meaning they produce superior offspring when crossed in various combinations. 3. These parents are allowed to intermate freely (open-pollinated) to produce the synthetic seed. 4. One advantage of synthetic varieties is that farmers can save the seeds for a few seasons, unlike F1 hybrids.

Final Answer: Synthetic varieties are developed from multiple well-combining inbred lines.

Answer: (B)

Q5.

Solution

Concept:

Biological Nitrogen Fixation (BNF) is the process where atmospheric nitrogen (N_2) is converted into ammonia (NH_3), which plants can then utilize. This process is catalyzed by a highly specific enzyme complex found in certain prokaryotes.

Solution:

1. Atmospheric nitrogen is very stable due to its triple bond. 2. The enzyme **Nitrogenase** is the only known biological catalyst capable of breaking this triple bond. 3. Free-living bacteria like *Azotobacter* and symbiotic bacteria like *Rhizobium* possess this enzyme. 4. The enzyme is highly sensitive to oxygen and typically functions under anaerobic or specialized micro-aerobic conditions within the microbial cell.

Final Answer: The enzyme nitrogenase is responsible for nitrogen fixation.

Answer: (B)

Q6.

Solution

Concept:

The 'Lock and Key' hypothesis is a classic model in biochemistry used to describe the high specificity of enzymes. It suggests that the enzyme (the lock) has a specifically shaped active site that only a particular substrate (the key) can fit into.

Solution:

1. Enzymes are biological catalysts that speed up chemical reactions. 2. The specificity of an enzyme depends on its three-dimensional molecular structure. 3. In 1894, the German chemist **Emil Fischer** proposed this hypothesis to explain how enzymes distinguish between different substrates. 4. Just as a specific key can only open a specific lock, only a substrate with a complementary shape can bind to the enzyme's active site to form an enzyme-substrate complex and eventually produce products.

Final Answer: The Lock and Key hypothesis was proposed by Emil Fischer.

Answer: (B)

Q7.

Solution

Concept:

Soil flora consists of various microorganisms that play vital roles in nutrient cycling and organic matter decomposition. Different groups of microbes specialize in breaking down different organic compounds based on their chemical complexity.

Solution:

1. Simple organic compounds like sugars are easily decomposed by many bacteria. 2. However, complex structural polymers like lignin, cellulose, and hemicellulose require specialized enzymatic toolkits. 3. **Fungi** and **Actinomycetes** (filamentous bacteria) are the primary decomposers of these tough materials. 4. They secrete extracellular enzymes that break down long-chain hydrocarbons and phenolic compounds found in woody plant tissues, turning them into humus.

Final Answer: Fungi and Actinomycetes are the primary decomposers of complex organic matter like lignin.

Answer: (C)

Q8.

Solution

Concept:

Agrometeorology involves the use of specialized instruments to monitor weather elements. Recording instruments (suffixed with '-graph') provide a continuous trace of the variable over a period of time, whereas measuring instruments (suffixed with '-meter') provide instantaneous readings.

Solution:

1. A barometer is used to measure atmospheric pressure at a given moment. 2. A **Barograph** is a barometer that records the barometric pressure over time on a rotating drum or digital log. 3. This is essential for observing pressure trends, such as a "falling barometer," which often indicates an approaching storm or low-pressure system. 4. For comparison: Anemometers measure wind speed, and Hygrometers measure humidity.

Final Answer: The instrument for continuous recording of atmospheric pressure is the Barograph.

Answer: (A)

Q9.

Solution

Concept:

A 'Rain Shadow' is a dry area on one side of a mountain or mountain range. This phenomenon is caused by the physical barrier that the mountains pose to moist air masses moving across the landscape.

Solution:

1. Moist air is forced to rise when it encounters a mountain range (orographic lifting). 2. As the air rises on the **windward side**, it cools and loses its moisture as rain or snow. 3. By the time the air crosses the peak and descends on the other side, it has lost most of its moisture and becomes warmer. 4. This dry side is called the **leeward side**, and the region of low precipitation created here is known as the rain shadow.

Final Answer: A rain shadow is found on the leeward side of a mountain range.

Answer: (B)

Q10.

Solution

Concept:

Cattle breeds are classified as Indigenous (Desi) or Exotic (Foreign). Exotic breeds are often introduced in cross-breeding programs in India to increase the milk yield of the local population.

