

CUET PG 2025 Horticulture Question Paper with Solutions

Time Allowed :1 Hour 45 Mins	Maximum Marks :300	Total Questions :75
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General Instructions

Read the following instructions very carefully and strictly follow them:

1. The examination duration is 90 minutes. Manage your time effectively to attempt all questions within this period.
2. The total marks for this examination are 300. Aim to maximize your score by strategically answering each question.
3. There are 75 mandatory questions to be attempted in the Agro forestry paper. Ensure that all questions are answered.
4. Questions may appear in a shuffled order. Do not assume a fixed sequence and focus on each question as you proceed.
5. The marking of answers will be displayed as you answer. Use this feature to monitor your performance and adjust your strategy as needed.
6. You may mark questions for review and edit your answers later. Make sure to allocate time for reviewing marked questions before final submission.
7. Be aware of the detailed section and sub-section guidelines provided in the exam. Understanding these will aid in effectively navigating the exam.

1. Arrange the following vegetables in increasing order of their production based on Area and Production Estimates of Horticulture Crops 2021-22 (Final) -

- (A). Bitter gourd
- (B). Cabbage
- (C). Cucumber
- (D). Cauliflower

Choose the correct answer from the options given below:

- (A) (A), (C), (D), (B).
- (B) (A), (B), (C), (D).
- (C) (B), (C), (A), (D).
- (D) (C), (B), (D), (A).

Correct Answer: (1) (A), (C), (D), (B).

Solution:

Step 1: Understanding the Concept:

The objective of this question is to correctly sequence four different vegetables—Bitter gourd, Cabbage, Cucumber, and Cauliflower—according to their production volume, from the least produced to the most produced. To accomplish this, one must refer to the official production statistics for India for the 2021-22 period as specified in the final estimates for horticulture crops.

Step 2: Key Formula or Approach:

The required methodology involves sourcing the production data, typically measured in '000 metric tonnes or lakh tonnes, for each of the four vegetables from the "Area and Production Estimates of Horticulture Crops 2021-22 (Final)" report. Subsequently, these figures must be arranged in ascending order, from the lowest production quantity to the highest.

Step 3: Detailed Explanation:

According to the Second Advance Estimates for 2021-22 issued by the Ministry of Agriculture and Farmers Welfare, which are closely representative of the final figures, the production data for the vegetables are as follows:

- **(A) Bitter gourd:** The total estimated production was approximately 13.33 lakh metric tonnes (equivalent to 1,333 '000 MT).
- **(C) Cucumber:** The total estimated production stood at approximately 16.08 lakh metric tonnes (equivalent to 1,608 '000 MT).
- **(D) Cauliflower:** Often reported alongside Broccoli, the production of Cauliflower was estimated to be around 95.55 lakh metric tonnes.
- **(B) Cabbage:** The total production of Cabbage was estimated at approximately 105.78 lakh metric tonnes.

When these production volumes are arranged in ascending order, the sequence is:

1. Bitter gourd (A) - $\approx$ 13.33 lakh MT
2. Cucumber (C) - $\approx$ 16.08 lakh MT
3. Cauliflower (D) - $\approx$ 95.55 lakh MT
4. Cabbage (B) - $\approx$ 105.78 lakh MT

This results in the correct increasing order of (A), (C), (D), (B).

Step 4: Final Answer:

The proper sequence of the vegetables when ordered by increasing production volume is Bitter gourd, followed by Cucumber, then Cauliflower, and finally Cabbage. This order directly corresponds to option (A), (C), (D), (B).

 Quick Tip

For questions based on specific government reports or data, it's crucial to be familiar with the latest annual or biennial publications, such as the Horticulture/Agriculture Statistics at a Glance. Often, remembering the relative order of major crops is more important than memorizing exact numbers.

2. Lalbagh Garden is situated at

- (A) Bengaluru
- (B) Mysore
- (C) Srinagar
- (D) Chandigarh

Correct Answer: (1) Bengaluru

Solution:

Step 1: Understanding the Concept:

This question seeks to identify the city where the renowned Lalbagh Garden is located. It falls under the category of general knowledge, specifically focusing on significant landmarks and heritage sites within India.

Step 2: Detailed Explanation:

The Lalbagh Botanical Garden is a historically significant and widely recognized botanical garden situated in the southern part of Bengaluru, India. Its creation was initiated in 1760 under the commission of Hyder Ali, the then-ruler of Mysore, with its development being concluded by his son, Tipu Sultan. It stands as a premier tourist destination for the city and is geographically located in the Mavalli neighbourhood of Bengaluru, in the state of Karnataka.

Step 3: Final Answer:

Consequently, the correct location for Lalbagh Garden is the city of Bengaluru.

 Quick Tip

Memorizing the locations of famous gardens, national parks, and historical monuments is a common requirement for general knowledge sections in competitive exams. Creating a list of these landmarks state-wise can be a helpful study aid.

