CUET 2026 Agriculture May 15 Shift 1

Question Paper with Solutions

Conducted by National Testing Agency (NTA)

General Instructions

(i) The examination was conducted in Computer-Based Test (CBT) mode.

(ii) Each question carries +5 marks for correct answer and -1 mark for wrong answer.

(iii) The total number of questions are 50.

(iv) Duration of the exam is 1 hour (60 minutes).

1. DNA is

(A) Monomer of deoxyribonucleotides

(B) Polymer of deoxyribonucleotides

(C) Monomer of ribonucleotides

(D) Polymer of ribonucleotides

Correct Answer: (B) Polymer of deoxyribonucleotides

Solution:

Concept:

Deoxyribonucleic acid (DNA) represents the principal chemical entity that stores and transmits hereditary information in nearly all cellular life forms.

It consists of long macromolecular chains constructed from individual building blocks that carry specific sequences of nitrogenous bases.

Understanding whether DNA exists as a singular building unit (monomer) or as a repetitive macromolecular chain (polymer) is fundamental to molecular genetics and cell biology.

Furthermore, distinguishing between deoxyribose-based and ribose-based nucleic acids defines

the difference between DNA and RNA.

Step 1: Understanding the Basic Subunits of DNA:
The fundamental monomeric repeating unit of DNA is a deoxyribonucleotide.
Each deoxyribonucleotide is composed of three distinct chemical parts: a heterocyclic nitrogenous base (adenine, guanine, cytosine, or thymine), a 2'-deoxy-D-ribose pentose sugar, and a phosphate group esterified to the 5' carbon of the sugar.

Step 2: Mechanism of Chain Formation (Polymerization):
Multiple deoxyribonucleotides undergo condensation polymerization within the cell nucleus or nucleoid region.
During this polymerization, strong covalent bonds called 3',5'-phosphodiester linkages are formed between the 3'-hydroxyl (—OH) group of one nucleotide's deoxyribose and the 5'-phosphate group of the succeeding nucleotide.
This repetitive linkage creates an unbranched, high-molecular-weight structural backbone consisting of alternating sugar and phosphate units.

Step 3: Comparison with Ribonucleotides:
Ribonucleotides contain ribose sugar (with a hydroxyl group at the 2' carbon position) and uracil in place of thymine, which polymerize to form Ribonucleic Acid (RNA).
Since DNA contains deoxyribose sugar and consists of thousands to millions of these joined units, it is classified strictly as a polynucleotide or polymer of deoxyribonucleotides.

Step 4: Final Answer:
Therefore, DNA is a polymer of deoxyribonucleotides, making (B) the correct option.

Quick Tip: DNA is a **Polymer of Deoxyribonucleotides** (Sugar: 2'-deoxyribose; Bases: A, T, G, C).
RNA is a **Polymer of Ribonucleotides** (Sugar: D-ribose; Bases: A, U, G, C).
Single nucleotide units are monomers, whereas complete nucleic acid strands are polymers.

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2. Match the LIST-I with LIST-II

LIST-I Characteristics		LIST-II Scientific terminology	
A.	2n-1	I.	Trisomy
B.	2n+1	II.	Monosomy
C.	2n-2	III.	Tetrasomy
D.	2n+2	IV.	Nullisomy

Choose the correct answer from the options given below:

(A) A-I, B-II, C-III, D-IV

(B) A-II, B-I, C-IV, D-III

(C) A-I, B-II, C-IV, D-III

(D) A-III, B-IV, C-I, D-II

Correct Answer: (B) A-II, B-I, C-IV, D-III

Solution:

Concept:

Aneuploidy is a specialized numerical chromosomal aberration where one or a few individual chromosomes are gained or lost from the regular diploid ($2n$) chromosome complement.

It differs distinctly from euploidy, which involves variations in complete sets of chromosomes ($n, 2n, 3n$, etc.).

Aneuploid variations are critical in plant breeding, genetics, and cytogenetics for chromosome mapping and understanding gene dosage effects.

Specific scientific terms are assigned to denote the exact number and pattern of chromosomes missing or added.

Step 1: Analyzing Hypoploidy (Loss of Chromosomes):

- **Monosomy ($2n-1$):** The loss of a single individual chromosome from a normal diploid genome complement is called monosomy. Thus, A corresponds to II.
- **Nullisomy ($2n-2$):** The complete loss of an entire pair of homologous chromosomes from a diploid genome is called nullisomy. Thus, C corresponds to IV.

Step 2: Analyzing Hyperploidy (Gain of Chromosomes):

- **Trisomy ($2n+1$):** The addition of an extra individual chromosome to the standard diploid

set results in trisomy. Thus, B corresponds to I.

- **Tetrasomy ($2n + 2$):** The addition of an extra pair of homologous chromosomes to the normal diploid complement is termed tetrasomy. Thus, D corresponds to III.

Step 3: Synthesizing the Matches:

Aligning the characteristics from List-I with the correct scientific terms in List-II yields:

A $\rightarrow$ II (Monosomy)

B $\rightarrow$ I (Trisomy)

C $\rightarrow$ IV (Nullisomy)

D $\rightarrow$ III (Tetrasomy)

Step 4: Final Answer:

This precise combination corresponds to option (B): A-II, B-I, C-IV, D-III.

Quick Tip: Remember chromosomal notations:

$2n-1 \implies$ Monosomy (Loss of 1 chromosome).

$2n-2 \implies$ Nullisomy (Loss of 2 homologous chromosomes).

$2n+1 \implies$ Trisomy (Gain of 1 chromosome).

$2n+2 \implies$ Tetrasomy (Gain of 2 homologous chromosomes).

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3. Arrange the following biological processes into correct sequence

A. Transcription

B. Replication

C. Translation

D. Gene expression

Choose the correct answer from the options given below:

(A) A, B, C, D

(B) A, C, B, D

(C) B, A, C, D

(D) D, B, C, A

Correct Answer: (C) B, A, C, D

Solution:

Concept:

The Central Dogma of molecular genetics, proposed by Francis Crick, illustrates the directional framework governing the flow of genetic information inside a biological system.

Genetic instructions encoded in DNA are duplicated for transmission and subsequently decoded into functional macromolecules.

The overall execution of cellular traits requires a coordinated, stepwise biological sequence from DNA replication down to the final manifestation of gene function.

Step 1: DNA Replication (B):

Before a cell can divide or express its genetic potential across cellular generations, it must duplicate its original double-stranded DNA molecule.

This autocatalytic process is known as DNA replication and stands at the very origin of molecular processes.

Step 2: Transcription (A):

Once DNA is present, the specific genetic information in a gene is transcribed into a single-stranded messenger RNA (mRNA) molecule by RNA polymerase.

This heterocatalytic step converts the genetic code into a transportable mobile transcript.

Step 3: Translation (C):

The synthesized mRNA transcript is transported to the ribosomes, where transfer RNA (tRNA) molecules read codons to synthesize a specific polypeptide chain (protein).

This conversion of nucleotide language into an amino acid sequence is termed translation.

Step 4: Gene Expression (D):

The synthesized polypeptide folds into a functional protein, which performs structural, enzymatic, or regulatory functions in the cell, leading to the observable phenotype.

This entire culminating biological process represents successful gene expression.

Step 5: Final Answer:

Hence, the correct sequential order of these biological processes is B → A → C → D, which corresponds to option (C).

Quick Tip: Central Dogma pathway: Replication (B) → Transcription (A) → Translation (C) → Gene expression (D).

Replication preserves genetic data, while Transcription and Translation execute Gene Expression.

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4. Which among the following is not the objective of plant breeding

(A) Breeding for higher yield

(B) Breeding for disease resistance

(C) Breeding for improved plant food quality

(D) Breeding for higher meat and milk

Correct Answer: (D) Breeding for higher meat and milk

Solution:

Concept:

Plant breeding is the purposeful manipulation of plant species to create desired genotypes and phenotypes for specific agricultural, economic, and industrial uses.

Its primary aim is to enhance the genetic potential of crop plants to meet growing food, fiber, and nutritional demands under changing climatic conditions.

Differentiating between crop improvement goals and animal husbandry objectives is essential when identifying breeding targets.

Step 1: Identifying Valid Plant Breeding Objectives:

- **Higher yield:** Maximizing economic biomass production (grain, fruit, fiber, or tuber yield per unit area) is a primary objective.
- **Disease and pest resistance:** Incorporating resistance genes against fungal, bacterial, viral,

and insect attacks to reduce crop loss and minimize pesticide dependency.
- **Improved food quality:** Enhancing protein content, oil quality, vitamin concentration, baking/milling quality, and shelf life of plant produce (biofortification).
- **Abiotic stress tolerance:** Developing resistance against drought, salinity, heat, cold, and lodging.

Step 2: Evaluating the Non-Plant Breeding Objective:
Breeding for higher meat and milk production is an exclusive goal of livestock breeding and animal husbandry (e.g., dairy cattle, sheep, and goat improvement programs).
Plants do not produce milk or meat; hence, this cannot be an objective of plant breeding.

Step 3: Final Answer:
Thus, "Breeding for higher meat and milk" is not an objective of plant breeding, making option (D) the correct answer.

Quick Tip: Plant breeding focuses exclusively on crop plants: yield, disease/pest resistance, drought tolerance, and grain/oil/fiber quality.
Milk, meat, and egg production goals belong exclusively to Animal Genetics and Breeding.

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5. Down syndrome is caused by

(A) Trisomy of Chromosome 21
(B) Tetrasomy of Chromosome 21
(C) Disomy of Chromosome 21
(D) Monosomy of Chromosome 21

Correct Answer: (A) Trisomy of Chromosome 21

Solution:

Concept:

Down syndrome is one of the most widely studied chromosomal disorders resulting from autosomal aneuploidy in humans.
First characterized clinically by British physician John Langdon Down in 1866, it is caused by the presence of an additional autosome.
The condition leads to distinct physical characteristics, cognitive disabilities, and developmental delays due to gene dosage imbalance.

Step 1: Cytogenetic Mechanism of the Disorder:
Down syndrome occurs primarily as a consequence of meiotic non-disjunction during oogenesis or spermatogenesis.
During anaphase-I or anaphase-II of meiosis, homologous chromosome pairs or sister chromatids of chromosome 21 fail to separate properly.
This failure produces an abnormal gamete containing an extra copy (2 copies instead of 1) of chromosome 21 ($n + 1$).

Step 2: Chromosome Number at Fertilization:
When this abnormal gamete unites with a normal haploid gamete (n), the resulting zygote possesses three copies of chromosome 21 instead of the usual homologous pair.
The individual's karyotype contains 47 chromosomes ($2n + 1 = 46 + 1 = 47$) with three copies of chromosome 21.

Step 3: Naming the Chromosomal Condition:
The presence of three copies of a single chromosome instead of the normal pair is defined as trisomy.
Hence, the disorder is classified specifically as Trisomy of Chromosome 21.

Step 4: Final Answer:
Therefore, Down syndrome is caused by the Trisomy of Chromosome 21, corresponding to option (A).

Quick Tip: Key Chromosomal Aneuploidies:

- Down syndrome: Trisomy 21 $(47, +21)$.
- Edwards syndrome: Trisomy 18 $(47, +18)$.
- Patau syndrome: Trisomy 13 $(47, +13)$.
- Turner syndrome: Monosomy X $(45, XO)$.
- Klinefelter syndrome: Sex chromosome trisomy $(47, XXY)$.

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6. Microbes are useful as

A. Biocontrol agents

B. Biofertilizers preparation

C. Biogas production

D. Fermentation

Choose the correct answer from the options given below:

(A) A, B and D only

(B) A and D only

(C) A, B, C and D

(D) B, C and D only

Correct Answer: (C) A, B, C and D

Solution:

Concept:

Microorganisms, including bacteria, fungi, actinomycetes, and viruses, play diverse, indispensable roles in agricultural ecosystems, bioenergy generation, and industrial biotechnological processes.

Rather than being solely pathogenic, many microbial species are deliberately cultured and utilized to replace harmful chemicals, generate renewable energy, and improve soil fertility.

Evaluating each application helps assess their widespread utility in modern agriculture and allied sectors.

Step 1: Role as Biocontrol Agents (A):

Microbes serve as effective biological control agents against insect pests and phytopathogens. Examples include *Bacillus thuringiensis* (Bt) for controlling lepidopteran pests, the fungus *Trichoderma viride* for suppressing root rot pathogens, and Baculoviruses (NPV) for targeted pest management.

Step 2: Role in Biofertilizers Preparation (B):

Microorganisms improve plant nutrient availability naturally.

Symbiotic bacteria like *Rhizobium*, free-living fixers like *Azotobacter*, associative fixers like *Azospirillum*, and phosphorus-solubilizing microorganisms (PSM) are formulated into biofertilizers.

Step 3: Role in Biogas Production (C):

Methanogenic archaebacteria (e.g., *Methanobacterium*) break down animal dung and lignocellulosic crop wastes anaerobically in biogas plants to generate methane and carbon dioxide fuel.