Solution:

1. **Holstein Friesian (HF)** originated in the Netherlands (specifically the provinces of North Holland and Friesland). 2. It is globally recognized as the highest-producing dairy cattle breed. 3. It is physically distinguished by its large size and characteristic black-and-white (piebald) coat pattern. 4. While the Jersey breed is also exotic (UK), the HF is the one specifically known for having the highest volume of milk production per lactation.

Final Answer: Holstein Friesian is the exotic breed originating from the Netherlands.

Answer: (B)

Q11.

Solution

Concept:

Cross-breeding in cattle is the mating of animals of different breeds. The objective is to combine the desirable characters of two or more breeds into a single individual, often resulting in 'Hybrid Vigor' or heterosis.

Solution:

1. The **Karan Swiss** is a prestigious cross-bred dairy cattle developed at the National Dairy Research Institute (NDRI) in India. 2. It was developed by crossing the indigenous **Sahiwal** cows (known for heat tolerance and disease resistance) with the exotic **Brown Swiss** bulls (known for high milk yield and sturdy build). 3. This specific cross was designed to produce an animal that could yield high quantities of milk while surviving the tropical climate of India. 4. The resulting breed shows significantly higher milk production compared to the pure Sahiwal parent.

Final Answer: Karan Swiss is a cross of Sahiwal and Brown Swiss.

Answer: (A)

Q12.

Solution

Concept:

Effective herd management requires maintaining only those animals that contribute to the productivity or genetic improvement of the farm. Keeping unproductive animals increases the cost of production without providing returns.

Solution:

1. **Culling** is the process of identifying and removing animals from a herd that do not meet the farm's standards. 2. Reasons for culling include low milk production, chronic illness, physical deformities, reproductive failures (sterility), or old age. 3. By removing these "uneconomic" animals, the farmer can focus resources (feed, space, and labor) on the healthy and high-yielding members of the herd. 4. It is a continuous process essential for maintaining the overall health and profitability of a livestock enterprise.

Final Answer: Culling is the removal of unproductive or diseased animals.

Answer: (B)

Q13.

Solution

Concept:

The first few days of milk production after a cow gives birth are unique in composition compared to regular milk. This secretion is known as colostrum and is vital for the survival of the neonate.

Solution:

1. Newborn calves are born with very little natural immunity against environmental pathogens. 2. **Colostrum** contains a very high concentration of **Immunoglobulins (Antibodies)**, which provide passive immunity to the calf until its own immune system becomes functional. 3. It is also much richer in proteins, minerals, and fat-soluble vitamins (especially Vitamin A) than normal milk. 4. Additionally, it acts as a mild laxative to help the calf pass its first stool (meconium).

Final Answer: Colostrum is rich in Antibodies and Vitamins.

Answer: (B)

Q14.

Solution

Concept:

Black Quarter (also known as Blackleg) is an acute, infectious, and highly fatal disease of cattle and sheep. It typically affects young, healthy animals between 6 months to 2 years of age.

Solution:

1. The disease is caused by the bacterium **Clostridium chauvoei**, which is a soil-borne, spore-forming anaerobe. 2. The spores can survive in the soil for many years and enter the animal's body through ingestion or contaminated wounds. 3. Symptoms include high fever and characteristic "crepitating" (crackling) swellings under the skin, usually in the heavy muscles of the hindquarters or shoulders. 4. Upon pressing these swellings, a crackling sound is heard due to the presence of gas produced by the bacteria.

Final Answer: Black Quarter is caused by Clostridium chauvoei.

Answer: (B)

Q15.

Solution

Concept:

Coccidiosis is one of the most economically significant diseases in the poultry industry worldwide. It affects the intestinal tract of birds, leading to decreased growth rates and high mortality.

Solution:

1. Unlike Ranikhet (viral) or Fowl Cholera (bacterial), Coccidiosis is caused by a **Protozoan** parasite belonging to the genus **Eimeria**. 2. The parasite multiplies in the intestinal lining, causing tissue damage and hemorrhaging. 3. Common symptoms include drooping wings, ruffled feathers, and bloody diarrhea. 4. It spreads through the ingestion of sporulated oocysts present in contaminated litter, feed, or water.

Final Answer: Coccidiosis is caused by a Protozoan.

Answer: (C)

Q16.

Solution

Concept:

Modern livestock breeding involves advanced biotechnological interventions to improve genetic gain and reproductive efficiency. These are broadly categorized under Assisted Reproductive Technologies (ART).