3. 'Pinjore Garden' in Chandigarh is a beautiful example of

- (A) Rock Garden
- (B) Terrace Garden
- (C) Bog Garden
- (D) Water Garden

Correct Answer: (2) Terrace Garden

Solution:

Step 1: Understanding the Concept:

The purpose of this question is to determine the specific architectural or design classification to which the Pinjore Garden, also known as Yadavindra Gardens, belongs from the given choices.

Step 2: Detailed Explanation:

Pinjore Gardens, situated in Pinjore near the city of Chandigarh, serves as a quintessential illustration of the Mughal Gardens architectural style. A fundamental design element of Mughal gardens, particularly those constructed on terrain with a natural slope, is the incorporation of terraces. Pinjore Garden is meticulously designed with a series of seven terraces that descend in elevation. This terraced layout is its most prominent structural attribute, which produces a magnificent visual progression as one explores the garden. Although it incorporates features of a water garden, such as a central water channel with fountains, and adheres to the Mughal style, its most defining structural characteristic among the options provided is its terrace-based design. It is important to distinguish it from the famous Rock Garden of Chandigarh, which is an entirely separate and unique garden created by Nek Chand.

Step 3: Final Answer:

Considering its layout across seven descending levels, Pinjore Garden is a splendid example of a Terrace Garden, executed in the traditional Mughal style.

💡 Quick Tip

When identifying garden types, look for the most defining structural or stylistic feature. Pinjore Garden's Mughal origin is key, and terraces are a hallmark of this style, especially on sloped terrain. Don't confuse it with the Rock Garden, another famous site in Chandigarh.

4. Cacti and Succulents are suitable for

- (A) Water Garden
- (B) Bog Garden
- (C) Rock Garden
- (D) Terrace Garden

Correct Answer: (3) Rock Garden

Solution:

Step 1: Understanding the Concept:

This question requires identifying which garden environment is optimally suited for the cultivation of cacti and succulents, based on their specific horticultural needs and natural adaptations.

Step 2: Detailed Explanation:

Cacti and succulent plants are evolutionarily adapted to thrive in arid or dry climates. A critical requirement for their survival is soil with excellent drainage, as they are highly susceptible to root rot in waterlogged conditions.

- A **Water Garden** and a **Bog Garden** are defined by their high levels of moisture and saturated soil, making them entirely inappropriate for these types of plants.
- A **Terrace Garden** refers to a structural design feature and does not intrinsically specify the soil composition or moisture content.
- A **Rock Garden**, also known as a rockery, is intentionally designed to replicate a rocky, often alpine, habitat. The integration of rocks, gravel, and sandy soil mixtures ensures the superior drainage that is essential for the health and growth of cacti and succulents. Consequently, a rock garden provides the perfect setting for cultivating these plants.

Step 3: Final Answer:

Due to its characteristic excellent drainage properties, a Rock Garden is the most suitable environment for Cacti and Succulents.

 Quick Tip

Match the plant's natural habitat to the garden type. Cacti and succulents are desert/arid plants, so they need a garden that replicates those conditions—dry, well-drained, and sunny. A rock garden is the perfect fit.

5. 'Water garden with fountains' is a special feature of

- (A) Mughal Garden
- (B) Rock Garden
- (C) French Garden
- (D) English Garden

Correct Answer: (1) Mughal Garden

Solution:**Step 1: Understanding the Concept:**

The objective is to associate the distinctive feature of a 'water garden with fountains' with its corresponding historical garden style from the options provided.

Step 2: Detailed Explanation:

The integration of water is a fundamental and indispensable component of Mughal garden architecture. These gardens are characteristically structured in a rectilinear layout known as Charbagh (meaning four gardens), where water channels, reflective pools, and fountains serve as the central axes. The presence of flowing water was intended not only to create a cool and refreshing microclimate but also to symbolize the rivers of paradise as depicted in the Quran. Fountains and pools were strategically employed to mirror the sky and surrounding architecture, thereby enhancing the garden's aesthetic appeal and tranquil atmosphere. While formal water elements are also found in French gardens, the particular combination described as a 'water garden with fountains' is most famously and fundamentally linked to the Mughal style.

Step 3: Final Answer:

The 'water garden with fountains' is a special and defining characteristic inherent to the design of a Mughal Garden.

💡 Quick Tip

Associate key features with garden styles. Mughal Gardens = Water, symmetry, Charbagh layout. English Gardens = Naturalistic, informal, flowing landscapes. French Gardens = Formal, geometric, grand vistas. Rock Gardens = Stones, alpine plants, drainage.

6. The quickest method of developing lawn is

- (A) By seed sowing
- (B) By dibbling method
- (C) Turfing
- (D) By turf plastering

Correct Answer: (3) Turfing

Solution:**Step 1: Understanding the Concept:**

This question evaluates different horticultural techniques for lawn establishment to determine which method yields a fully developed lawn in the shortest amount of time.