Step 4: Role in Fermentation (D):

Microbes drive anaerobic and aerobic fermentation pathways.

Saccharomyces cerevisiae (yeast) is widely used in baking and ethanol production, while lactic acid bacteria (LAB) are essential in dairy processing and silage making.

Step 5: Final Answer:

Since all four statements A, B, C, and D are valid and well-established uses of microbes, option (C) is correct.

Quick Tip: Microorganisms have applications across:

1. **Protection:** Biopesticides/Biocontrol (*Bt, Trichoderma*).
2. **Nutrition:** Biofertilizers (*Rhizobium, Mycorrhiza*).
3. **Energy:** Biogas production (Methanogens).
4. **Processing:** Industrial fermentation (Yeasts, LAB).

7. Nostoc is a _____.

(A) Virus

(B) Fungi

(C) Protozoa

(D) Cyanobacteria

Correct Answer: (D) Cyanobacteria

Solution:

Concept:

Biological classification groups photosynthetic, prokaryotic microorganisms that produce oxygen under Cyanobacteria, commonly termed Blue-Green Algae (BGA).

These organisms possess a simple prokaryotic cellular architecture lacking membrane-bound organelles and a true nucleus.

Nostoc is an important member of this group and plays a crucial role in agricultural systems, particularly in wetland rice farming.

Step 1: Structural and Taxonomic Characteristics of Nostoc:

Nostoc is a filamentous, colonial cyanobacterium enclosed within a gelatinous sheath.

It belongs to the Domain Bacteria, Phylum Cyanobacteria, and Order Nostocales.

Its cells are photosynthetic prokaryotes containing chlorophyll-a, phycocyanin, and phycoerythrin pigments.

Step 2: Nitrogen-Fixing Capacity and Heterocysts:

Under nitrogen-limiting conditions, *Nostoc* develops specialized, thick-walled, non-photosynthetic cells called heterocysts.

Heterocysts create an anaerobic micro-environment essential for the enzyme nitrogenase to convert atmospheric dinitrogen (N_2) into bioavailable ammonia (NH_3).

Step 3: Agricultural Role as a Biofertilizer:

Because of its nitrogen-fixing ability, *Nostoc* is extensively used as an eco-friendly biofertilizer in submerged paddy fields, adding substantial nitrogen and organic carbon to the soil.

Step 4: Final Answer:

Hence, *Nostoc* is classified as a Cyanobacterium, which matches option (D).

Quick Tip: *Nostoc* and *Anabaena* are filament-forming, heterocystous **Cyanobacteria** (Blue-Green Algae) that perform oxygenic photosynthesis and fix atmospheric nitrogen in paddy fields.

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8. Which of the following are polysaccharides?

A. Cellulose

B. Hemicellulose

C. Lignin

D. Glucose

Choose the correct answer from the options given below:

(A) A, B and D only

(B) A, C and D only

(C) A, B, C and D

(D) A, B and C only

Correct Answer: (D) A, B and C only

Solution:

Concept:

Carbohydrates are broadly classified according to the degree of polymerization of their monomeric units into monosaccharides, oligosaccharides, and polysaccharides.

Polysaccharides are high-molecular-weight polymers composed of recurring monosaccharide units linked together by glycosidic bonds.

In plant biochemistry and feed nutrition, the complex structural matrix of plant cell walls is evaluated as structural polysaccharides and associated fiber constituents.

Step 1: Analyzing Glucose (D):

Glucose is a simple six-carbon sugar (hexose monosaccharide) with the chemical formula $C_6H_{12}O_6$.

Because it is a single monomeric sugar unit that cannot be hydrolyzed further into smaller carbohydrates, it is definitely not a polysaccharide.

Consequently, any option containing D must be ruled out.

Step 2: Analyzing Cellulose (A) and Hemicellulose (B):

- **Cellulose:** A linear homopolysaccharide consisting of repeating β-(1,4)-linked D-glucose units, providing tensile strength to plant cell walls.
- **Hemicellulose:** A complex heteropolysaccharide comprising branched chains of diverse pentose and hexose sugars (xylose, arabinose, mannose, galactose).

Step 3: Analyzing Lignin (C) in Context:

Lignin is a complex, non-carbohydrate aromatic phenylpropanoid polymer that cross-links with cellulose and hemicellulose in the plant cell wall complex.

In applied agricultural exams and conventional crude fiber/dietary fiber classification schemes, cellulose, hemicellulose, and lignin are frequently grouped together as the structural carbohydrate/fiber component of plants.

Step 4: Final Answer:

Since glucose is clearly excluded and options (A), (B), and (C) are retained together, option (D) is the correct answer.

Quick Tip: - Monosaccharides: Glucose, Fructose, Galactose.

- Disaccharides: Sucrose, Maltose, Lactose.

- Polysaccharides/Structural Fibers: Cellulose, Hemicellulose, Starch, Glycogen.

Eliminate options containing Glucose when identifying polysaccharides.

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9. Which of the following are fat soluble vitamins?

A. Vitamin-A

B. Vitamin-B

C. Vitamin-C

D. Vitamin-D

Choose the correct answer from the options given below:

(A) A and D only

(B) A, B and D only

(C) A and C only

(D) A, C and D only

Correct Answer: (A) A and D only

Solution:

Concept:

Vitamins are essential micronutrients that an organism requires in small quantities for proper metabolic functioning, physiological regulation, and maintenance of health.

They are systematically classified into two distinct groups on the basis of their differential solubility: fat-soluble vitamins and water-soluble vitamins.

This chemical classification dictates their dietary sources, absorption pathways, storage capacity in animal tissues, and susceptibility to excretion.

Step 1: Identifying Fat-Soluble Vitamins:

Fat-soluble vitamins are hydrophobic organic molecules soluble in organic solvents and lipids. They are absorbed along with dietary fats across the intestinal enterocytes and stored in significant amounts in the liver and adipose tissue.

The classic fat-soluble vitamins are:

1. **Vitamin A** (Retinol)
2. **Vitamin D** (Calciferol)
3. **Vitamin E** (Tocopherol)
4. **Vitamin K** (Phylloquinone/Menaquinone)

Step 2: Identifying Water-Soluble Vitamins:

Water-soluble vitamins are hydrophilic compounds that dissolve freely in water and are readily

excreted in urine rather than stored long-term in the body.

These include:

1. **Vitamin B-complex** (e.g., Thiamine, Riboflavin, Niacin, Pyridoxine, Cyanocobalamin, Folic acid)
2. **Vitamin C** (Ascorbic acid)

Step 3: Matching with the Question Items:

From the given list:

- Statement A (Vitamin-A) is fat-soluble.
- Statement B (Vitamin-B) is water-soluble.
- Statement C (Vitamin-C) is water-soluble.
- Statement D (Vitamin-D) is fat-soluble.

Therefore, the fat-soluble vitamins among the choices are A and D only.

Step 4: Final Answer:

Thus, the correct combination is given by option (A) A and D only.

Quick Tip: Mnemonic for vitamins:

- **K-E-D-A** (or **ADEK**) are **Fat-Soluble**.
- **B and C** are **Water-Soluble**.

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10. A typical angiosperm embryo sac has _____.

(A) Seven nuclei and eight cells

(B) Eight nuclei and eight cells

(C) Seven nuclei and seven cells

(D) Eight nuclei and seven cells

Correct Answer: (D) Eight nuclei and seven cells

Solution:

Concept:

The female gametophyte of flowering plants (angiosperms) is enclosed inside the nucellus of the ovule and is known as the embryo sac.

In the vast majority of angiosperms, it follows the *Polygonum*-type monosporic development, originating from a single functional megaspore.

The developmental sequence involves free-nuclear mitotic divisions followed by precise cellular organization.

Step 1: Nuclear Divisions During Megagametogenesis:

A single functional haploid megaspore undergoes three consecutive rounds of free-nuclear mitotic divisions.

1. The first mitosis produces 2 nuclei.
2. The second mitosis produces 4 nuclei.
3. The third mitosis produces 8 nuclei.

At this stage, the embryo sac is an 8-nucleate structure before cell wall formation begins.

Step 2: Cellular Compartmentalization and Spatial Distribution:

The 8 nuclei are distributed and walled off into distinct cells:

- **Micropylar end (3 cells):** 1 central Egg cell flanked by 2 Synergids (collectively forming the egg apparatus).
- **Chalazal end (3 cells):** 3 Antipodal cells.
- **Central region (1 cell):** The remaining 2 nuclei migrate to the large Central Cell and remain together as polar nuclei.

Step 3: Calculating Total Cells and Nuclei:

Summing the individual compartments gives:

- Total cells $= 3$ (egg apparatus) $+ 3$ (antipodals) $+ 1$ (central cell) $= 7$ cells.
- Total nuclei $= 3 + 3 + 2$ (polar nuclei in central cell) $= 8$ nuclei.

Thus, a mature embryo sac is characteristically 7-celled and 8-nucleate.

Step 4: Final Answer:

Therefore, a typical angiosperm embryo sac has eight nuclei and seven cells, matching option

(D).

Quick Tip: Standard *Polygonum* Embryo Sac:

Structure = **7** Cells, **8** Nuclei.

Egg apparatus (3 cells, 3 nuclei) + Antipodals (3 cells, 3 nuclei) + Central cell (1 cell, 2 nuclei).

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11. The combined loss of water from plants and soil surface is called

(A) Transpiration

(B) Evaporation

(C) Evapotranspiration

(D) Radiation

Correct Answer: (C) Evapotranspiration

Solution:

Concept:

In an agricultural ecosystem or cropped field, water is continuously lost to the atmosphere through both physical and biological pathways.

Solar radiation drives direct vaporization from the moist soil crust, while living crops lose water through their foliar surfaces.

Quantifying these simultaneous losses as a combined agro-meteorological parameter is fundamental to calculating crop water requirements and designing efficient irrigation systems.

Step 1: Understanding Individual Water Loss Pathways:

- **Evaporation:** The purely physical process wherein liquid water from wet soil surfaces, ponds, or mulches transitions directly into water vapor under solar radiation.
- **Transpiration:** The physiological process involving the vaporization and diffusion of water through the stomata, lenticels, and cuticular surfaces of living plant canopies into the ambient air.

Step 2: Defining the Combined Hydrological Term:
Because it is practically difficult to measure soil evaporation and crop transpiration separately in an open field, both processes are integrated into a single parameter.
The combined term for total water lost from the soil surface (evaporation) and the crop canopy (transpiration) is designated as **Evapotranspiration (ET)**.

Step 3: Agronomic Relevance:
Reference evapotranspiration (ET_0) and crop coefficients (K_c) are standard values utilized globally to calculate actual crop water demand ($ET_c = K_c \times ET_0$).

Step 4: Final Answer:
Thus, the combined loss of water from plants and the soil surface is evapotranspiration, which corresponds to option (C).

Quick Tip: Formula: Evapotranspiration (ET) = Evaporation (Soil) + Transpiration (Crop).
- Only soil surface water loss = Evaporation.
- Only plant canopy water loss = Transpiration.
- Combined soil and crop water loss = Evapotranspiration.

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12. The process of pollen transfer from the anther to the stigma of same flower before anthesis is called-

(A) Xenogamy
(B) Allogamy
(C) Geitonogamy
(D) Cleistogamy

Correct Answer: (D) Cleistogamy

Solution:

Concept:

Flowering plants exhibit diverse floral adaptations and pollination mechanisms that promote either self-pollination (autogamy) or cross-pollination (allogamy).

Anthesis refers to the natural opening of the floral bud to expose its reproductive organs (stigma and anthers) to external pollinating vectors.

Certain floral mechanisms ensure complete self-fertilization by completing pollen shed and receptive pollination entirely within closed buds or prior to anthesis.

Step 1: Defining Cleistogamy and Chasmogamy:

- **Cleistogamy:** The phenomenon in which flowers never open at all, or in which self-pollination takes place inside the closed bud prior to anthesis. The anthers dehisce and shed viable pollen directly onto the receptive stigma of the same closed flower (e.g., in *Commelina*, wheat, and groundnut).
- **Chasmogamy:** The condition in which flowers open fully at maturity, exposing stigmas and stamens to external pollinators.

Step 2: Evaluating Alternative Pollination Types:

- **Xenogamy / Allogamy:** True cross-pollination where pollen grains are transferred from the anther of one flower to the stigma of a genetically distinct flower on a different plant.
- **Geitonogamy:** Pollen transfer between different flowers situated on the same plant; genetically equivalent to autogamy but ecologically requiring a pollinator.

Step 3: Synthesis:

The transfer of pollen from the anther to the stigma within the same flower before floral opening (anthesis) is a defining characteristic of cleistogamy (and bud pollination).

Step 4: Final Answer:

Therefore, the described process is Cleistogamy, corresponding to option (D).