Solution:

1. 'In vitro' fertilization (IVF) refers to the process where the fertilization of an egg by a sperm occurs outside the animal's body, typically in a laboratory environment (in a glass dish or test tube). 2. The process involves the collection of oocytes (eggs) from a donor female, followed by fertilization with high-quality semen. 3. Once the embryos develop to a specific stage, they are transferred to the uterus of a surrogate or recipient mother. 4. Because these techniques involve laboratory manipulation to assist the natural reproductive process, they are classified under **Assisted Reproductive Technology (ART)**.

Final Answer: IVF is a part of Assisted Reproductive Technology (ART).

Answer: (B)

Q17.

Solution

Concept:

Milk is composed of water, fats, proteins, lactose, and minerals. Measuring the fat content is crucial because the commercial value of milk is often determined based on its fat percentage.

Solution:

1. The **Gerber Method** is a rapid and standard chemical test used in the dairy industry to determine the fat content in milk and milk products. 2. It involves adding measured amounts of milk, sulfuric acid, and amyl alcohol into a specialized glass container called a butyrometer. 3. The sulfuric acid dissolves the proteins (casein) and generates heat, which helps in the separation of fat. 4. After centrifuging the mixture, the fat separates into a clear layer at the top, and the percentage can be read directly from the graduated scale on the butyrometer.

Final Answer: The Gerber Method is used to determine the fat percentage in milk.

Answer: (B)

Q18.

Solution

Concept:

Soil texture refers to the relative proportion of sand, silt, and clay particles in a soil mass. These proportions determine the physical properties of the soil, such as aeration and water-holding capacity.

Solution:

1. According to the USDA soil textural triangle, a soil is named based on the dominant size fractions present. 2. A 'Silty Clay' soil is a heavy-textured soil that contains a high percentage of both **Silt** (particles between 0.002 to 0.05 mm) and **Clay** (particles smaller than 0.002 mm). 3. Such soils generally have high water retention capacity but poor drainage and aeration compared to sandy soils. 4. The term 'Silty' indicates a significant silt fraction, and 'Clay' indicates a significant clay fraction, while sand content is minimal.

Final Answer: Silty Clay texture has a high proportion of Silt and Clay.

Answer: (B)

Q19.

Solution

Concept:

Fertilizers are classified based on the number of primary nutrients they provide. Straight fertilizers provide only one nutrient, while complex (or compound) fertilizers provide two or more primary nutrients in chemical combination.

Solution:

1. Urea provides only Nitrogen (46% N). 2. Muriate of Potash provides only Potassium (60% K_2O). 3. Single Super Phosphate provides primarily Phosphorus (16% P_2O_5) and some Sulfur/Calcium. 4. **Diammonium Phosphate (DAP)** is a complex fertilizer that chemically contains both **Nitrogen (18% N)** and **Phosphorus (46% P_2O_5)**. 5. It is one of the most widely used fertilizers for providing an initial boost of N and P to crops during sowing.

Final Answer: DAP is a complex fertilizer providing Nitrogen and Phosphorus.

Answer: (C)

Q20.

Solution

Concept:

Soil water is categorized based on how tightly it is held by soil particles and whether it can be utilized by plants. Not all water present in the soil is accessible to the roots.

Solution:

1. **Field Capacity (FC):** This is the amount of water remaining in the soil after excess gravitational water has drained away (usually 2-3 days after rain or irrigation). 2. **Permanent Wilting Point (PWP):** This is the soil moisture level at which plants can no longer extract water and will wilt permanently if more water is not added. 3. The water held between these two points (FC and PWP) is known as **Available Water**. 4. Water held tighter than the PWP (hygroscopic water) is unavailable, and water held above FC (gravitational water) drains away too quickly for effective use.

Final Answer: Available water is held between Field Capacity and Permanent Wilting Point.

Answer: (A)

Q21.

Solution

Concept:

Irrigation methods are classified based on how water is applied to the soil and delivered to the plant. Drip irrigation is the most efficient modern method, delivering water directly to the root zone.

Solution:

1. In Drip Irrigation, water is delivered through a network of valves, pipes, tubing, and emitters. 2. Because the water is applied drop-by-drop or in a very slow stream (trickling) at the base of each plant, it is widely referred to as **Trickle Irrigation**. 3. This method minimizes evaporation and runoff, making it ideal for water-scarce regions and high-value row crops like fruits and vegetables. 4. It allows for precise control over the amount of water and nutrients (fertigation) provided to the crop.