Step 2: Detailed Explanation:

An analysis of the proposed methods reveals the following:

- **Seed Sowing:** This technique involves distributing grass seeds across a prepared soil surface. It is considered the most time-consuming method because it depends on the germination of seeds and the subsequent growth of seedlings to achieve complete lawn coverage.
- **Dibbling:** This method consists of planting small sections or 'plugs' of grass roots at spaced intervals. While it is quicker than seeding, it still necessitates a period of growth for the grass to spread and fill in the bare areas between the plugs.
- **Turfing:** This process involves laying down pre-cultivated sections of mature grass, known as sod or turf, directly onto the prepared soil. Because the grass is already fully grown and dense, this technique creates the effect of an "instant lawn." It is universally regarded as the most rapid method for establishing a complete and functional lawn.
- **Turf Plastering:** In this technique, a paste-like mixture of soil, manure, and finely chopped grass roots or stems is spread over the ground. It establishes a lawn more quickly than seeding but is typically slower than turfing in achieving a dense, uniform sward.

By comparing these alternatives, it is clear that turfing offers immediate ground coverage and is therefore the most expeditious method for developing a lawn.

Step 3: Final Answer:

The most rapid technique for establishing a new lawn is Turfing.

💡 Quick Tip

Think of the starting material for each method. Seeding starts from scratch. Dibbling uses small pieces. Turfing uses a finished product (a mature mat of grass). Therefore, turfing is the fastest way to get a finished lawn.

7. In Controlled Atmospheric Storage, oxygen and carbon dioxide gases are maintained as

- (A) Low concentration of oxygen and high concentration of carbon dioxide
- (B) High concentration of oxygen and low concentration of carbon dioxide
- (C) Low concentration of oxygen and low concentration of carbon dioxide
- (D) High concentration of oxygen and high concentration of carbon dioxide

Correct Answer: (1) Low concentration of oxygen and high concentration of carbon dioxide

Solution:

Step 1: Understanding the Concept:

The question pertains to the specific atmospheric conditions maintained in Controlled Atmosphere (CA) storage, a post-harvest technology designed to prolong the viability of fresh produce such as fruits and vegetables. The fundamental principle of this method is to significantly decelerate the natural metabolic processes of respiration and ripening.

Step 2: Detailed Explanation:

Cellular respiration in harvested produce involves the consumption of oxygen (O_2) and the emission of carbon dioxide (CO_2), a process analogous to animal breathing. This metabolic activity breaks down stored organic compounds, like sugars, leading to the eventual senescence and decay of the produce. To mitigate this, CA storage deliberately alters the gaseous composition of the storage environment:

- **Oxygen (O_2) level is lowered:** The normal atmosphere contains approximately 21% oxygen. Within a CA facility, this concentration is substantially reduced, typically to a level between 1% and 5%. Reducing the available oxygen directly curtails the rate of respiration.
- **Carbon Dioxide (CO_2) level is elevated:** The ambient air has a very low concentration of CO_2 (around 0.04%). In CA storage, the CO_2 concentration is artificially increased. This higher level of carbon dioxide acts as an inhibitor for both the respiration process and the effects of ethylene, the hormone responsible for ripening.

Thus, the standard practice for CA storage involves maintaining an atmosphere with a low concentration of oxygen and a concentration of carbon dioxide that is significantly higher than normal.

Step 3: Final Answer:

Within a Controlled Atmospheric Storage system, the environment is regulated to have a low concentration of oxygen and a high concentration of carbon dioxide.

💡 Quick Tip

To preserve produce, you want to put it to "sleep." This means slowing down its breathing (respiration). You achieve this by reducing the oxygen it needs to "breathe" and increasing the carbon dioxide it "exhales," which further slows the process.

8. On the basis of ripening behaviour, choose the non climacteric fruits

- (A). Litchi
- (B). Grape
- (C). Jackfruit

(D). Pineapple

Choose the correct answer from the options given below:

(A) (A), (B) and (D) only.

(B) (A), (B) and (C) only.

(C) (A), (B), (C) and (D).

(D) (B), (C) and (D) only.

Correct Answer: (1) (A), (B) and (D) only.

Solution:

Step 1: Understanding the Concept:

This question centers on the physiological classification of fruits based on their ripening patterns. Fruits are divided into two primary groups:

- **Climacteric fruits:** These are fruits that are capable of continuing their ripening process even after being detached from the parent plant. Their post-harvest ripening is marked by a significant increase in respiration rate and a burst of ethylene production, which is a natural ripening hormone. Common examples include bananas, mangoes, and apples.
- **Non-climacteric fruits:** These fruits mature on the plant and do not ripen further after being harvested. They need to be picked at or near their peak ripeness. These fruits do not exhibit the characteristic spike in respiration or ethylene production post-harvest. Examples include citrus, grapes, and strawberries.

The task is to correctly select the fruits from the list that fall into the non-climacteric category.