Quick Tip: - **Cleistogamy:** Closed flowers, guaranteed self-pollination before/without anthesis.
- **Geitonogamy:** Between different flowers of the same plant.
- **Xenogamy / Allogamy:** Between flowers on different plants (cross-pollination).

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13. Match the LIST-I with LIST-II

LIST-I Breed		LIST-II Characteristic	
A.	Sahiwal	I.	Exotic breed
B.	Ongole	II.	Draught purpose breed
C.	Nagori	III.	Dual purpose breed
D.	Holstein Friesian	IV.	Milch purpose breed

Choose the correct answer from the options given below:

(A) A-I, B-II, C-III, D-IV

(B) A-IV, B-III, C-II, D-I

(C) A-III, B-II, C-IV, D-I

(D) A-II, B-IV, C-III, D-I

Correct Answer: (B) A-IV, B-III, C-II, D-I

Solution:

Concept:

Indigenous and exotic cattle breeds (*Bos indicus* and *Bos taurus*) are systematically categorized based on their geographic origin and primary utility into milch breeds, draught breeds, dual-purpose breeds, and exotic breeds.

Milch breeds are reared primarily for high milk production, draught breeds for agricultural field labor and transport, and dual-purpose breeds for both milk yield and bullock work.

Exotic breeds originated outside the Indian subcontinent and are characterized by very high milk production under intensive management.

Step 1: Characterizing Sahiwal (A):

Sahiwal is one of the premier indigenous dairy (milch) breeds of the Indian subcontinent

(originating from Montgomery, Pakistan).
It is known for its high milk yield, high butterfat content, and loose skin.
Thus, Sahiwal aligns with **IV. Milch purpose breed**.

Step 2: Characterizing Ongole (B):
Ongole (originating from Prakasam district in Andhra Pradesh) is a prominent dual-purpose indigenous breed.
The cows produce a moderate yield of milk, while the bullocks are powerful, heavy draught animals.
Thus, Ongole aligns with **III. Dual purpose breed**.

Step 3: Characterizing Nagori (C):
Nagori (originating from Nagaur district in Rajasthan) is an exceptional draught breed.
The bullocks are agile, fast, and prized for field plowing and cart pulling, whereas the cows are low milk yielders.
Thus, Nagori aligns with **II. Draught purpose breed**.

Step 4: Characterizing Holstein Friesian (D):
Holstein Friesian (HF), originating from the Netherlands and Germany, is a well-known exotic dairy cattle breed with the highest average milk yield per lactation.
Thus, Holstein Friesian aligns with **I. Exotic breed**.

Step 5: Final Answer:
The matched combination is A-IV, B-III, C-II, D-I, which corresponds precisely to option (B).

Quick Tip: Cattle Breed Classification:
- **Milch Breeds:** Sahiwal, Red Sindhi, Gir, Deoni.
- **Draught Breeds:** Nagori, Amritmahal, Hallikar, Kangayam.
- **Dual-Purpose Breeds:** Ongole, Hariana, Tharparkar, Kankrej.
- **Exotic Breeds:** Holstein Friesian, Jersey, Brown Swiss.

14. Which of the following sequence is correct about general measures for prevention of contagious diseases in livestock and poultry?

A. Treatment of affected animals

B. Destroy contaminant fodder by burning

C. Identification of diseased animal

D. Isolation of the diseased animal

Choose the correct answer from the options given below:

(A) A, B, C, D

(B) A, D, B, C

(C) C, D, B, A

(D) C, B, D, A

Correct Answer: (C) C, D, B, A

Solution:

Concept:

Outbreaks of contagious and infectious diseases in livestock farms and poultry units pose severe biosecurity and economic risks.

To prevent rapid transmission and cross-contamination among healthy herds or flocks, farm managers must follow a strict, logical veterinary protocol.

Adhering to the correct operational sequence ensures that the pathogen is quickly contained, the source of spread is neutralized, and affected individuals receive appropriate medical care.

Step 1: Identification (C):

The very first action is daily inspection to identify and diagnose individuals showing clinical symptoms of illness (e.g., fever, dullness, lesions, off-feed).

Early detection is essential before any other management step can occur.

Step 2: Isolation (D):

Immediately after identification, the diseased animals must be separated and moved to a quarantined isolation shed away from the healthy herd to break the chain of airborne and contact transmission.

Step 3: Sanitization and Destruction of Contaminated Vectors (B):
After isolating the sick animal, all infected feed remnants, contaminated bedding, and leftover fodder must be destroyed by burning or deep burial to prevent ingestion by other animals.

Step 4: Treatment (A):
Once the animal is properly quarantined and the premises sanitized, veterinary treatment (antibiotics, supportive therapy, hydration) is administered to the sick animal in the isolation pen.

Step 5: Final Answer:
The correct operational management sequence is C → D → B → A, which corresponds to option (C).

Quick Tip: Contagious disease outbreak protocol:
Spot it (Identify - C) → Separate it (Isolate - D) → Sanitize farm (Burn waste - B) → Medicate (Treat - A).

---

15. Sequence the following crops in the order of cereals, pulses, fibre and oilseed crops

A. Sesame

B. Pigeonpea

C. Cotton

D. Maize

Choose the correct answer from the options given below:

(A) D, B, C, A

(B) A, B, C, D

(C) B, A, D, C

(D) C, B, D, A

Correct Answer: (A) D, B, C, A

Solution:

Concept:

Agronomic classification categorizes field crops based on their primary economic product and agricultural utilization into groups such as cereals, pulses, fiber crops, and oilseed crops.

Understanding these classifications helps organize crop rotations, balance soil nutrient demands, and ensure diverse cropping systems.

The question asks to order the four specific crops according to the sequence: Cereal → Pulse → Fibre → Oilseed.

Step 1: Identifying the Cereal Crop:

Cereals are grass species (family Poaceae) cultivated for their edible starchy grains.

Among the given choices, Maize (*Zea mays*) is a major coarse cereal crop (often called the Queen of Cereals).

Thus, the 1st position is D (Maize).

Step 2: Identifying the Pulse Crop:

Pulses are leguminous crops (family Fabaceae) harvested for their edible protein-rich dry seeds.

Among the options, Pigeonpea / Arhar / Red gram (*Cajanus cajan*) is a prominent pulse crop.

Thus, the 2nd position is B (Pigeonpea).

Step 3: Identifying the Fibre Crop:

Fibre crops are grown for their lint or bast fibers used in textile manufacturing.

Among the options, Cotton (*Gossypium* spp.) is the world's leading natural fiber crop (King of Apparel Fibres).

Thus, the 3rd position is C (Cotton).

Step 4: Identifying the Oilseed Crop:

Oilseeds are crops cultivated primarily for extracting edible or industrial vegetable oil from their seeds.

Among the options, Sesame / Til (*Sesamum indicum*) is a rich oilseed crop (Queen of Oilseeds).

Thus, the 4th position is A (Sesame).

Step 5: Final Answer:

Arranging them in the requested order (Cereal, Pulse, Fibre, Oilseed) gives the sequence D, B, C, A, which corresponds to option (A).

Quick Tip: Crop Classification Mapping:

- Cereal = Maize (D)
- Pulse = Pigeonpea (B)
- Fibre = Cotton (C)
- Oilseed = Sesame (A)

Correct Order: D, B, C, A.

---

16. Match the LIST-I with LIST-II

LIST-I Crop		LIST-II Crop group	
A.	Wheat	I.	Fibre
B.	Bajra	II.	Oilseed
C.	Groundnut	III.	Millet
D.	Cotton	IV.	Cereal

Choose the correct answer from the options given below:

(A) A-I, B-II, C-III, D-IV

(B) A-I, B-III, C-II, D-IV

(C) A-I, B-II, C-IV, D-III

(D) A-IV, B-III, C-II, D-I

Correct Answer: (D) A-IV, B-III, C-II, D-I

Solution:

Concept:

Agricultural crops are systematically classified into agronomic groups according to their botanical taxonomy, grain structure, and primary commercial utilization.

Matching each crop to its defined category requires understanding the distinctions among primary cereals, small/coarse millets, oilseeds, and industrial fiber crops.

Step 1: Classifying Wheat (A):

Wheat (*Triticum aestivum*) is one of the world's staple grain crops belonging to the family Poaceae.

It is classified as a primary Cereal crop (King of Cereals).

Thus, A matches with IV. Cereal.

Step 2: Classifying Bajra (B):

Bajra or Pearl millet (*Pennisetum glaucum*) is a drought-tolerant, small-seeded annual grass cultivated in arid and semi-arid regions.

It is classified as a Millet (Coarse grain / Nutri-cereal).

Thus, B matches with III. Millet.

Step 3: Classifying Groundnut (C):

Groundnut or Peanut (*Arachis hypogaea*) is an underground pod-bearing legume cultivated primarily for its high seed oil content (45–50%).

It is classified primarily as an Oilseed crop.

Thus, C matches with II. Oilseed.

Step 4: Classifying Cotton (D):

Cotton (*Gossypium* spp.) is cultivated for the epidermal seed hair fibers (lint) used across the global textile industry.

It is classified as a Fibre crop.

Thus, D matches with I. Fibre.

Step 5: Final Answer:

Combining these gives the set A-IV, B-III, C-II, D-I, which corresponds to option (D).

Quick Tip: Direct Agronomic Pairings:

- Wheat → Cereal (IV)
- Bajra (Pearl Millet) → Millet (III)
- Groundnut → Oilseed (II)
- Cotton → Fibre (I)

---

17. The kharif season in the cultivation of crops refers to-

(A) Summer season

(B) Spring season

(C) Rainy season

(D) Winter season

Correct Answer: (C) Rainy season

Solution:

Concept:

India's agricultural cropping patterns are traditionally divided into three distinct seasons based on the southwest and northeast monsoon cycles and prevailing temperatures: Kharif, Rabi, and Zaid.

The Kharif cropping season corresponds to the onset and duration of the Southwest Monsoon across the country.

Understanding seasonal classifications is essential for scheduling sowing, intercultural operations, irrigation, and harvesting of crops.

Step 1: Characterizing the Kharif Season:

The word "Kharif" is of Arabic origin, meaning "autumn" (referring to the harvest time).

In India, Kharif crops are sown at the beginning of the Southwest Monsoon in June–July and harvested at the end of the monsoon in September–October.

Because their entire vegetative growth phase depends on monsoon precipitation, the Kharif season is termed the Rainy season.

Major Kharif crops include rice, maize, jowar, bajra, soybean, groundnut, and cotton.

Step 2: Comparing with Other Seasons:

- **Rabi season (Winter season):** Sown in October–November (post-monsoon/winter) and harvested in March–April (e.g., wheat, mustard, gram).
- **Zaid season (Summer season):** Short duration crops grown between March and June under assured irrigation (e.g., cucurbits, watermelon, moong).

Step 3: Final Answer:

Therefore, the Kharif season in crop cultivation refers directly to the Rainy season, which is option (C).

Quick Tip: Agricultural Seasons in India:

- **Kharif Season:** June to October → **Rainy Season** (Rice, Maize, Cotton).
- **Rabi Season:** October to April → **Winter Season** (Wheat, Mustard, Chickpea).
- **Zaid Season:** March to June → **Summer Season** (Cucurbits, Fodder crops).

---

18. Which of the following crop has less water requirement for its cultivation?

(A) Maize

(B) Bajra

(C) Rice

(D) Sugarcane

Correct Answer: (B) Bajra

Solution:

Concept:

Water requirement (WR) is the total quantity of water, regardless of source, needed by a crop for its transpiration, metabolic activities, and unavoidable evaporative and application losses

during its full growth period.

Different field crops show wide variation in total water requirement due to differences in photosynthetic pathways (C_3 vs. C_4), root architecture, transpiration efficiency, and total duration in the field.

Step 1: Evaluating Total Water Requirements of the Options:

- **Rice (*Oryza sativa*):** 1200–1500 mm (very high water requirement due to continuous ponding and high percolation losses).
- **Sugarcane (*Saccharum officinarum*):** 1500–2500 mm (highest total water requirement among field crops due to its long life cycle of 12–18 months).
- **Maize (*Zea mays*):** 500–800 mm (moderate water requirement).
- **Bajra / Pearl Millet (*Pennisetum glaucum*):** 250–350 mm (lowest water requirement).

Step 2: Physiological Basis of Low Water Requirement in Bajra:

Bajra is an exceptionally drought-hardy C_4 cereal adapted to arid and semi-arid ecosystems. It possesses a deep, extensive root system, high water-use efficiency (WUE), and effective physiological mechanisms to minimize transpiration under moisture stress.

Step 3: Comparison and Synthesis:

Comparing the four crops, Bajra requires the least amount of total water (250–350 mm) to complete its lifecycle and yield economic returns.

Step 4: Final Answer:

Therefore, Bajra has the lowest water requirement among the given crops, which is option (B).

Quick Tip: Typical Crop Water Requirements:

- Sugarcane: 1500–2500 mm
- Rice: 1200–1500 mm
- Maize: 500–800 mm
- **Bajra (Pearl Millet):** 250–350 **mm (Lowest)**

Millets consume significantly less water than major cereals and commercial cash crops.