Final Answer: Drip irrigation is also known as Trickle irrigation.

Answer: (B)

Q22.

Solution

Concept:

The 'Critical Period of Weed Competition' is the specific interval in the life cycle of a crop during which weeds cause the maximum reduction in yield. If the crop is kept weed-free during this window, the yield loss is minimized.

Solution:

1. In most field crops, the early growth stages are the most vulnerable because the young crop plants are small and have not yet established a canopy to shade out weeds. 2. Research indicates that this critical period usually occurs during the **first one-third of the crop's total duration**. 3. For example, in a 120-day crop, the first 30 to 40 days after sowing are crucial. 4. Weeds emerging after this period are typically suppressed by the established crop canopy and do not significantly impact the final harvest.

Final Answer: The critical period falls during the first one-third of the crop duration.

Answer: (A)

Q23.

Solution

Concept:

Herbicides are chemicals used to control unwanted plants. They are classified by their "selectivity" (whether they kill all plants or only specific types) and "activity" (whether they kill only on contact or move through the plant).

Solution:

1. **Glyphosate** is a prime example of a **non-selective** herbicide, meaning it will kill or damage almost any green plant it touches. 2. It is also **translocated** (systemic), meaning it is absorbed by the foliage and travels through the vascular system (phloem) to the roots and storage organs. 3. This makes it highly effective for killing perennial weeds with deep root systems. 4. In contrast, herbicides like 2,4-D are selective (killing only broadleaf plants) and are used within standing cereal crops.

Final Answer: Glyphosate is a non-selective and translocated herbicide.

Answer: (C)

Q24.

Solution

Concept:

Rust diseases are among the most destructive fungal infections in agriculture, caused by obligate parasites belonging to the order Pucciniales. They are commonly known by local names like 'Gheru' in parts of India.

Solution:

1. **Wheat Rust** (caused by *Puccinia* species) is a major constraint to wheat production globally. 2. There are three main types: Stem rust (Black rust), Leaf rust (Brown rust), and Stripe rust (Yellow rust). 3. The disease is characterized by the appearance of pustules containing orange, brown, or black spores on the leaves and stems, which resemble the rusting of iron. 4. While other crops have specific fungal issues (like Blast in rice or Red Rot in sugarcane), the term 'Rust' or 'Gheru' is most synonymous with Wheat in the Indian agricultural context.

Final Answer: Rust is a major fungal disease of Wheat.

Answer: (B)

Q25.

Solution

Concept:

Parboiling is a specialized post-harvest process applied to paddy (unmilled rice) to improve its nutritional, physical, and milling properties.

Solution:

1. The process involves three steps: soaking the paddy in water, steaming it, and then drying it. 2. During steaming, water-soluble vitamins (especially **B-vitamins like Thiamine**) and minerals migrate from the outer bran layer into the starchy endosperm. 3. This process also gelatinizes the starch, making the grain harder. This hardness leads to **reduced breakage** during the subsequent milling process, resulting in a higher "Head Rice Yield." 4. Parboiled rice is therefore more nutritious and stays firmer after cooking compared to raw white rice.

Final Answer: Parboiling improves milling quality and vitamin retention.

Answer: (B)

Q26.

Solution

Concept:

Precision Farming (or Satellite Farming) is a modern 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. Traditional farming treats an entire field as a single unit, applying uniform amounts of water and fertilizer. 2. Precision farming recognizes that different parts of a field have different needs (soil fertility, moisture, pest pressure). 3. To manage this variability, farmers use the **Global Positioning System (GPS)** to precisely map their location in the field. 4. Combined with Geographic Information Systems (GIS) and remote sensing, GPS allows for 'Variable Rate Technology' (VRT), where automated machinery applies inputs only where and when they are needed.

Final Answer: Precision farming relies on Global Positioning System (GPS).

Answer: (B)

Q27.

Solution

Concept:

Organic farming is a production system that sustains the health of soils, ecosystems, and people. It relies on ecological processes, biodiversity, and cycles adapted to local conditions, rather than the use of inputs with adverse effects.

Solution:

1. The primary principle of organic farming is the avoidance of synthetic (man-made) chemicals. 2. It strictly **prohibits the use of synthetic pesticides and chemical fertilizers**, which can leave harmful residues in food and the environment. 3. Instead, it promotes the use of organic manures (vermicompost, FYM), bio-fertilizers, and natural pest control methods like neem oil or pheromone traps. 4. It also emphasizes practices like crop rotation and green manuring to maintain soil health naturally.