Step 2: Detailed Explanation:

A classification of each fruit is as follows:

- **(A) Litchi:** Litchi is a definitive example of a non-climacteric fruit. Once harvested, it does not continue to ripen, and its quality begins to decline.
- **(B) Grape:** Grapes are also classified as non-climacteric. They must be harvested when fully mature and sweet, as their sugar content will not increase after being picked.
- **(C) Jackfruit:** In contrast, Jackfruit is a climacteric fruit. It is known to continue ripening, softening, and developing its characteristic aroma after it has been harvested.
- **(D) Pineapple:** Pineapple is categorized as a non-climacteric fruit. While the external skin color might change post-harvest, the internal flesh does not become sweeter or ripen further.

Following this classification, Litchi, Grape, and Pineapple are the non-climacteric fruits.

Step 3: Final Answer:

The fruits from the provided list that are classified as non-climacteric are (A) Litchi, (B) Grape, and (D) Pineapple. This selection matches the option (A), (B) and (D) only.

 Quick Tip

A simple rule of thumb for exams: If a fruit needs to be bought when it's already ripe and won't get better on your kitchen counter (like berries, citrus, grapes), it's likely non-climacteric. If you can buy it green and it will ripen (like bananas, avocados, mangoes), it's climacteric.

9. Arrange the following fruits in decreasing order of their area of cultivation based on Area and Production estimates of Horticulture Crops 2021-22 (Final) -

- (A). Pomegranate
- (B). Pineapple
- (C). Plum
- (D). Papaya

Choose the correct answer from the options given below:

- (A) (A), (B), (C), (D).
- (B) (A), (D), (B), (C).
- (C) (B), (A), (D), (C).
- (D) (C), (B), (D), (A).

Correct Answer: (2) (A), (D), (B), (C).

Solution:

Step 1: Understanding the Concept:

The objective of this question is to rank the provided list of fruits from the largest to the smallest, based on the total geographical area dedicated to their cultivation within India, referencing the final statistical estimates for the 2021-22 period.

Step 2: Key Formula or Approach:

The strategy to solve this is to access or recall the approximate cultivation area for each of the four fruits from the designated horticulture report. After obtaining the data, the fruits must be arranged in a descending sequence, starting with the largest area and ending with the smallest.

Step 3: Detailed Explanation:

Based on data from the Horticulture Statistics at a Glance and associated reports for the 2021-22 period, the approximate cultivation areas for these fruits in India are as follows:

- **(A) Pomegranate:** The land area dedicated to pomegranate cultivation is quite substantial, estimated to be around 2.9 lakh hectares.
- **(D) Papaya:** The area under papaya cultivation is estimated to be approximately 1.5 lakh hectares.
- **(B) Pineapple:** The cultivation of pineapple covers an area of roughly 1.1 lakh hectares.
- **(C) Plum:** Being a temperate fruit, plum cultivation is restricted to specific geographical regions, resulting in a much smaller total area, estimated at about 0.3 lakh hectares.

Organizing these fruits in decreasing order based on their cultivation area yields the following ranking:

1. Pomegranate (A) - $\approx$ 2.9 lakh Ha
2. Papaya (D) - $\approx$ 1.5 lakh Ha
3. Pineapple (B) - $\approx$ 1.1 lakh Ha
4. Plum (C) - $\approx$ 0.3 lakh Ha

Therefore, the correct sequence in decreasing order is (A), (D), (B), (C).

Step 4: Final Answer:

The correct arrangement of the fruits in descending order of their cultivation area is Pomegranate, Papaya, Pineapple, and Plum. This sequence corresponds to option (A), (D), (B), (C).

Quick Tip

For questions involving statistical data, it's helpful to remember the relative rankings of major crops rather than the exact figures. Tropical/sub-tropical fruits like Papaya and Pomegranate generally have a larger cultivation area in India than temperate fruits like Plum.

10. Based on botanical relationships, choose the correct combinations

- (A). Apocynaceae- Aonla
- (B). Rosaceae- Loquat
- (C). Tiliaceae- Phalsa
- (D). Myrtaceae- Jamun

Choose the correct answer from the options given below:

- (A) (A), (B) and (D) only.
- (B) (A), (B) and (C) only.
- (C) (A), (B), (C) and (D).
- (D) (B), (C) and (D) only.

Correct Answer: (4) (B), (C) and (D) only.

Solution:

Step 1: Understanding the Concept:

This question assesses one's understanding of plant taxonomy, requiring the identification of correctly matched pairs of fruit plants and their respective scientific families.

Step 2: Detailed Explanation:

Let's individually assess the botanical accuracy of each given pair:

- **(A) Apocynaceae - Aonla:** The Aonla, or Indian Gooseberry (with the scientific name *Phyllanthus emblica*), belongs to the family Phyllanthaceae. Historically, it was sometimes placed under Euphorbiaceae. The Apocynaceae family, in contrast, includes plants such as periwinkle and oleander. Therefore, this pairing is **incorrect**.
- **(B) Rosaceae - Loquat:** The Loquat (*Eriobotrya japonica*) is correctly classified as a member of the Rosaceae family. This large family also includes other well-known fruits like apples, pears, and plums. This pairing is **correct**.
- **(C) Tiliaceae - Phalsa:** The Phalsa fruit (*Grewia asiatica*) is traditionally classified under the family Tiliaceae. While modern APG (Angiosperm Phylogeny Group) classifications now place it within the Malvaceae family, the Tiliaceae classification remains widely recognized and accepted in many academic and examination contexts. Thus, this combination is considered **correct**.
- **(D) Myrtaceae - Jamun:** The Jamun, also known as Black Plum (*Syzygium cumini*), is a member of the Myrtaceae family, which also includes other notable plants like guava and eucalyptus. This pairing is **correct**.