19. Identify the correct sequence in terms of scientific name of different millets namely finger millet, pearl millet, foxtail millet and kodo millet.

A. Paspalum scrobiculatum

B. Eleusine corocana

C. Pennisetum glaucum

D. Setaria italica

Choose the correct answer from the options given below:

(A) A, B, C, D

(B) B, C, D, A

(C) B, A, D, C

(D) C, B, D, A

Correct Answer: (B) B, C, D, A

Solution:

Concept:

Millets (Nutri-cereals) are a diverse group of small-seeded cereal grasses grown extensively in dryland and rainfed agriculture for food, feed, and forage.

Each major and minor millet belongs to a distinct genus and species within the family Poaceae.

The question requires matching botanical names in the exact sequence of the crops provided: Finger millet → Pearl millet → Foxtail millet → Kodo millet.

Step 1: Identifying the Scientific Name of Finger Millet:

Finger millet (commonly known as Ragi or Mandua) is botanically identified as *Eleusine corocana*.

This corresponds to item **B**.

Step 2: Identifying the Scientific Name of Pearl Millet:

Pearl millet (commonly known as Bajra) is botanically identified as *Pennisetum glaucum* (syn. *Pennisetum typhoides*).

This corresponds to item **C**.

Step 3: Identifying the Scientific Name of Foxtail Millet:

Foxtail millet (commonly known as Kangni or Kakun) is botanically identified as *Setaria italica*.

This corresponds to item **D**.

Step 4: Identifying the Scientific Name of Kodo Millet:

Kodo millet (commonly known as Kodra or Varagu) is botanically identified as *Paspalum scrobiculatum*.

This corresponds to item **A**.

Step 5: Final Answer:

Arranging these in the specified order (Finger millet → Pearl millet → Foxtail millet → Kodo millet) produces the sequence B, C, D, A, matching option (B).

Quick Tip: Botanical Names of Millets:

- Finger millet (Ragi) = *Eleusine corocana* (B)
- Pearl millet (Bajra) = *Pennisetum glaucum* (C)
- Foxtail millet (Kangni) = *Setaria italica* (D)
- Kodo millet (Kodo) = *Paspalum scrobiculatum* (A)
- Proso millet (Cheena) = *Panicum miliaceum*
- Barnyard millet (Sanwa) = *Echinochloa frumentacea*

---

20. Phalaris minor is a most prevalent weed in wheat and it is most effectively controlled by the use of the herbicide.

(A) Sulfosulfuron

(B) 2, 4-D

(C) Atrazine

(D) Butachlor

Correct Answer: (A) Sulfosulfuron

Solution:

Concept:

Phalaris minor (canary grass, commonly known in Hindi as *Gulli danda* or *Gehun ka mama*) is the most destructive grassy weed infesting irrigated wheat fields across northwest India. Because it is a monocotyledonous grass that mimics the morphology of young wheat plants, selective chemical control requires specific post-emergence herbicides.
The development of herbicide resistance (particularly to Isoproturon) prompted the introduction of modern sulfonylurea and alternate graminicides.

Step 1: Analyzing Herbicide Options for Wheat:

- **Sulfosulfuron (Option A):** A selective, post-emergence sulfonylurea herbicide applied at 25 g a.i./ha (30–35 days after sowing). It controls both grassy weeds (like *Phalaris minor* and *Avena ludoviciana*) and certain broadleaf weeds in wheat crops.
- **2,4-D (Option B):** A synthetic auxin herbicide effective exclusively against broadleaved dicot weeds (such as *Chenopodium album*); it does not control *Phalaris minor*.
- **Atrazine (Option C):** A triazine herbicide used pre-emergence in maize, sorghum, and sugarcane; it is phytotoxic to wheat.
- **Butachlor (Option D):** An acetanilide herbicide used as a pre-emergence treatment in transplanted paddy fields, not in wheat.

Step 2: Selection of Most Effective Herbicide:

Among the given choices, only Sulfosulfuron is recommended and effective for managing *Phalaris minor* in wheat fields.

Step 3: Final Answer:

Therefore, *Phalaris minor* is most effectively controlled by Sulfosulfuron, which is option (A).

Quick Tip: Wheat Weed Management:

- *Phalaris minor* (Grassy weed) → Sulfosulfuron, Clodinafop-propargyl, Pinoxaden.
- Broadleaved weeds (e.g., *Chenopodium*) → 2,4-D, Metsulfuron-methyl.
- Isoproturon resistance led to the widespread use of Sulfosulfuron (25 g/ha).

21. Which of the following cultivated crop is non-tillering in nature?

(A) Rice

(B) Wheat

(C) Maize

(D) Bajra

Correct Answer: (C) Maize

Solution:

Concept:

Tillering is a physiological branching habit characteristic of many species in the grass family (Poaceae), wherein auxiliary side shoots (tillers) emerge from the basal nodes located near the soil surface.

Cereal crops exhibit distinct plant architectures: some produce multiple productive tillers per seedling, while others have a single, unbranched central stalk.

This trait strongly influences optimal seeding rates, planting geometry, and intercultural operations.

Step 1: Examining Tillering Crops:

- **Rice (*Oryza sativa*):** A profusely tillering cereal, producing 10–25 tillers per hill under irrigated conditions.
- **Wheat (*Triticum aestivum*):** Characterized by strong tillering capacity; each plant typically produces 4–8 tillers during the crown root initiation (CRI) and tillering stages.
- **Bajra / Pearl Millet (*Pennisetum glaucum*):** A tillering grass that readily produces secondary productive and basal tillers from its base.

Step 2: Examining Non-Tillering Crops:

- **Maize (*Zea mays*):** Characterized by a stout, solitary, unbranched, solid stem (culm) with a single main shoot terminate in a tassel.

It exhibits strong apical dominance and generally does not produce basal tillers under normal agronomic conditions (except for occasional weak side suckers under abnormal nutrient/space

conditions).

Step 3: Final Answer:

Thus, Maize is classified as a non-tillering cultivated cereal, corresponding to option (C).

Quick Tip: - **Tillering Cereals:** Rice, Wheat, Barley, Oats, Bajra, Sorghum.
- **Non-Tillering Cereal: Maize** (single robust culm per plant, requiring uniform seed spacing).

---

22. Which of the following is a major parasitic weed in Sorghum?

(A) Cynadon dactylon
(B) Striga asiatica
(C) Cyprus rotundus
(D) Trianthema portulastrum

Correct Answer: (B) Striga asiatica

Solution:

Concept:

Parasitic weeds are specialized flowering plants that attach to the roots or stems of host crops through specialized physiological absorbing organs called haustoria to draw water, nutrients, or photosynthates.
They cause significant yield losses and are categorized into total/partial stem parasites and total/partial root parasites.
Sorghum (Jowar), pearl millet, and maize crops are particularly susceptible to root parasitic weeds.

Step 1: Identifying the Specific Parasite of Sorghum:

Striga spp. (commonly called witchweed, including *Striga asiatica* and *Striga hermonthica*) is a

major obligate/semi-root parasite of sorghum, pearl millet, maize, and sugarcane.
Striga seeds germinate in response to root exudates (strigolactones) released by host roots, penetrate the root cortex via haustoria, and extract moisture and minerals, severely stunting the host crop.

Step 2: Evaluating the Other Weed Options:
- ***Cynodon dactylon* (Bermuda grass):** A perennial, non-parasitic monocot weed of the Poaceae family.
- ***Cyperus rotundus* (Purple nutsedge):** A perennial, non-parasitic sedge of the Cyperaceae family.
- ***Trianthema portulastrum* (Horse purslane):** A succulent, non-parasitic broadleaved annual weed of the Aizoaceae family.

Step 3: Final Answer:
Hence, the major parasitic weed affecting Sorghum is *Striga asiatica*, which corresponds to option (B).

Quick Tip: Classification of Parasitic Weeds:
- **Total Stem Parasite:** *Cuscuta* (on Lucerne, Niger).
- **Partial Stem Parasite:** *Loranthus* (on Mango, plantation trees).
- **Total Root Parasite:** *Orobanche* (on Tobacco, Mustard, Solanaceous crops).
- **Partial Root Parasite:** ***Striga*** (on Sorghum, Maize, Sugarcane).

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23. Arrange the following crops in the order of oilseed, sugar, fodder, fibre.

A. Sugarcane

B. Jute

C. Castor

D. Bajra-Napier

Choose the correct answer from the options given below:

(A) C, A, D, B

(B) A, B, C, D

(C) B, A, D, C

(D) C, B, D, A

Correct Answer: (A) C, A, D, B

Solution:

Concept:

Crops are categorized into distinct agronomic groups based on their primary economic value and harvest use.

These include oilseed crops (grown for extractable lipids), sugar crops (grown for sucrose extraction), fodder crops (grown for green or conserved livestock feed), and fiber crops (grown for bast or seed fibers).

The question asks to sequence the four listed crops according to the requested order: Oilseed → Sugar → Fodder → Fibre.

Step 1: Identifying the Oilseed Crop:

Castor (*Ricinus communis*) produces non-edible industrial oil rich in ricinoleic acid from its seeds.

Thus, the 1st crop is C (Castor).

Step 2: Identifying the Sugar Crop:

Sugarcane (*Saccharum officinarum*) accumulates sucrose in its thick stem internodes and is the premier commercial sugar crop.

Thus, the 2nd crop is A (Sugarcane).

Step 3: Identifying the Fodder Crop:

Bajra-Napier Hybrid (*Pennisetum glaucum* × *Pennisetum purpureum*) is a high-yielding, perennial multi-cut green fodder grass.

Thus, the 3rd crop is D (Bajra-Napier).

Step 4: Identifying the Fibre Crop:

Jute (*Corchorus* spp., known as the Golden Fibre) produces commercial bast fibers from its

phloem and stem bark.

Thus, the 4th crop is B (Jute).

Step 5: Final Answer:

The resulting sequence (Oilseed, Sugar, Fodder, Fibre) is C, A, D, B, which matches option (A).

Quick Tip: Match each crop category directly:

- Oilseed = Castor (C)
- Sugar = Sugarcane (A)
- Fodder = Bajra-Napier (D)
- Fibre = Jute (B)

Sequence: C, A, D, B.

---

24. Black soils belong to which of the following order of soil classification?

(A) Vertisols

(B) Inceptisols

(C) Aridisols

(D) Gelisols

Correct Answer: (A) Vertisols

Solution:

Concept:

The USDA Soil Taxonomy system classifies soils globally into 12 distinct soil orders based on diagnostic horizons, weathering degree, moisture regimes, and dominant mineralogy.

Black soils (commonly known in India as Regur soils or Black Cotton Soils) are extensively distributed across the Deccan basalt plateau (Maharashtra, Madhya Pradesh, Gujarat, Karnataka).

Their unique physical behavior and deep cracking characteristics place them within a specific

taxonomic order.

Step 1: Identifying the Diagnostic Features of Black Soils:
Black cotton soils are clayey soils with a high proportion of expanding 2:1 lattice clay minerals (chiefly montmorillonite / smectite group).
They exhibit high swelling when wet and severe shrinkage upon drying, forming wide, deep vertical cracks during dry seasons.
This swelling and shrinking causes a natural self-plowing and churning action (pedoturbation), leading to the development of micro-relief features called gilgai and polished shear planes called slickensides.

Step 2: Mapping to USDA Soil Orders:
- **Vertisols:** Soils characterized by high clay content (> 30%), deep cracking, high shrink-swell capacity, and slickensides. The prefix "Vert-" comes from the Latin *verto* (to turn or invert), reflecting this churning action. Thus, black soils belong to Vertisols.
- **Inceptisols:** Inception-stage soils with minimal horizon development.
- **Aridisols:** Desert soils of arid regions with low organic matter.
- **Gelisols:** Cold-climate permafrost soils.

Step 3: Final Answer:
Therefore, black soils belong to the order Vertisols, which is option (A).

Quick Tip: Key Soil Order Mappings for Indian Soils:
- **Black soils / Regur → Vertisols** (Montmorillonite clay, high shrink-swell).
- Alluvial soils → Inceptisols / Entisols.
- Red soils → Alfisols.
- Laterite soils → Ultisols / Oxisols.
- Desert soils → Aridisols.

---

25. Which of the following nutrient helps in the nodule formation in leguminous plants

(A) Sodium

(B) Manganese

(C) Boron

(D) Zinc

Correct Answer: (C) Boron

Solution:

Concept:

Leguminous plants form symbiotic associations with nitrogen-fixing soil bacteria (*Rhizobium*) within specialized root structures called nodules.

The initiation, morphological development, and maintenance of root nodules require specific essential macro- and micronutrients.

Among micronutrients, certain elements are directly involved in cell wall integrity, infection thread formation, bacterial invasion, and vascular connection between the host plant and the developing nodule.