Final Answer: Organic farming prohibits synthetic pesticides and fertilizers.

Answer: (B)

Q28.

Solution

Concept:

Hybridization in mango is used to combine the best traits of different varieties. 'Amrapali' is one of the most famous mango hybrids developed at the Indian Agricultural Research Institute (IARI).

Solution:

1. **Amrapali** was developed in 1971 and is known for its dwarf stature, making it suitable for high-density planting. 2. It is a cross between the variety **Dashehari** (the female parent) and **Neelum** (the male parent). 3. It inherited the excellent fruit quality and sweetness of Dashehari and the regular bearing habit of Neelum. 4. Note: The reverse cross (Neelum $\times$ Dashehari) resulted in the hybrid variety known as 'Mallika'.

Final Answer: Amrapali is a hybrid of Dashehari and Neelum.

Answer: (B)

Q29.

Solution

Concept:

Binomial nomenclature is the formal system of naming species of living things by giving each a name composed of two parts, both of which use Latin grammatical forms.

Solution:

1. The plant family Solanaceae contains several important food crops. 2. **Solanum tuberosum** is the scientific name for the **Potato**. 3. For comparison: - *Solanum lycopersicum* is the Tomato. - *Solanum melongena* is the Brinjal. - *Capsicum annuum* is the Chilli. 4. The potato is a modified underground stem known as a tuber, hence the species name "tuberosum".

Final Answer: Solanum tuberosum is the botanical name of Potato.

Answer: (B)

Q30.

Solution

Concept:

Layering is a method of vegetative propagation where a stem is induced to produce roots while still attached to the parent plant.

Solution:

1. **Air Layering** is a specific technique used for plants that have stiff branches that cannot be easily bent to the ground for simple layering. 2. It is very common in fruit crops like Litchi, Pomegranate, and Citrus. 3. In this method, a ring of bark is removed from a healthy branch, and the area is covered with a moist rooting medium (like sphagnum moss) and wrapped in plastic. 4. In India, this method is traditionally and widely known as **Gootee**.

Final Answer: Air layering is commonly known as Gootee.

Answer: (A)

Q31.

Solution

Concept:

Grafting is a horticultural technique whereby tissues of plants are joined so as to continue their growth together. The upper part of the combined plant is called the scion while the lower part is called the rootstock.

Solution:

1. **Whip Grafting** (also known as Splice Grafting) is a simple method where a diagonal cut is made in both the scion and the rootstock. 2. **Tongue Grafting** is an advanced modification of the whip graft. 3. In this method, a reverse "tongue" or slit is cut into both the diagonal faces of the scion and the stock. 4. When joined, these tongues interlock, providing a much larger area of cambium contact and greater mechanical strength to the joint. 5. This ensures the graft does not slip or move before the union is fully healed.

Final Answer: Tongue grafting is a modification of Whip grafting.

Answer: (B)

Q32.

Solution

Concept:

Jelly making is a method of fruit preservation that relies on the interaction between sugar, acid, and a specific structural heteropolysaccharide found in the cell walls of terrestrial plants.

Solution:

1. **Pectin** is the key substance responsible for the "setting" or gelation of fruit jelly. 2. When fruit is boiled with water, pectin is extracted. When the correct concentration of sugar and acid is added to this extract and boiled to the right temperature, a three-dimensional network (gel) is formed. 3. Fruits like Guava, Apple, and Wood Apple are naturally rich in pectin and are therefore ideal for jelly making. 4. If the fruit is low in pectin, commercial pectin must be added to achieve a firm set.

Final Answer: Pectin is the most important constituent for Fruit Jelly.

Answer: (C)

Q33.

Solution

Concept:

Food preservatives are substances added to food to prevent spoilage by microorganisms or unwanted chemical changes. The choice of preservative often depends on the color and type of the product.

Solution:

1. **Potassium Metabisulphite (KMS)** is a common preservative used in the fruit industry. 2. When added to juice, it releases Sulfur Dioxide (SO_2), which acts as an antioxidant and antimicrobial agent. 3. However, SO_2 has a bleaching effect on plant pigments (anthocyanins). 4. Therefore, KMS is strictly used for **colorless or light-colored** juices (like Lime, Lemon, or Litchi) where bleaching is not an issue. 5. For colored juices (like Jamun, Grape, or Pomegranate), Sodium Benzoate is preferred as it does not bleach the color.