Based on this analysis, the correctly matched combinations are (B), (C), and (D).

Step 3: Final Answer:

The botanically correct combinations are Loquat with Rosaceae, Phalsa with Tiliaceae, and Jamun with Myrtaceae. Consequently, the correct choice is the option that includes (B), (C) and (D) only.

 Quick Tip

Knowing the botanical families of major crops is essential. Create a chart listing common fruits, vegetables, and flowers and their respective families. Pay attention to common families like Rosaceae (apple, pear, stone fruits), Myrtaceae (guava, jamun), and Solanaceae (tomato, potato, pepper).

11. In plant cells, the cell wall has abundance of which polysaccharide?

- (A) Chitin
- (B) Cellulose
- (C) Starch
- (D) Glycogen

Correct Answer: (2) Cellulose

Solution:

Step 1: Understanding the Concept:

This question aims to identify the specific polysaccharide that constitutes the primary and most plentiful structural material within the cell walls of plants.

Step 2: Detailed Explanation:

A breakdown of the given options clarifies their roles:

- **Chitin:** This is a structural polysaccharide, but it is characteristic of the cell walls in fungi and forms the hard exoskeletons of arthropods like insects and crustaceans, not plants.
- **Cellulose:** This complex carbohydrate is a polysaccharide composed of long chains of glucose molecules. It serves as the principal structural component of plant cell walls, providing them with rigidity, tensile strength, and structural support. Cellulose is also recognized as the most abundant organic compound on Earth.
- **Starch:** This polysaccharide is the primary form of energy storage in plants. It is typically found as granules within cell organelles called plastids (such as chloroplasts and amyloplasts) and is not a structural element of the cell wall.
- **Glycogen:** This is the main polysaccharide used for energy storage in animals and fungi, serving a function analogous to starch in plants.

Based on this, cellulose is unequivocally the polysaccharide present in abundance in the cell walls of plants.

Step 3: Final Answer:

The plant cell wall is predominantly composed of the polysaccharide Cellulose.

💡 Quick Tip

Remember the distinct roles of major polysaccharides: Cellulose = Structure in plants; Chitin = Structure in fungi/insects; Starch = Energy storage in plants; Glycogen = Energy storage in animals.

12. Based on the growing season, choose the correct combinations

- (A). Summer season- Kochia
- (B). Winter season- Petunia
- (C). Summer season- Gaillardia
- (D). Winter season- Balsam

Choose the correct answer from the options given below:

- (A) (A), (B) and (D) only.
- (B) (A), (B) and (C) only.
- (C) (A), (B), (C) and (D).
- (D) (B), (C) and (D) only.

Correct Answer: (2) (A), (B) and (C) only.

Solution:

Step 1: Understanding the Concept:

The question evaluates knowledge of horticulture, specifically concerning the appropriate growing seasons for several popular ornamental annual flowers, particularly within the climatic conditions prevalent in the plains of India.

Step 2: Detailed Explanation:

Let's review the growing season for each plant listed:

- **(A) Summer season - Kochia:** Kochia, often called Summer Cypress for its appearance, is a foliage plant that thrives in heat and is cultivated as a summer annual. This combination is therefore **correct**.
- **(B) Winter season - Petunia:** Petunia is among the most widely grown winter-flowering annuals in the Indian plains, as it flourishes in cooler temperatures. This combination is **correct**.
- **(C) Summer season - Gaillardia:** Gaillardia, also known as the Blanket Flower, is noted for its tolerance to drought and high temperatures, flowering abundantly throughout the summer and monsoon seasons. This combination is **correct**.

- **(D) Winter season - Balsam:** Balsam (*Impatiens balsamina*) is a classic rainy season (monsoon) annual. It prefers warm and humid environments and is not cultivated as a winter season flower. This combination is **incorrect**.

Consequently, the accurately paired combinations are (A), (B), and (C).

Step 3: Final Answer:

The correct associations between plants and their respective growing seasons are Kochia with Summer, Petunia with Winter, and Gaillardia with Summer. This confirms that the correct option is (A), (B) and (C) only.

💡 Quick Tip

For floriculture questions, classify common annual flowers into three main seasons for the Indian plains: Winter (e.g., Petunia, Pansy, Calendula), Summer (e.g., Zinnia, Gaillardia, Kochia), and Rainy (e.g., Balsam, Celosia, Gomphrena).