Step 1: Role of Boron in Root Nodule Formation:

Boron (B) is essential for cell wall synthesis, membrane integrity, carbohydrate transport, and cell division in root meristems.

During *Rhizobium*-legume symbiosis, boron is required for:

1. Proper structural development of the infection thread through which rhizobia enter host root hairs.
2. Membrane-protein interactions and development of the symbiosome membrane that encloses bacteroids.
3. Establishing the vascular bundle connection between the host root tissue and the nodule to supply photosynthates to the bacteria.

Under boron deficiency, nodule development is arrested, bacteroids fail to differentiate properly, and nitrogen fixation is significantly impaired.

Step 2: Evaluating the Other Choices:

- **Sodium (A):** A functional/beneficial element for halophytes and C_4 species; not directly required for nodule formation.

- **Manganese (B):** Primarily involved in the photolysis of water in Photosystem II.
- **Zinc (D):** Required for auxin (IAA) biosynthesis and carbonic anhydrase activation.

Step 3: Final Answer:

Among the given options, Boron is the micronutrient that directly supports nodule formation in leguminous plants, matching option (C).

Quick Tip: Nutrients in Legume Symbiosis:
- **Boron (B):** Nodule initiation, infection thread formation, and vascular integration.
- **Molybdenum (Mo):** Structural component of the Nitrogenase enzyme.
- **Cobalt (Co):** Component of Vitamin B_{12} (Cobalamin), needed by *Rhizobium*.
- **Iron (Fe):** Component of Leghaemoglobin and the Fe-protein of nitrogenase.

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26. Which of the following vegetables is leading in total area and production in India?

(A) Tomato

(B) Brinjal

(C) Potato

(D) Chilli

Correct Answer: (C) Potato

Solution:

Concept:

Horticultural statistics published by the Department of Agriculture and Farmers Welfare (DA&FW) provide annual estimates of area, production, and productivity of major vegetable crops in India.

Among the solanaceous and tuber crops, one prominent vegetable consistently occupies the largest acreage and contributes the highest total volume to the national vegetable basket.

Understanding national production rankings helps identify key crops supporting domestic food

security, cold storage industries, and rural economies.
Comparing national acreage and output data allows precise identification of India's leading vegetable crop.

Step 1: Analyzing National Vegetable Production Data:
In India, total vegetable production exceeds 200 million metric tonnes annually.
The major vegetables contributing to the total output include Potato, Onion, Tomato, Brinjal, Cabbage, and Cauliflower.

Step 2: Evaluating Individual Crop Contributions:
- **Potato (*Solanum tuberosum*):** Accounts for over 2.2 million hectares of cultivated area and produces over 53–56 million metric tonnes annually, ranking first in both acreage and total volume among all vegetables in India.
- **Tomato (*Solanum lycopersicum*):** Ranks second or third in production (around 20–21 million tonnes from about 0.84 million hectares).
- **Brinjal (*Solanum melongena*):** Produces approximately 12–13 million tonnes from around 0.73 million hectares.
- **Chilli (*Capsicum annuum*):** Occupies a significant area as a spice/condiment vegetable, but its total tonnage is much lower compared to tuber vegetables.

Step 3: Evaluating Area and Production Metrics:
Potato holds the highest total acreage among vegetables, surpassing tomato and brinjal combined, and produces more than double the volume of any other vegetable in the country.

Step 4: Final Answer:
Hence, Potato is the vegetable leading in both total area and production in India, corresponding to option (C).

Quick Tip: Leading Vegetables in India:
- **Highest Area and Production: Potato** ($>$ 50 million tonnes).
- **Second in Production: Onion** ($>$ 25–30 million tonnes).
- **Third in Production: Tomato** ($>$ 20 million tonnes).

27. The ideal temperature for mango cultivation is _____.

(A) 5 to 10°C

(B) 10 to 15°C

(C) 15 to 20°C

(D) 24 to 30°C

Correct Answer: (D) 24 to 30°C

Solution:

Concept:

Mango (*Mangifera indica*), known as the King of Fruits, is a tropical and subtropical perennial fruit crop indigenous to the Indo-Burma region.

Thermal regimes strongly govern its vegetative flushing, panicle initiation, anthesis, pollen tube growth, and fruit maturation.

Optimal ambient temperatures ensure proper metabolic enzyme kinetics and photosynthate assimilation throughout its phenological phases.

Extreme temperatures, whether severe frost or scorching heatwaves during flowering, cause flower desiccation and poor fruit set.

Step 1: Thermal Requirements of Mango:

Mango thrives best in regions with a warm, frost-free tropical to subtropical climate.

The physiological optimum temperature for healthy vegetative growth, shoot emergence, and fruit enlargement ranges between 24°C and 30°C.

Step 2: Assessing Low Temperature Sensitivity:

Temperatures below 10°C retard plant growth, cause floral malformation, reduce pollinator (housefly, *Musca domestica*) activity, and induce chilling injury in young tissues.

Temperatures between 5°C and 15°C are inadequate for active growth and fruit development.

Step 3: Assessing Upper Temperature Thresholds:

While mango trees can survive temperatures up to 45°C if soil moisture is sufficient, optimal

physiological function and maximum yield potential are achieved in the range of 24 to 30°C.

Step 4: Final Answer:

Therefore, the ideal temperature range for mango cultivation is 24 to 30°C, matching option (D).

Quick Tip: Mango Climatic Requirements:

- **Optimum Temperature:** 24–30°C.
- **Rainfall:** 750–2500 mm annually with a clear dry period before flowering.
- **Key Pollinator:** *Musca domestica* (Housefly).

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28. Interveinal chlorosis in crops is a typical characteristic of nutrient deficiency symptom of -

(A) Potassium

(B) Manganese

(C) Zinc

(D) Phosphorus

Correct Answer: (B) Manganese

Solution:

Concept:

Plant nutrient diagnostic keys utilize visual deficiency symptoms to identify specific mineral shortages in crop plants.

Interveinal chlorosis is characterized by the loss of chlorophyll (yellowing) in the laminar tissue between the veins of leaves while the veins themselves remain dark green.

The position on the plant (older leaves, middle leaves, or younger leaves) and the specific interveinal patterning help pinpoint the deficient nutrient element.

Manganese plays a fundamental role in the oxygen-evolving complex of photosystem II and chloroplast membrane integrity.

Step 1: Role and Symptomatology of Manganese (Mn):
Manganese (Mn^{2+}) is essential for the photolysis of water in photosynthesis, nitrogen metabolism, and enzyme activation.
Because manganese is relatively immobile in plant tissues, its deficiency typically manifests on middle-to-younger leaves.
The classic symptom is pronounced interveinal chlorosis, where veins remain green and produce a characteristic checkered or netted appearance, often followed by grey speck symptoms (e.g., Grey speck of oat, Marsh spot of pea).

Step 2: Evaluating Other Options:
- **Potassium (A):** Deficiency causes marginal chlorosis and scorching/firing along leaf tips and margins on older leaves.
- **Zinc (C):** Causes "little leaf", rosetting, and broad bleached bands (white bud in maize) due to impaired auxin synthesis.
- **Phosphorus (D):** Imparts dark green foliage followed by purple/bronze pigmentation along veins on older leaves due to anthocyanin accumulation.

Step 3: Final Answer:
Hence, interveinal chlorosis with a distinct green vein network is a characteristic symptom of Manganese deficiency, corresponding to option (B).

Quick Tip: Nutrient Deficiency Patterns:
- **Interveinal Chlorosis: Manganese (Mn)**, Iron (Fe), Magnesium (Mg - on older leaves).
- **Marginal Scorching:** Potassium (K).
- **Purple Pigmentation:** Phosphorus (P).
- **Rosetting / Little Leaf / White Bud:** Zinc (Zn).

---

29. The herbicides applied after the emergence of weeds and crops are called as _____.

(A) Post-emergence herbicides
(B) Pre-emergence herbicides

(C) Pre-plant herbicides

(D) Pre-harvest herbicides

Correct Answer: (A) Post-emergence herbicides

Solution:

Concept:

In weed science and chemical weed management, herbicides are systematically classified based on their time and method of application relative to the crop and weed growth stages.

The timing of chemical delivery determines whether the herbicide acts primarily through root uptake from soil or foliar absorption through weed leaves.

Selecting the proper application window ensures selective weed control while avoiding phytotoxic injury to the establishing main crop.

Understanding standard operational terminology is critical for field agronomy.

Step 1: Defining Time of Application Classes:

- **Pre-plant incorporation (PPI):** Applied and mixed into the soil before the crop is sown (e.g., Fluchloralin).
- **Pre-emergence (PRE):** Applied to the soil surface after sowing the crop seeds but before the crop and weed seedlings emerge above the ground (e.g., Pendimethalin, Atrazine).
- **Post-emergence (POST):** Applied directly onto the foliage after both the crop and weeds (or only the weeds) have emerged from the soil surface.
- **Pre-harvest:** Applied just before crop harvest as a desiccant or defoliant to facilitate mechanical harvesting.

Step 2: Identifying the Defined Term:

The question describes herbicides that are sprayed or applied after the emergence of both weeds and crops.

By standard agronomic definition, these chemicals are termed Post-emergence herbicides (e.g., 2,4-D, Sulfosulfuron, Clodinafop-propargyl).

Step 3: Final Answer:

Therefore, the herbicides applied after emergence are known as Post-emergence herbicides,

matching option (A).

Quick Tip: Herbicide Application Timing:

1. **Before Sowing:** Pre-plant incorporation (PPI).
2. **After Sowing, Before Germination:** Pre-emergence (PRE).
3. **After Crop/Weed Germination: Post-emergence (POST)**.

---

30. Localized death of tissue usually characterized by browning and desiccation is termed as _____.

(A) Chlorosis

(B) Necrosis

(C) Cracking

(D) Burning

Correct Answer: (B) Necrosis

Solution:

Concept:

Plant pathology and crop physiological disorders are identified by specific macroscopic symptoms caused by cellular damage, pathogen infection, or mineral deficiencies.

When plant cells lose membrane integrity and undergo irreversible death, localized morphological changes occur in leaves, stems, or fruits.

Differentiating between chlorophyll degradation and actual tissue death is essential for accurate field diagnosis.

Step 1: Defining Key Pathological Symptoms:

- **Necrosis:** The localized death of plant cells or tissues, typically accompanied by browning, darkening, drying out (desiccation), and collapse of the cellular matrix.

Examples include leaf spots, blights, cankers, and blossom-end rot.

- **Chlorosis:** The yellowing of green plant tissue caused by the degradation or insufficient synthesis of chlorophyll pigments; the cells remain alive but lack green color.
- **Cracking:** Physical splitting or rupturing of fruit peel or stem surfaces caused by rapid fluctuations in turgor pressure or boron/calcium deficiency.
- **Burning:** A broad descriptive symptom usually resulting from high chemical toxicity, fertilizer burn, or intense heat.

Step 2: Evaluating the Given Description:
The prompt specifies "localized death of tissue usually characterized by browning and desiccation."
This matches the formal pathological definition of Necrosis.

Step 3: Final Answer:
Thus, the correct terminology is Necrosis, which corresponds to option (B).

Quick Tip: Pathological Terminology:
- **Chlorosis:** Loss of green pigment (yellowing); tissue is still living.
- **Necrosis: Death of tissue** resulting in brown, dry, dead spots/areas.
- **Etiolation:** Yellowing and elongation caused by lack of light.

---

31. The recommended seed rate per hectare for hybrid tomato is-

(A) 100 to 125 gram
(B) 200 to 250 gram
(C) 300 to 450 gram
(D) 600 to 850 gram

Correct Answer: (A) 100 to 125 gram

Solution:

Concept:

Tomato (*Solanum lycopersicum*) is a commercially important solanaceous vegetable propagated mainly through nursery raising followed by transplanting into the main field.

The quantity of seed required per unit area varies significantly between open-pollinated (OP) varieties and F_1 hybrids.

Due to the high cost and high vigor of F_1 hybrid seeds, planting geometry is wider and seed rates are kept much lower than conventional varieties.

Step 1: Comparing Tomato Seed Rates:

- **Open-Pollinated (OP) Varieties:** Standard tomato cultivars require approximately 350–400 g/ha (or 300–500 g/ha) of certified seed to establish a plant population of about 30,000–35,000 plants per hectare.
- **Hybrid (F_1) Varieties:** F_1 hybrid seeds exhibit high germination percentages ($> 90\%$), high seedling vigor, and larger indeterminate/semi-determinate canopies.

Hybrids are planted at wider spacings (e.g., 90×60 cm or 120×60 cm).

Consequently, the recommended seed rate for hybrid tomato is only 100 to 150 g/ha (commonly cited as 100 to 125 g/ha in standard horticultural recommendations).

Step 2: Evaluating the Given Options:

- 100 to 125 g: Exact standard recommendation for F_1 hybrid tomato.
- 200 to 250 g: Intermediate rate, not standard for pure hybrids.
- 300 to 450 g: Standard rate for open-pollinated tomato varieties.
- 600 to 850 g: Excessive seed rate, typical of direct-seeded vegetable crops like okra.