Final Answer: Potassium Metabisulphite (KMS) is used for colorless juices.

Answer: (B)

Q34.

Solution

Concept:

The 'Central Dogma' of molecular biology, first proposed by Francis Crick in 1958, describes the two-step process, transcription and translation, by which the information in genes flows into proteins.

Solution:

1. Genetic information is stored in the **DNA** (the master blueprint). 2. Through the process of **Transcription**, this information is copied into a messenger molecule called **RNA** (mRNA). 3. The mRNA then travels to the ribosome, where, through the process of **Translation**, the sequence of nucleotides is converted into a sequence of amino acids to form a **Protein**. 4. Thus, the flow is: DNA $\rightarrow$ RNA $\rightarrow$ Protein.

Final Answer: Information flows from DNA $\rightarrow$ RNA $\rightarrow$ Protein.

Answer: (B)

Q35.

Solution

Concept:

A mutation is a sudden, heritable change in the DNA sequence of an organism. Mutations are classified based on the type of cells in which they occur.

Solution:

1. Somatic mutations occur in non-reproductive cells (like skin or leaf cells) and are only passed to daughter cells within that individual; they are not passed to offspring. 2. **Germ-line mutations** occur in the germ cells (cells that produce eggs and sperm). 3. Because these mutations are present in the gametes, they are **heritable** and can be passed on to the next generation. 4. These are the mutations that provide the raw material for evolution and are utilized in mutation breeding in agriculture.

Final Answer: Mutations in germ cells are heritable to the next generation.

Answer: (B)

Q36.

Solution

Concept:

Heterosis, also known as hybrid vigor, is the phenomenon where the progeny (F1) of a cross between two genetically diverse parents shows superior performance in terms of yield, growth rate, or resistance compared to the average of its parents.

Solution:

1. Heterosis is the genetic result of crossing two inbred lines or varieties that are genetically distinct. 2. The term 'superiority' can be measured against the mean of the two parents (mid-parent heterosis) or against the better parent (better-parent heterosis). 3. This superiority is often attributed to 'Dominance' (masking of deleterious recessive alleles) or 'Overdominance' (the heterozygote being superior to both homozygotes). 4. In agriculture, exploitation of heterosis through the development of F1 hybrids has been the primary driver for massive increases in the yield of crops like Maize, Bajra, and Sorghum.

Final Answer: Heterosis is the superiority of F1 over its parents.

Answer: (A)

Q37.

Solution

Concept:

Vitamins are organic compounds required in small quantities for normal metabolic functions. They are classified into two groups based on their solubility: Fat-soluble (A, D, E, and K) and Water-soluble (B-complex and C).

Solution:

1. Vitamins A, D, E, and K are fat-soluble, meaning they are stored in the body's fatty tissues and the liver. 2. **Vitamin C** (Ascorbic Acid) and the B-complex vitamins are **water-soluble**. 3. Because they dissolve in water, they are not stored in the body to a significant extent and excess amounts are excreted through urine. 4. Vitamin C is essential for collagen synthesis, wound healing, and maintaining a strong immune system in both humans and livestock.

Final Answer: Vitamin C is a water-soluble vitamin.

Answer: (C)

Q38.

Solution

Concept:

Digestion is the mechanical and chemical breakdown of food into smaller components that can be absorbed into the bloodstream. Enzymes are the biological catalysts that drive these chemical reactions.

Solution:

1. **Pepsin** is an endopeptidase enzyme secreted by the gastric glands in the stomach. 2. It is secreted in an inactive form called pepsinogen, which is activated by the hydrochloric acid (HCl) present in the stomach. 3. Its primary function is the digestion of **Proteins**. 4. It breaks down long protein chains (polypeptides) into smaller fragments called peptides, which are further digested in the small intestine by other enzymes like trypsin.

Final Answer: Pepsin is primarily involved in the digestion of Proteins.

Answer: (C)

Q39.

Solution

Concept:

Nitrification is a key step in the Nitrogen Cycle within the soil. It is a two-step aerobic process carried out by specialized autotrophic bacteria.