13. Based on growth behavior, choose the correct combinations

- (A). Tree- Vanilla
- (B). Shrub- Tea
- (C). Vine- Black pepper
- (D). Tree- Nutmeg

Choose the correct answer from the options given below:

- (A) (A), (B) and (D) only.
- (B) (A), (B) and (C) only.
- (C) (A), (B), (C) and (D).
- (D) (B), (C) and (D) only.

Correct Answer: (4) (B), (C) and (D) only.

Solution:

Step 1: Understanding the Concept:

This question requires an understanding of plant morphology, asking to validate the pairings between specific plants and their characteristic growth forms, such as tree, shrub, or vine.

Step 2: Detailed Explanation:

An examination of each plant and its associated growth habit is as follows:

- **(A) Tree - Vanilla:** The spice vanilla is derived from the seed pods of an orchid, *Vanilla planifolia*. This plant is a perennial herbaceous **vine** that requires support, often a tree,

to climb. As it is a vine, not a tree, this pairing is **incorrect**.

- **(B) Shrub - Tea:** The tea plant, scientifically known as *Camellia sinensis*, is an evergreen **shrub**. In commercial cultivation, it is regularly pruned to maintain a manageable height, which facilitates the harvesting of its leaves. This classification is **correct**.
- **(C) Vine - Black pepper:** Black pepper (*Piper nigrum*) is a perennial flowering **vine**. It is cultivated for its fruit, the peppercorn, and grows by ascending trees or other forms of support. This pairing is **correct**.
- **(D) Tree - Nutmeg:** The spices nutmeg and mace are both sourced from the fruit of *Myristica fragrans*, which is a large evergreen **tree**. This pairing is **correct**.

Therefore, the combinations that are accurately described are (B), (C), and (D).

Step 3: Final Answer:

The correct pairings of plants and their growth behaviors are Tea-Shrub, Black pepper-Vine, and Nutmeg-Tree. This makes the option including (B), (C) and (D) only the correct choice.

💡 Quick Tip

When studying spices and plantation crops, make a note of their growth habit (e.g., Cardamom - perennial herb; Clove - tree; Black Pepper - vine; Tea - shrub). This is a common area for questions in botany and agriculture exams.

14. Choose the correct combination based on nutrient availability

- (A). Protein- Almond
- (B). Carbohydrate- Apricot
- (C). Fibre- Guava
- (D). Fat- Papaya

Choose the correct answer from the options given below:

- (A) (A), (B) and (D) only.
- (B) (A), (B) and (C) only.
- (C) (A), (B), (C) and (D).
- (D) (B), (C) and (D) only.

Correct Answer: (2) (A), (B) and (C) only.

Solution:

Step 1: Understanding the Concept:

The purpose of this question is to assess nutritional knowledge by identifying the correct associations between specific foods (fruits and a nut) and the primary macronutrient they are well-known for providing.

Step 2: Detailed Explanation:

Let's assess the nutritional profile of each given combination:

- **(A) Protein - Almond:** Almonds are a type of nut recognized for being a rich source of healthy monounsaturated fats, dietary fibre, and a significant amount of plant-based **protein**. This association is **correct**.
- **(B) Carbohydrate - Apricot:** Apricots, in line with most fruits, derive the majority of their caloric content from **carbohydrates**, primarily in the form of natural sugars like fructose, along with water and fibre. This association is **correct**.
- **(C) Fibre - Guava:** Guava is widely acknowledged as an outstanding source of dietary **fibre**, with a high concentration found especially in its edible seeds and skin. This association is **correct**.
- **(D) Fat - Papaya:** Papaya is a fruit that contains a negligible amount of **fat**. Its primary macronutrient is carbohydrate. Thus, pairing it with fat as a key nutrient is **incorrect**.

From this evaluation, the valid combinations are (A), (B), and (C).

Step 3: Final Answer:

The accurately matched nutrient-food pairs are Almond-Protein, Apricot-Carbohydrate, and Guava-Fibre. Therefore, the option listing (A), (B) and (C) only is the correct answer.

💡 Quick Tip

General nutrient rules for exams: Nuts and seeds are rich in protein and fats. Fruits are rich in carbohydrates (sugars) and fibre. Vegetables are rich in fibre, vitamins, and minerals. Knowing these basics helps in eliminating incorrect options quickly.

15. Which fruit plant is suitable for the arid conditions?

- (A) Ber
- (B) Guava
- (C) Papaya
- (D) Banana

Correct Answer: (1) Ber

Solution:

Step 1: Understanding the Concept:

This question requires selecting the fruit-bearing plant from the provided list that demonstrates the highest degree of suitability for cultivation in arid environments, which are defined by minimal precipitation and elevated temperatures.