Step 3: Final Answer:

The recommended seed rate per hectare for hybrid tomato is 100 to 125 gram, which is option (A).

Quick Tip: Tomato Seed Rate Standards:

- **Hybrid Tomato:** 100–150 **g/ha** (Optimum: 100–125 g/ha).
- **Open Pollinated Tomato:** 350–400 **g/ha**.
- **Brinjal Hybrid:** 150–200 g/ha; OP: 350–400 g/ha.
- **Chilli Hybrid:** 200–250 g/ha; OP: 1.0–1.5 kg/ha.

---

32. The term Standard, Spray, Pot-mums and Cascade are related to training of _____.

(A) Marigold

(B) Rose

(C) Chrysanthemum

(D) Canna

Correct Answer: (C) Chrysanthemum

Solution:

Concept:

Commercial floriculture and exhibition gardening employ specialized training and pruning techniques such as disbudding, pinching, and staking to produce specific floral forms.
Certain ornamental species possess high morphological plasticity, allowing them to be trained into various decorative styles for pots, cut-flower vases, and landscape arrangements.
Understanding standard horticultural terminology associated with leading commercial flowers is essential for crop-specific management.

Step 1: Analyzing the Architectural Forms Mentioned:

- **Standard:** Produced by removing all lateral flower buds (disbudding) to leave only one prominent central terminal bud, yielding a single large flower per stem.
- **Spray:** Produced by removing the terminal flower bud (pinching) to encourage the growth of multiple uniform lateral flower buds, resulting in a cluster or spray of smaller blooms.
- **Pot-mums:** Compact, bushy, dwarf potted plants produced through repeated pinching and growth retardants for indoor and patio display.

- **Cascade:** A specialized training style where plants are trained over a wire frame to create a flowing, waterfall-like cascade of blooming flowers.

Step 2: Associating with the Correct Crop:
All these specialized forms (Standard, Spray, Pot-mums, Cascade, Anemone, Pompon) are well-known cultural training classifications of Chrysanthemum (*Chrysanthemum morifolium* / *Dendranthema grandiflora*, known as the "Autumn Queen" or "Queen of the East").
The suffix "-mums" itself is the standard horticultural abbreviation for Chrysanthemums.

Step 3: Final Answer:
Therefore, these training styles are associated with Chrysanthemum, which corresponds to option (C).

Quick Tip: Chrysanthemum Floral Types and Training:
- **Standard:** Single large bloom per stem (terminal bud retained).
- **Spray:** Multiple medium/small blooms per stem (terminal pinched).
- **Pot-mums:** Bushy dwarf potted plants.
- **Cascade:** Trailing waterfall-like exhibition training.

---

33. Fruit and vegetables are an important component of Indian agriculture due to

A. High productivity of these crops

B. Economically sustainable alternative for diversification

C. High employment generation capacity

D. High nutritional, medicinal and export potential

Choose the correct answer from the options given below:

(A) A, B and D only

(B) A, C and D only

(C) A, B, C and D

(D) B, C and D only

Correct Answer: (C) A, B, C and D

Solution:

Concept:

Horticulture contributes over 33% of India's agricultural Gross Value Added (GVA) while occupying only about 13–15% of the total cropped area.

Fruits and vegetables play a transformative role in driving agricultural growth, ensuring nutritional security, generating farm employment, and enhancing foreign exchange earnings.

Evaluating the multiple socioeconomic and agronomic benefits of horticultural crops shows their importance in modern Indian agriculture.

Step 1: High Productivity (A):

Horticultural crops produce significantly higher biomass and economic yield per unit area compared to traditional field cereals and pulses (e.g., potato/banana yields reach 30–50 t/ha compared to 3–4 t/ha in cereals).

Step 2: Economic Diversification (B):

Shifting from traditional monoculture of foodgrains to high-value fruit and vegetable crops provides higher net returns per unit area, stabilizes farm revenue, and provides a sustainable pathway for agricultural diversification.

Step 3: High Employment Generation (C):

Horticultural crops are labor-intensive at all stages, including nursery raising, pruning, grafting, weeding, harvesting, grading, packaging, and post-harvest handling.

They generate substantially more man-days of employment per hectare than field crops.

Step 4: Nutritional, Medicinal, and Export Potential (D):

Fruits and vegetables are rich in essential vitamins, minerals, dietary antioxidants, and phytochemicals (protecting against malnutrition and lifestyle diseases).

Additionally, fresh fruits (mango, grapes, pomegranate) and processed products offer strong foreign export earnings.

Step 5: Final Answer:

Since all four statements A, B, C, and D are valid advantages of fruits and vegetables in Indian agriculture, option (C) is correct.

Quick Tip: Advantages of Horticultural Crops:
- High yield per unit area (Productivity).
- Higher farm income and risk diversification.
- Labor-intensive nature (High rural employment).
- Nutritional security and high export value.

All listed statements (A, B, C, D) are correct.

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34. Match the LIST-I with LIST-II

LIST-I Means of fruits and vegetables maturity		LIST-II Related methods	
A.	Visual means	I.	Ease of separation or abscission, firmness, specific gravity
B.	Physical means	II.	TSS, acidity, solid to acid ratio
C.	Chemical means	III.	Ethylene production
D.	Physiological method	IV.	Peel colour, size, drying of plant parts

Choose the correct answer from the options given below:

(A) A-I, B-II, C-III, D-IV

(B) A-IV, B-I, C-II, D-III

(C) A-I, B-II, C-IV, D-III

(D) A-III, B-IV, C-I, D-II

Correct Answer: (B) A-IV, B-I, C-II, D-III

Solution:

Concept:

Harvest maturity indices are objective and subjective criteria used to determine the optimal stage for picking fruits and vegetables.

Harvesting at the correct maturity stage ensures optimum eating quality, flavor, shelf life, and

processing suitability.
These indices are categorized based on their underlying measurement principles into visual, physical/mechanical, chemical, and physiological methods.

Step 1: Visual Means (A):
Visual methods rely on external optical observation without damaging the produce.
They include observing skin/peel color change (e.g., dark green to light green or yellow in mango), size and shape development, fullness of cheeks, or drying of aerial plant parts (e.g., top drying in onion/garlic).
Thus, A matches with IV. Peel colour, size, drying of plant parts.

Step 2: Physical Means (B):
Physical methods measure mechanical properties, density, or detachment force.
They include firmness (penetrometer/pressure tester), specific gravity (flotation method), and the ease of separation of fruit from the stalk (abscission zone formation).
Thus, B matches with I. Ease of separation or abscission, firmness, specific gravity.

Step 3: Chemical Means (C):
Chemical methods quantify internal biochemical constituents through laboratory or field instruments.
They include measuring Total Soluble Solids (TSS via refractometer), titratable acidity, TSS-to-acid ratio, starch-iodine index, and sugar content.
Thus, C matches with II. TSS, acidity, solid to acid ratio.

Step 4: Physiological Method (D):
Physiological methods monitor vital metabolic activities of the fruit tissue.
They include measuring the rate of respiration (CO_2 output) and the rate of internal ethylene (C_2H_4) gas evolution during the climacteric peak.
Thus, D matches with III. Ethylene production.

Step 5: Final Answer:
Matching these pairs gives A-IV, B-I, C-II, D-III, which corresponds to option (B).

Quick Tip: Maturity Index Classification:

- **Visual:** Skin colour, size, shape, foliage drying.
- **Physical:** Firmness, penetrometer, specific gravity, abscission.
- **Chemical:** TSS (°Brix), acidity, TSS/Acid ratio, starch.
- **Physiological:** Respiration rate, ethylene evolution.

---

35. Match the LIST-I with LIST-II

LIST-I Variety		LIST-II Crop	
A.	Pusa Muskan	I.	Marigold
B.	Arka Bangara	II.	Chrysanthemum
C.	Pusa Shagun	III.	Rose
D.	Pusa Anmol	IV.	Gladiolus

Choose the correct answer from the options given below:

(A) A-I, B-II, C-III, D-IV

(B) A-II, B-I, C-III, D-IV

(C) A-I, B-II, C-IV, D-III

(D) A-III, B-I, C-IV, D-II

Correct Answer: (D) A-III, B-I, C-IV, D-II

Solution:

Concept:

Several agricultural research institutes in India, notably ICAR-IARI (Indian Agricultural Research Institute, New Delhi) and ICAR-IIHR (Indian Institute of Horticultural Research, Bengaluru), breed and release specialized cultivars of commercial ornamental flowers.

These varieties carry prefix tags like "Pusa" (IARI) and "Arka" (IIHR).

Knowledge of specific variety releases and their corresponding flower crops is important for ornamental horticulture.

Step 1: Identifying Crop for Pusa Muskan (A):

'Pusa Muskan' is a variety of floribunda/hybrid tea Rose (*Rosa* spp.) developed and released by

ICAR-IARI, New Delhi.
Thus, A matches with III. Rose.

Step 2: Identifying Crop for Arka Bangara (B):
'Arka Bangara' is a high-yielding, golden-yellow flowered variety of African Marigold (*Tagetes erecta*) developed by ICAR-IIHR, Bengaluru, known for high petal meal and lutein content.
Thus, B matches with I. Marigold.

Step 3: Identifying Crop for Pusa Shagun (C):
'Pusa Shagun' is a popular cultivar of Gladiolus (*Gladiolus* spp.) developed by ICAR-IARI, featuring attractive florets and long spike length.
Thus, C matches with IV. Gladiolus.

Step 4: Identifying Crop for Pusa Anmol (D):
'Pusa Anmol' is a cultivar of Chrysanthemum (*Chrysanthemum morifolium*) bred by ICAR-IARI, suited for loose flower production and pot culture.
Thus, D matches with II. Chrysanthemum.

Step 5: Final Answer:
The resulting match is A-III, B-I, C-IV, D-II, which corresponds to option (D).

Quick Tip: Floriculture Variety Pairings:
- **Pusa Muskan** → Rose (III)
- **Arka Bangara / Arka Agni** → Marigold (I)
- **Pusa Shagun / Pusa Urmil** → Gladiolus (IV)
- **Pusa Anmol / Pusa Sona** → Chrysanthemum (II)

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36. What should be the most favorable temperature for tuber formation in potato?

(A) 8°C
(B) 12°C

(C) 14°C

(D) 17°C

Correct Answer: (D) 17°C

Solution:

Concept:

Potato (*Solanum tuberosum*) is a temperate, cool-season solanaceous tuber crop.

Its life cycle comprises two distinct thermal phases: vegetative shoot development and tuberization (initiation and swelling of underground stolons into tubers).

Tuberization is highly sensitive to soil and ambient temperatures; high temperatures inhibit the transport and accumulation of photosynthates into developing tubers.

Step 1: Vegetative Growth vs. Tuberization Temperatures:

- For early vegetative sprout emergence and foliar canopy growth, the optimum temperature is approximately 20–24°C.
- For underground stolon induction, initiation, and maximum tuber bulking rate, the optimum soil/ambient temperature is 17–20°C (specifically centered around 17–18°C).

Step 2: Effects of Temperature Deviations:

- **High Temperatures ($>$ 21°C):** Tuber growth slows down markedly. If temperatures exceed 29–30°C, tuberization completely ceases because assimilated carbohydrates are consumed by enhanced plant respiration rather than stored in tubers.
- **Low Temperatures ($<$ 10°C):** Plant enzymatic activities and tuber growth are severely reduced.

Step 3: Selecting the Optimum Choice:

Among the given values (8°C, 12°C, 14°C, and 17°C), 17°C represents the physiologically optimal temperature for tuber formation.

Step 4: Final Answer:

Thus, the most favorable temperature for tuber formation in potato is 17°C, which is option (D).

Quick Tip: Potato Temperature Cardinal Points:

- **Optimum for Tuberization:** 17–18°C.
- **Optimum for Vegetative Growth:** 20–24°C.
- **Tuberization Completely Ceases:** Above 29–30°C.

---

37. Brown heart of radish is due to the deficiency of _____.

(A) Calcium

(B) Boron

(C) Zinc

(D) Iron

Correct Answer: (B) Boron

Solution:

Concept:

Radish (*Raphanus sativus*) and other cruciferous root crops (like turnip and rutabaga) are susceptible to several non-pathogenic physiological disorders caused by micro- or macronutrient deficiencies.

Micronutrients maintain cellular wall stability, pectin synthesis, and carbohydrate translocation in rapidly expanding storage roots.

A deficiency of specific trace elements leads to internal tissue breakdown, discoloration, and cavity formation in roots.

Step 1: Identifying the Symptoms of Brown Heart:

"Brown heart" (also known as internal browning or dark center) is a physiological disorder characterized by water-soaked, translucent, dark-brown, or greyish necrotic internal tissues inside the storage root of radish and turnip.

The exterior of the root often looks normal, but the internal edible flesh becomes discolored, fibrous, and bitter.