Solution:

1. The first step involves the oxidation of **Ammonia** (NH_3) or Ammonium (NH_4^+) into **Nitrites** (NO_2^-). This is primarily performed by bacteria like *Nitrosomonas*. 2. The second step involves the oxidation of Nitrites into **Nitrates** (NO_3^-), carried out by bacteria like *Nitrobacter*. 3. Nitrates are the primary form in which most plants absorb nitrogen from the soil. 4. Because this process requires oxygen, it occurs most efficiently in well-aerated, moist soils with a neutral pH.

Final Answer: Nitrification is the conversion of Ammonia to Nitrites and then to Nitrates.

Answer: (B)

Q40.

Solution

Concept:

Humidity is the amount of water vapor present in the air. Relative Humidity (RH) is a measure of how "saturated" the air is with moisture at a specific temperature.

Solution:

1. Relative Humidity is defined as the ratio of the actual amount of water vapor present in the air to the maximum amount the air could hold at that same temperature. 2. Because it is a ratio of two similar quantities, it is expressed as a **Percentage (%)**. 3. An RH of 100% indicates that the air is completely saturated (leading to dew or fog), while low RH indicates dry air. 4. RH is a critical factor in agriculture as it influences the rate of transpiration in plants and the incidence of fungal diseases.

Final Answer: Relative Humidity is expressed in Percentage (%).

Answer: (B)

Q41.

Solution

Concept:

The atmosphere is divided into several layers based on temperature gradients. In the lowermost layer, the troposphere, temperature generally decreases as one moves further away from the Earth's surface (the primary heat source). This rate of change is called the Lapse Rate.

Solution:

1. The 'Lapse Rate' is defined as the rate at which an atmospheric variable, usually temperature, falls with an increase in altitude. 2. In the troposphere, the normal or environmental lapse rate is approximately 6.5°C per kilometer (or 3.6°F per 1,000 feet). 3. This happens because air pressure decreases with height, causing rising air to expand and cool (adiabatic cooling), and because the atmosphere is heated from the ground up by terrestrial radiation. 4. Understanding the lapse rate is crucial in agrometeorology for predicting frost, cloud formation, and vertical stability of the atmosphere.

Final Answer: The lapse rate refers to the decrease in temperature with an increase in altitude.

Answer: (B)

Q42.

Solution

Concept:

Ranikhet disease, known internationally as Newcastle Disease (ND), is a highly contagious and fatal viral disease affecting various species of birds, particularly domestic fowl.

Solution:

1. It is caused by a virulent strain of the Avian Paramyxovirus type 1. 2. The disease is characterized by respiratory distress (gasping), nervous signs (twisted necks or 'torticollis'), and digestive issues (greenish diarrhea). 3. In a non-vaccinated poultry flock, the mortality rate can reach up to 100%, making it the most significant threat to the **Poultry** industry in India. 4. Transmission occurs through direct contact with secretions of infected birds or contaminated feed, water, and equipment.

Final Answer: Ranikhet is a devastating disease of Poultry.

Answer: (C)

Q43.

Solution

Concept:

Artificial Insemination (AI) is a process of breeding where semen is collected from a male and manually deposited into the reproductive tract of a female. It is the most effective tool for livestock improvement.

Solution:

1. AI allows for the 'intensive' use of genetically superior sires. While a bull in natural service can serve only about 50–80 cows a year, a single ejaculate from a superior bull can be diluted to inseminate hundreds of cows. 2. This allows farmers to utilize **superior germplasm from high-yielding bulls** (including imported exotic breeds) without the need to maintain an expensive and potentially dangerous bull on the farm. 3. It also prevents the spread of certain venereal diseases and allows for the use of semen from injured or physically distant sires. 4. Consequently, it is a key driver in increasing the average milk production of the national herd.

Final Answer: AI helps in using a superior sire for a large number of females.

Answer: (B)

Q44.

Solution

Concept:

Standardization is a technical and legal requirement in the dairy industry to ensure that milk sold to consumers has a consistent and guaranteed composition regardless of the breed or season.

Solution:

1. Raw milk collected from different sources varies in its chemical composition. 2. **Standardization** is the process of adjusting the ratio of **Fat** and **Solids-not-fat (SNF)** to meet specific statutory levels. 3. For example, in India, 'Standardized Milk' must contain a minimum of 4.5% fat and 8.5% SNF. 4. This is usually achieved by using a cream separator to remove excess fat or by adding skim milk (or skim milk powder) to increase the SNF.

Final Answer: Standardization involves adjusting Fat and SNF levels.