Step 2: Detailed Explanation:

An evaluation of the water dependency for each plant is necessary:

- **Ber** (*Ziziphus mauritiana*), commonly known as Indian jujube, is an exceptionally drought-resistant fruit crop. It is characterized by a deep taproot system and other xerophytic features that enable it to not only survive but also be productive in arid and semi-arid climates with scarce water resources.
- **Guava** (*Psidium guajava*), while being relatively tolerant of dry spells once it is well-established, still needs consistent irrigation to yield a commercially viable crop. It lacks the hardiness of Ber when faced with truly arid conditions.
- **Papaya** (*Carica papaya*) has a high water requirement and needs frequent and consistent watering for healthy growth and fruit production. It is not considered tolerant to drought.
- **Banana** (*Musa* spp.) is a plant native to tropical regions and has extremely high water demands, making it entirely unsuitable for cultivation in arid zones without intensive and costly irrigation systems.

Among the choices given, Ber is uniquely adapted and best suited for arid conditions.

Step 3: Final Answer:

The fruit plant most appropriate for cultivation in arid conditions is the Ber.

 Quick Tip

Associate crops with their climatic zones. Ber and Date Palm are classic examples of arid zone fruits. Banana and Coconut are tropical, high-rainfall crops. Apple and Plum are temperate zone crops. This mental mapping is very useful.

16. Pineapple is a

- (A) C3 Plant
- (B) C2 Plant
- (C) C4 Plant
- (D) CAM Plant

Correct Answer: (4) CAM Plant

Solution:

Step 1: Understanding the Concept:

The objective of this question is to determine the specific photosynthetic mechanism (C3, C4, or CAM) utilized by the pineapple plant for carbon fixation.

Step 2: Detailed Explanation:

Photosynthesis in plants primarily follows one of three major pathways:

- **C3 Photosynthesis:** This is the most prevalent pathway, employed by the majority of plants, including staple crops like rice, wheat, and soybean.
- **C4 Photosynthesis:** This pathway is an evolutionary adaptation found in plants in hot, sunny environments, such as maize, sugarcane, and sorghum. It is more efficient at carbon fixation under conditions of high light intensity and temperature.
- **Crassulacean Acid Metabolism (CAM) Photosynthesis:** This is a specialized adaptation for plants in arid or dry conditions. To conserve water, CAM plants open their stomata (leaf pores) during the cooler night to take in CO₂, which they store as organic acids. During the day, they close their stomata to prevent water loss and release the stored CO₂ internally for use in photosynthesis.

The Pineapple plant (*Ananas comosus*) is a quintessential textbook example of a **CAM plant**. This unique photosynthetic strategy enables it to flourish in environments where water conservation is paramount. Other examples of CAM plants include various cacti, succulents, and agave. (It should be noted that the "C2 pathway" refers to photorespiration, a related process, but not a primary mode of carbon fixation).

Step 3: Final Answer:

The pineapple is classified botanically as a CAM plant.

 Quick Tip

Remember key examples for each photosynthetic pathway: C3 (Rice, Wheat), C4 (Maize, Sugarcane), and CAM (Pineapple, Cacti). This classification is fundamental in plant physiology and agronomy.

17. Strawberry is a typically

- (A) Short day plant
- (B) Long day plant
- (C) Day neutral plant
- (D) CAM Plant

Correct Answer: (1) Short day plant

Solution:

Step 1: Understanding the Concept:

This question seeks to categorize the strawberry plant according to its flowering response to photoperiod, which is the organism's physiological reaction to the relative lengths of day and night.

Step 2: Detailed Explanation:

Based on their photoperiodic requirements for flowering, plants are generally categorized into three groups:

- **Short-day plants (SDP):** These plants are induced to flower when the length of daylight falls below a specific critical threshold. More accurately, they require a long, uninterrupted period of darkness.
- **Long-day plants (LDP):** These plants initiate flowering when the duration of daylight extends beyond a certain critical length. They effectively require a short period of darkness.
- **Day-neutral plants (DNP):** The flowering of these plants is not influenced by the length of the day or night.

The majority of traditional and commercially significant strawberry varieties (*Fragaria × ananassa*) are classified as **short-day plants**. They typically initiate the formation of flower buds in response to the shorter days of autumn and winter. These buds then develop further to produce fruit in the following spring. Although plant breeders have developed long-day and day-neutral strawberry cultivars, the standard classification for the species is as a short-day plant.

Step 3: Final Answer:

Typically, the strawberry is classified as a short-day plant.

💡 Quick Tip

For exams, it's good to know the photoperiodic classification of a few key crops. For instance, Rice (many varieties) and Soybean are short-day plants. Wheat and Spinach are long-day plants. Maize and Tomato are generally day-neutral plants.

18. On the basis of fruit, choose the correct combination

- (A). Pome- Quince
- (B). Berry- Guava
- (C). Syconium-Fig
- (D). Stone- Litchi

Choose the correct answer from the options given below:

- (A) (A), (B) and (D) only.
- (B) (A), (B) and (C) only.
- (C) (A), (B), (C) and (D).
- (D) (B), (C) and (D) only.

Correct Answer: (2) (A), (B) and (C) only.

Solution:

Step 1: Understanding the Concept:

This question assesses knowledge in the field of pomology and plant morphology by asking to verify the accuracy of given pairs, each consisting of a common fruit and its scientific classification type.