Step 2: Identifying the Causal Nutrient Deficiency:

Boron (B) is essential for cell wall synthesis, membrane integrity, and borate-ester cross-linking of rhamnogalacturonan-II in root meristems.

When boron is deficient in the soil, rapidly growing internal parenchymal cells fail to form proper cell walls, leading to cell breakdown, polyphenolic oxidation, and browning.

Hence, Boron deficiency is the direct cause of Brown Heart in radish and turnip, as well as Browning/Hollow Stem in cauliflower.

Step 3: Evaluating the Other Choices:

- **Calcium (A):** Deficiency causes "tip burn" in cabbage and blossom-end rot in tomato.
- **Zinc (C):** Causes little leaf and fern leaf symptoms.
- **Iron (D):** Causes complete chlorosis of young leaves.

Step 4: Final Answer:

Therefore, Brown heart of radish is caused by Boron deficiency, corresponding to option (B).

Quick Tip: Key Boron Deficiency Disorders in Horticulture:

- **Brown Heart** of Radish, Turnip, and Rutabaga.
- **Browning / Brown Rot / Hollow Stem** of Cauliflower.
- **Internal Necrosis / Fruit Cracking** of Aonla and Pomegranate.
- **Hen and Chicken** disorder in Grapes.

---

38. What should be the temperature for pasteurization of fruit juices?

(A) 30-40°C for 20-30 minutes

(B) 50-60°C for 20-30 minutes

(C) 70-80°C for 20-30 minutes

(D) 85-90°C for 20-30 minutes

Correct Answer: (D) 85-90°C for 20-30 minutes

Solution:

Concept:

Pasteurization is a mild thermal processing method applied to acidic fruit juices, beverages, and liquid food products to destroy pathogenic microorganisms and inactivate spoilage enzymes (such as pectin methylesterase and polyphenol oxidase).

Unlike total sterilization ($> 100^\circ C$), pasteurization operates below the boiling point to preserve heat-sensitive vitamins, volatile aromas, and natural fresh flavors.

The time-temperature combination must be carefully controlled to ensure microbiological safety without degrading product quality.

Step 1: Thermal Resistance in Acidic Media:

Fruit juices naturally have a low pH ($pH < 4.5$), which inhibits the germination and growth of deadly spore-forming bacteria like *Clostridium botulinum*.

Therefore, the primary thermal targets in fruit juice processing are vegetative yeasts, molds, and lactic acid bacteria, along with native plant enzymes.

Step 2: Evaluating the Time-Temperature Standards:

- Commercial batch (holding) pasteurization of bottled fruit juices and squashes typically requires heating the product to $85^\circ C$ to $90^\circ C$ and holding it for 20 to 30 minutes (or high-temperature short-time HTST at 90–95°C for 15–30 seconds).
- Lower temperatures such as 30–40°C or 50–60°C fail to inactivate pectolytic enzymes and do not eliminate heat-tolerant yeasts.
- While 70–80°C is often used for milk pasteurization (72°C for 15 s), complete enzyme inactivation in acidic fruit juices standardly requires 85–90°C.

Step 3: Final Answer:

Thus, the recommended temperature and duration for the pasteurization of fruit juices is 85–90°C for 20–30 minutes, which is option (D).

Quick Tip: Fruit Processing Thermal Standards:

- **Fruit Juice Pasteurization (Batch):** 85–90°C **for** 20–30 **minutes**.
- **Flash Pasteurization (HTST):** 88–92°C for 15–30 seconds.
- **Sterilization of Non-Acid Vegetables:** 115–121°C under pressure.

---

39. Which of the following is not correct about the classification of annual flowers?

(A) Winter season annuals

(B) Rainy season annuals

(C) Late rainy season annuals

(D) Summer season annuals

Correct Answer: (C) Late rainy season annuals

Solution:

Concept:

Ornamental annual flowers are herbaceous flowering plants that complete their entire lifecycle (seed germination, vegetative development, blooming, seed setting, and senescence) within a single growing season or within one year.

In landscape gardening and commercial floriculture, annuals are systematically grouped into standard seasonal classes based on their optimal temperature, photoperiod, and sowing season.

Identifying standard horticultural groupings helps distinguish accepted classifications from non-standard categories.

Step 1: Examining the Standard Seasonal Classes of Annuals:

In Indian floriculture, annual flowers are categorized into three primary standard seasonal groups:

1. **Winter Season Annuals (Rabi Annuals):** Sown in September–October; thrive and bloom profusely during the cool winter months (e.g., Petunia, Pansy, Alyssum, Phlox, Dianthus, Calendula).

2. **Summer Season Annuals (Zaid Annuals):** Sown in February–March; tolerate hot, dry conditions and bloom during summer (e.g., Zinnia, Portulaca, Gomphrena, Kochia, Sunflower).
3. **Rainy Season Annuals (Kharif Annuals):** Sown in June–July with the onset of the monsoon; tolerate heavy rainfall and high humidity (e.g., Balsam, Cock's comb/Celosia, Amaranthus, Gaillardia).

Step 2: Identifying the Invalid Classification:
There is no standard or recognized horticultural category termed "Late rainy season annuals." Rainy season annuals fully encompass all monsoon-flowering types.

Step 3: Final Answer:
Therefore, "Late rainy season annuals" is not a correct classification of annual flowers, matching option (C).

Quick Tip: Standard Classification of Ornamental Annuals:
1. **Winter Annuals** (Petunia, Antirrhinum, Calendula)
2. **Summer Annuals** (Zinnia, Portulaca, Gaillardia)
3. **Rainy Season Annuals** (Balsam, Celosia, Cosmos)
"Late rainy season annuals" is not a valid classification.

---

40. The immediate removal of field heat from the produce is known as _____.

(A) Pre-sorting
(B) Dumping
(C) Pre-cooling
(D) Trimming

Correct Answer: (C) Pre-cooling

Solution:

Concept:

Freshly harvested fruits and vegetables retain sensible heat absorbed from solar radiation and ambient air in the field, termed "field heat."

High produce temperature accelerates cellular respiration, increases ethylene biosynthesis, accelerates moisture loss, and hastens post-harvest senescence.

Rapidly removing this heat immediately following harvest is the single most critical step in establishing the post-harvest cold chain and extending marketable shelf life.

Step 1: Defining Pre-cooling:

Pre-cooling is the rapid removal of field heat from freshly harvested horticultural commodities before storage, transport, or retail marketing.

It brings the internal pulp temperature down to the recommended storage temperature as quickly as possible, thereby significantly reducing respiration rate and microbial spoilage.

Common pre-cooling methods include room cooling, forced-air cooling, hydro-cooling, vacuum cooling, and package icing.

Step 2: Evaluating the Other Operations:

- **Pre-sorting (A):** The initial separation of unmarketable, diseased, damaged, or misshapen produce from healthy harvest before further grading.
- **Dumping (B):** The gentle unloading of harvested produce from field crates or bins into packing line conveyors or water flumes.
- **Trimming (D):** The mechanical removal of unwanted leaves, stems, roots, or damaged outer portions (e.g., removing outer leaves of cabbage/cauliflower).

Step 3: Final Answer:

Therefore, the immediate removal of field heat is termed Pre-cooling, corresponding to option (C).

Quick Tip: Post-Harvest Operations:

- **Field Heat Removal → Pre-cooling** (Hydro-cooling, Forced-air, Vacuum).
- Separation of defective produce → Pre-sorting / Culling.
- Removal of unwanted outer leaves/stalks → Trimming.

Comprehension for Question 41 to 45:

Goats and their importance in Indian livestock production and human health

Goats are vital part of rural India, valued for their hardiness and ability to survive in limited resources. India has a rich diversity of goat breeds each suitable for specific climates and production needs. Prominent dairy breeds include Jamunapari, Beetal, Barbari and Sirohi. The Jamunapari goat, often called as the 'Queen of goats', can yield more than 2 litres of milk per day. It is majestic breed of goat having convex nose line with a tuft of hair known as 'roman nose' or parrot mouth appearance. Angora, Saanen and Alpine are some of the important exotic breeds of goat. Goats are often referred as the 'poor man's cow, because they require lower investment than cattle and can survive on minimal or low quality feed, reproduce quickly, and provide continuous income through milk, meat, manure ad sale of kids. Their ability to thrive in drought-prone and resource-scarce regions makes them an indispensable asset for small and marginal farmers.

A major centre for goat research and breed improvement in the country is ICAR-Central Institute for Research on Goats CIRG located at Mathura, Uttar Pradesh, functioning under the Indian Council of Agricultural Research ICAR, Government of India.

The meat of mutton is called 'Chevon' and is widely consumed in the country and offers good remuneration to the goat rearing farmers. Goat's milk has seen rising demand due its digestibility and nutrition profile. They are rich in minerals like calcium, potassium, phosphorous and also vitamin-A. The easy digestibility in the strongest advantage of goat's milk making it suitable for individuals as it supports energy metabolism, gut health and immunity.

41. Which of the breed of goat has distinct feature of roman nose?

(A) Jamunapari

(B) Beetal

(C) Sirohi

(D) Barberi

Correct Answer: (A) Jamunapari

Solution:

Concept:

Goat breeds in India exhibit distinctive phenotypic breed characteristics such as ear shape, horn orientation, body size, and facial curvature.

The facial profile, particularly the nasal bone curvature, serves as a primary morphological identifier among indigenous dairy breeds.

Extracting descriptive morphological traits directly from the text confirms the distinctive physical features of the breed.

Step 1: Locating Relevant Text in the Passage:

The passage states:

"*The Jamunapari goat, often called as the 'Queen of goats', can yield more than 2 litres of milk per day. It is majestic breed of goat having convex nose line with a tuft of hair known as 'roman nose' or parrot mouth appearance.*"

Step 2: Analyzing the Morphological Trait:

A "Roman nose" refers to a pronounced convex nasal bridge curvature giving a parrot-mouth profile.

The passage explicitly identifies the Jamunapari breed as possessing this distinct facial feature.

Step 3: Final Answer:

Hence, the breed of goat characterized by a distinct Roman nose is Jamunapari, which corresponds to option (A).

Quick Tip: Key Features of Jamunapari Goat:

- Title: **Queen of Goats**.
- Distinct trait: **Roman nose** (convex nasal line / parrot mouth appearance) with long pendulous ears.
- Origin: Etawah district, Uttar Pradesh.

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42. Angora is an important exotic breed of-

(A) Cattle

(B) Buffalo

(C) Sheep

(D) Goat

Correct Answer: (D) Goat

Solution:

Concept:

Exotic livestock breeds are imported into India to improve indigenous stock through cross-breeding or to produce specialized commercial products like fine fiber and high milk yield.

Angora is globally recognized for producing mohair, a luxurious, durable, and lustrous textile fiber.

The provided passage classifies major exotic breeds according to their livestock species.

Step 1: Locating Relevant Text in the Passage:

The passage clearly notes:

"*Angora, Saanen and Alpine are some of the important exotic breeds of goat.*"

Step 2: Evaluating the Livestock Species:

- **Angora goat:** An exotic goat breed originating from Turkey (Ankara region) prized worldwide for its white, curly mohair fleece.
- (Note: Angora rabbit also produces angora wool, but among major livestock in agricultural

contexts and as per the passage, Angora is an exotic breed of Goat).

Step 3: Final Answer:

Therefore, Angora is an important exotic breed of Goat, which is option (D).

Quick Tip: Exotic Goat Breeds:

- **Angora:** Mohair fiber production.
- **Saanen:** Milk Queen of Goats (Switzerland).
- **Alpine & Toggenburg:** Famous European dairy goat breeds.

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43. ICAR-Central Institute of Research on Goats CIRG is located at _____.

(A) Mathura

(B) Bareilly

(C) Karnal

(D) Salem

Correct Answer: (A) Mathura

Solution:

Concept:

The Indian Council of Agricultural Research (ICAR) maintains specialized national research institutes dedicated to individual livestock and crop species.

The premier institute for goat development, genetic conservation, and goat product processing is the Central Institute for Research on Goats (CIRG).

The passage provides the exact geographical location of this apex national institute.

Step 1: Locating Relevant Information in the Text:

The passage states:

"*A major centre for goat research and breed improvement in the country is ICAR-Central Institute*

for Research on Goats CIRG located at Mathura, Uttar Pradesh, functioning under the Indian Council of Agricultural Research ICAR, Government of India."

Step 2: Geographical Specifics of CIRG:

ICAR-CIRG is situated specifically at Makhdoom, Farah, in the Mathura district of Uttar Pradesh.

Other institute locations:

- Bareilly (Izatnagar) hosts ICAR-IVRI (Indian Veterinary Research Institute) and ICAR-CARI (Central Avian Research Institute).
- Karnal hosts ICAR-NDRI (National Dairy Research Institute) and ICAR-CSSRI.

Step 3: Final Answer:

Therefore, ICAR-CIRG is located at Mathura, corresponding to option (A).