Answer: (B)

Q45.

Solution

Concept:

Problematic soils are those that have physical or chemical constraints that limit crop production. Saline soils are characterized by an excess of neutral soluble salts.

Solution:

1. **Saline soils** contain a high concentration of soluble salts, mainly chlorides and sulfates of sodium, calcium, and magnesium. 2. These salts increase the osmotic pressure of the soil solution, making it difficult for plant roots to absorb water (physiological drought). 3. Chemically, these soils have an Electrical Conductivity (EC) of more than 4 dS/m, an Exchangeable Sodium Percentage (ESP) less than 15%, and a **pH usually less than 8.5**. 4. Unlike 'Sodic' (Alkali) soils which have high pH and high sodium, Saline soils are primarily a salt problem rather than a sodium/alkalinity problem.

Final Answer: Saline soil has high soluble salts and a pH less than 8.5.

Answer: (B)

Q46.

Solution

Concept:

Plant nutrients are chemical elements essential for growth, reproduction, and metabolic processes. Based on the quantity required by the plant, they are classified into Macronutrients (Primary and Secondary) and Micronutrients.

Solution:

1. **Primary Nutrients** are required in the largest amounts and are most frequently deficient in the soil. These include Nitrogen (N), **Phosphorus (P)**, and Potassium (K). 2. Secondary Nutrients are needed in moderate amounts, such as Calcium, Magnesium, and Sulfur. 3. Micronutrients are needed in very small (trace) quantities, such as Zinc, Iron, and Boron. 4. Phosphorus is critical for energy transfer (as a component of ATP), root development, and early maturity of the crop.

Final Answer: Phosphorus is a primary nutrient for plants.

Answer: (C)

Q47.

Solution

Concept:

Evapotranspiration (ET) is a combined term representing the total loss of water from a cropped field to the atmosphere. It is a fundamental component of the water cycle and essential for determining irrigation requirements.

Solution:

1. **Evaporation** is the physical process by which water changes from a liquid to a vapor state directly from the soil surface or water bodies. 2. **Transpiration** is the biological process by which water is absorbed by plant roots, moves through the plant, and is released as vapor through the stomata in the leaves. 3. Therefore, ET = Evaporation + Transpiration. 4. It is influenced by solar radiation, temperature, wind speed, and humidity.

Final Answer: Evapotranspiration is the sum of Evaporation from soil and Transpiration from plants.

Answer: (B)

Q48.

Solution

Concept:

Integrated Pest Management (IPM) is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques.

Solution:

1. IPM does not seek to eradicate pests but to keep their population below the Economic Threshold Level (ETL). 2. The priority is given to **Biological control** (using natural enemies like predators/parasites) and **Cultural control** (crop rotation, trap cropping, resistant varieties). 3. Chemical pesticides are used only as a last resort and in a targeted manner that minimizes risks to human health and beneficial organisms. 4. This approach ensures sustainable agriculture and prevents the development of pesticide resistance.

Final Answer: Priority is given to Biological and Cultural control methods.

Answer: (B)

Q49.

Solution

Concept:

Sugarcane belongs to the genus *Saccharum*. Different species have been used in breeding to develop the modern commercial varieties we see today.

Solution:

1. ***Saccharum officinarum*** is known as the **'Noble Cane'**. 2. It is characterized by thick, juicy stalks, high sugar content, and low fiber. 3. Historically, these were "nobled" by crossing them with hardy wild species like *Saccharum barberi* (North Indian canes) to combine high sugar with disease resistance and environmental hardiness. 4. Most modern commercial hybrids are derivatives of *S. officinarum*.

Final Answer: The Noble Cane refers to Saccharum officinarum.

Answer: (C)

Q50.

Solution

Concept:

Tillage is the physical manipulation of soil. Traditional tillage involves multiple passes of plowing, but modern conservation tillage aims to minimize soil disturbance.

Solution:

1. **Zero Tillage** (or No-till) is an extreme form of conservation tillage. 2. In this system, the soil is left undisturbed from harvest to planting, except for a narrow strip where the seed is placed. 3. **Seeds are sown directly** into the residue of the previous crop using specialized seed drills (like the Happy Seeder). 4. This practice helps in reducing fuel costs, conserving soil moisture, and increasing organic matter content in the soil.

Final Answer: Zero Tillage involves sowing seeds directly into crop residue.

Answer: (B)

Answer Key

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