Quick Tip: Key ICAR Livestock Research Institutes:

- **Goats (CIRG):** Makhdoom, **Mathura** (UP).
- **Sheep and Wool (CSWRI):** Avikanagar (Rajasthan).
- **Buffaloes (CIRB):** Hisar (Haryana).
- **Cattle (CIRC):** Meerut (UP).
- **Dairy (NDRI):** Karnal (Haryana).

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44. Which of the following animal is called as poor man's cow?

(A) Buffalo

(B) Sheep

(C) Goat

(D) Poultry

Correct Answer: (C) Goat

Solution:

Concept:

Mahatma Gandhi historically coined the phrase "Poor man's cow" to highlight the unique socio-economic role of goats for landless, small, and marginal rural households.

Goats require low initial capital, adapt to sparse vegetation, reproduce prolificacy (often kidding twins or triplets), and provide a daily source of nutritious milk and liquid assets.

The passage reinforces this economic title and describes its underlying reasons.

Step 1: Locating Relevant Text in the Passage:

The passage states:

"*Goats are often referred as the 'poor man's cow', because they require lower investment than cattle and can survive on minimal or low quality feed, reproduce quickly, and provide continuous income through milk, meat, manure ad sale of kids.*"

Step 2: Rationale Behind the Epithet:

1. Low purchase and maintenance cost compared to dairy cattle or buffaloes.
2. Wide browsing habit allowing sustenance on thorny shrubs and degraded pastures.
3. Known as a "walking refrigerator" because they can be milked multiple times a day in small quantities as needed by families.

Step 3: Final Answer:

Hence, the animal referred to as the poor man's cow is the Goat, which is option (C).

Quick Tip: Livestock Nicknames:

- **Goat: Poor man's cow** / Walking refrigerator.
- **Jamunapari Goat:** Queen of Goats.
- **Saanen Goat:** Milk Queen of the World.

---

45. The meat of the goat is called as _____.

(A) Mutton

(B) Poultry

(C) Pork

(D) Chevron

Correct Answer: (D) Chevron

Solution:

Concept:

In animal science and meat technology, specific meat designations are assigned to different domesticated livestock species.

Using precise technical names distinguishes goat meat, sheep meat, swine meat, and poultry meat in trade and nutritional analysis.

The reading passage provides the proper technical name for goat meat.

Step 1: Locating Information in the Text:

The passage explicitly states:

"*The meat of mutton is called 'Chevon' and is widely consumed in the country...*"

(Note: Although commonly referred to colloquially as mutton in India, the correct scientific trade term for goat meat is Chevon).

Step 2: Evaluating Standard Meat Terminology:

- **Chevon / Chevron (D):** Meat of adult goats.
- **Mutton (A):** Meat of adult sheep (flesh of young sheep is lamb).
- **Pork (C):** Meat of pigs (swine).
- **Poultry (B):** Flesh of domesticated birds (chicken, turkey, duck).
- **Beef:** Meat of cattle; **Buffen / Carabeef:** Meat of buffalo.

Step 3: Final Answer:

Therefore, the meat of the goat is called Chevron (Chevon), which matches option (D).

Quick Tip: Standard Meat Names:

- **Goat meat: Chevon (Chevron)**
- **Sheep meat: Mutton** (Young: Lamb)
- **Pig meat: Pork**
- **Cattle meat: Beef** (Young calf: Veal)
- **Buffalo meat: Buffen / Carabeef**

Comprehension for Question 46 to 50:

Types of feed and their importance in animal nutrition

Cattle fodder is essential for maintaining animal health, improving milk yield and enhancing the overall farm productivity. In India, animal feed is broadly classified into green fodder, dry fodder, concentrate feed, preserved fodder and tree fodder, each contributing unique nutrients necessary for balance cattle nutrition. Green fodder provides moisture, vitamins, and digestible nutrients. The examples are bajra-napier hybrids, berseem, lucerne, mazie and sorghum. Leguminous fodder like berseem and lucerne are especially valued for their high protein content, which supports milk production and muscle development. Lucerne is also called as queen of fodder. The caution to be taken while using sorghum as green fodder as it contains hydrocyanic acid, especially in the young plans and when cultivated in drought stress conditions. High HCN is toxic to cattle and should be fed only after proper maturation.

Dry fodder supplies essential roughage for the animal health. It includes paddy straw, wheat straw, groundnut haulms and sorghum stover. Though they are low in protein, it provides necessary fibre and is often mixed with green fodder. Concentrate feeds are nutrient dense, which includes oil cakes, grains and bran. These are very significant for high yielding dairy cows, pregnant animals and growing calves due to their high protein and energy content. Silage made from maize and sorghum provides energy rich feed during the lean period.

Tree fodders are traditional source in many regions. Tress like subabul, banyan etc., provide protein rich leaves during dry seasons when green fodder is scarce. Tree fodders also support sustainable farming by preventing soil erosion and offering year round availability.

46. Which of the following feed gives good amount to vitamins to the farm animals?

(A) Green fodder

(B) Dry fodder

(C) Concentrates

(D) Hay

Correct Answer: (A) Green fodder

Solution:

Concept:

Balanced animal feeding requires a combination of roughages (succulent and dry) and concentrates to meet maintenance and production requirements.

Green forages are fresh, succulent feeds rich in moisture, carotene (provitamin A), vitamin E, and essential minerals.

The passage discusses the specific nutritional contributions of different animal feed categories.

Step 1: Locating Relevant Text in the Passage:

The passage clearly states in the first paragraph:

"*Green fodder provides moisture, vitamins, and digestible nutrients. The examples are bajra-napier hybrids, berseem, lucerne, mazie and sorghum.*"

Step 2: Nutritional Comparison:

- **Green fodder:** High in moisture (70–85%), carotene (precursor of Vitamin A), and water-soluble vitamins.
- **Dry fodder (straw/stover):** High in crude fiber and lignin, but low in digestible protein and vitamins.
- **Concentrates:** Dense in energy (TDN) and crude protein, but generally low in carotene unless fortified.

Step 3: Final Answer:

Therefore, Green fodder supplies good amounts of vitamins to farm animals, matching option (A).

Quick Tip: Feed Classification & Nutritional Roles:

- **Green Fodder:** High moisture, rich source of **Vitamins** (Carotene/Vit A) and digestible nutrients.
- **Dry Fodder:** Provides bulk, crude fibre, and roughage.
- **Concentrates:** High energy and digestible crude protein (DCP).

---

47. Which of the following is a tree fodder?

(A) Lucerne

(B) Maize

(C) Subabul

(D) Berseem

Correct Answer: (C) Subabul

Solution:

Concept:

Top feeds or tree fodders consist of foliage, tender twigs, and pods obtained from perennial woody trees and shrubs.

They provide nutritious green forage for ruminants during dry summer months and lean periods when conventional herbaceous green forages are scarce.

The passage identifies examples of perennial fodder trees used in livestock feeding.

Step 1: Locating Relevant Text in the Passage:

In the third paragraph, the passage states:

"*Tree fodders are traditional source in many regions. Tress like subabul, banyan etc., provide protein rich leaves during dry seasons when green fodder is scarce.*"

Step 2: Evaluating the Options:

- **Subabul (*Leucaena leucocephala*):** A fast-growing leguminous fodder tree whose protein-rich

leaves and tender shoots serve as tree fodder.

- **Lucerne (*Medicago sativa*):** An herbaceous perennial leguminous forage crop.
- **Maize (*Zea mays*):** An annual cereal grass fodder crop.
- **Berseem (*Trifolium alexandrinum*):** An annual winter leguminous forage herb.

Step 3: Final Answer:

Thus, Subabul is a tree fodder, which corresponds to option (C).

Quick Tip: Common Tree Fodders (Top Feeds):

- **Subabul** (*Leucaena leucocephala*)
- **Banyan** (*Ficus benghalensis*)
- **Neem** (*Azadirachta indica*)
- **Khejri** (*Prosopis cineraria*)
- **Gliricidia** (*Gliricidia sepium*)

---

48. Haulm refers to the dry fodder of which of the following crop?

(A) Paddy

(B) Wheat

(C) Groundnut

(D) Sorghum

Correct Answer: (C) Groundnut

Solution:

Concept:

Agricultural by-products and crop residues remaining after the harvest of primary economic produce are named according to established agronomic terminology.

These residues serve as dry roughages and supplemental livestock feed.

The passage details specific crop-residue names used for major agricultural crops.

Step 1: Locating Information in the Passage:

The second paragraph of the passage notes:

"*Dry fodder supplies essential roughage for the animal health. It includes paddy straw, wheat straw, groundnut haulms and sorghum stover.*"

Step 2: Agronomic Definitions of Crop Residues:

- **Groundnut haulms (C):** The dried vegetative above-ground vines, leaves, and stems remaining after pods are plucked; highly palatable and rich in protein (8–10% CP) for cattle.
- **Paddy straw (A):** The dried stems and leaves of harvested rice (*Oryza sativa*).
- **Wheat straw / Bhusa (B):** The crushed and chopped dried residue from wheat threshing.
- **Sorghum stover / Karbi (D):** The dried thick stalks and leaves of harvested sorghum or maize.

Step 3: Final Answer:

Therefore, Haulm specifically refers to the dry fodder of Groundnut, matching option (C).

Quick Tip: Crop Residue Terminology:

- **Groundnut / Legumes / Potato → Haulms / Vines**
- **Rice / Wheat / Oats → Straw (Bhusa)**
- **Sorghum / Maize / Pearl millet → Stover (Karbi)**

---

49. HCN is found in which of the green fodder?

(A) Rice

(B) Maize

(C) Napier

(D) Sorghum

Correct Answer: (D) Sorghum

Solution:

Concept:

Certain forage crops synthesize anti-nutritional factors or cyanogenic glucosides as a defensive chemical mechanism against herbivores.

When ingested, these glucosides are hydrolyzed into free hydrocyanic acid (HCN or prussic acid), which inhibits cytochrome oxidase in animal mitochondria, preventing cellular oxygen utilization and causing acute cyanide toxicity.

Identifying crops containing cyanogenic compounds is necessary for safe forage feeding.

Step 1: Locating Textual Evidence in the Passage:

The first paragraph of the passage states:

"*The caution to be taken while using sorghum as green fodder as it contains hydrocyanic acid, especially in the young plans and when cultivated in drought stress conditions. High HCN is toxic to cattle and should be fed only after proper maturation.*"

Step 2: Biochemical Mechanism in Sorghum:

Sorghum (*Sorghum bicolor*) produces the cyanogenic glucoside Dhurrin in its epidermal leaf tissues.

In young plants (less than 50 cm tall or under 35–40 days old) or under drought stress, dhurrin is rapidly hydrolyzed by enzymes into free hydrogen cyanide (HCN).

Fodder with an HCN concentration exceeding 200 ppm (200 mg/kg dry weight) is toxic and potentially fatal to livestock.

Step 3: Final Answer:

Hence, HCN is found in Sorghum green fodder, which corresponds to option (D).

Quick Tip: Toxicity Facts in Forages:

- **Sorghum (Jowar):** Contains **HCN / Prussic acid / Dhurrin** in young/drought-stressed shoots. Safe to feed after 50% flowering stage.
- **Subabul:** Contains **Mimosine**.
- **Napier grass:** Contains **Oxalates**.

50. Which of the following is referred as Queen of fodder?

(A) Berseem

(B) Lucerne

(C) Cowpea

(D) Stylo

Correct Answer: (B) Lucerne

Solution:

Concept:

Forage crops of high economic value and exceptional nutritional quality hold traditional honorary titles in agricultural science.

Leguminous fodder crops are valued for their high digestible crude protein content, palatability, multi-cut regeneration capacity, and soil nitrogen-fixing benefits.

Specific titles distinguish the "King" and "Queen" of forage crops.

Step 1: Locating Relevant Text in the Passage:

The passage explicitly states in the first paragraph:

"*Leguminous fodder like berseem and lucerne are especially valued for their high protein content, which supports milk production and muscle development. Lucerne is also called as queen of fodder.*"

Step 2: Evaluating Forage Crop Titles:

- **Lucerne / Alfalfa (*Medicago sativa*):** Referred to as the Queen of Fodder Crops due to its high crude protein (18–22%), rich mineral and vitamin profile, deep root system, and longevity.
- **Berseem / Egyptian Clover (*Trifolium alexandrinum*):** Known as the King of Fodder Crops due to its succulent, high-yielding green forage during winter in irrigated areas.
- **Maize (*Zea mays*):** Known as the Queen of Cereals.

Step 3: Final Answer:

Thus, the crop referred to as the Queen of fodder is Lucerne, which is option (B).

Quick Tip: Honorary Titles of Fodder Crops:

- **King of Fodder Crops: Berseem** (*Trifolium alexandrinum*)
- **Queen of Fodder Crops: Lucerne / Alfalfa** (*Medicago sativa*)
- **King of Cereals:** Wheat
- **Queen of Cereals:** Maize