Step 2: Detailed Explanation:

Let's conduct a botanical analysis of each pairing:

- **(A) Pome - Quince:** The quince fruit, similar to its relatives apples and pears in the Rosaceae family, is botanically classified as a pome. In a pome, the fleshy, edible portion is derived from the floral tube that swells and encases the ovary (core). This pairing is **correct**.
- **(B) Berry - Guava:** From a botanical standpoint, a true berry is a fleshy fruit that develops from a single ovary and contains multiple seeds. The guava fruit fits this definition precisely. This pairing is **correct**.
- **(C) Syconium - Fig:** The fruit of a fig is unique in that it develops from an entire inflorescence (a flower cluster) that is inverted to form a hollow, fleshy structure. This highly specialized type of multiple fruit is botanically termed a syconium. This pairing is **correct**.

- **(D) Stone - Litchi:** A stone fruit, also known as a drupe (like a peach or mango), is characterized by a fleshy middle layer (mesocarp) that develops from the ovary wall and encloses a hard pit or "stone". In the litchi, the part that is consumed is a fleshy, succulent aril, which is an outgrowth of the seed coat, not the ovary wall. Therefore, a litchi is not a true stone fruit. This pairing is **incorrect**.

Based on this analysis, the combinations (A), (B), and (C) are botanically accurate.

Step 3: Final Answer:

After careful botanical evaluation, the correct option is the one that includes the combinations (A), (B) and (C) only.

💡 Quick Tip

Memorizing the fruit types of common crops is crucial. Key examples include: Pome (Apple, Pear), Berry (Grape, Tomato, Guava), Drupe/Stone (Mango, Peach, Plum), Hesperidium (Citrus), Pepo (Cucumber, Watermelon), and Syconium (Fig).

19. Tomb or Mosque are the main feature of

- (A) Mughal Garden
- (B) Japanese Garden
- (C) English Garden
- (D) French Garden

Correct Answer: (1) Mughal Garden

Solution:

Step 1: Understanding the Concept:

The question requires identifying the specific garden style where a tomb or a mosque serves as a primary and integral architectural element.

Step 2: Detailed Explanation:

Mughal gardens, which are heavily influenced by the Persian 'charbagh' style, are distinguished by their formal, symmetrical layouts and the seamless integration of substantial architecture. Unlike other garden styles where architecture may be supplementary, in Mughal gardens, a monumental building like a tomb or a mosque is often the central focus and the very reason for the garden's existence. Famous examples include the gardens surrounding Humayun's Tomb and the Taj Mahal, where the garden is designed to complement and venerate the mausoleum. This contrasts with other styles: Japanese gardens prioritize naturalism and symbolism through rocks and water; English gardens aim to create an idealized, informal landscape; and French

gardens focus on grand geometric patterns and long vistas.

Step 3: Final Answer:

A tomb or mosque is a principal and defining feature of the Mughal Garden style.

💡 Quick Tip

Associate key elements with garden styles: Mughal = Tombs, symmetry, water channels; Japanese = Asymmetry, symbolism, rocks; English = Naturalistic, informal, sweeping lawns; French = Geometric, formal, grand scale.

20. Rock Garden is situated in

- (A) Srinagar
- (B) Vadodra
- (C) Coimbatore
- (D) Chandigarh

Correct Answer: (4) Chandigarh

Solution:

Step 1: Understanding the Concept:

This question asks for the geographical location of the internationally acclaimed Rock Garden of India, a significant piece of Indian art and a popular tourist destination.

Step 2: Detailed Explanation:

The Rock Garden of Chandigarh is a unique and famous sculpture garden located in the city of Chandigarh. It is also widely known by the name of its creator, Nek Chand Saini, as Nek Chand's Rock Garden. Nek Chand, a government official, initiated this project clandestinely in his leisure time beginning in 1957. The garden is an extraordinary example of "outsider art," as it is constructed entirely from a diverse array of industrial and domestic waste materials, such as broken bangles, ceramics, and bottles. It stands today as one of Chandigarh's most visited attractions.

Step 3: Final Answer:

The renowned Rock Garden is located in the city of Chandigarh.

 Quick Tip

For general knowledge questions about landmarks, associate the landmark with its city and creator if possible. For example, Rock Garden - Chandigarh - Nek Chand; Lalbagh Garden - Bengaluru - Hyder Ali/Tipu Sultan.

21. Persian gardens are based on the idea of

- (A) Heaven
- (B) Life
- (C) God
- (D) Dream

Correct Answer: (1) Heaven

Solution:

Step 1: Understanding the Concept:

The question explores the foundational philosophical or spiritual inspiration that underpins the design principles of traditional Persian gardens.

Step 2: Detailed Explanation:

The design of a classic Persian garden is deeply rooted in the concept of creating a terrestrial representation of Paradise, or Heaven (Jannah in Islamic tradition). The hallmark 'Charbagh' layout, which divides the garden into four quadrants with intersecting water channels, is a direct symbol of the four rivers of Paradise described in the Quran. Key elements such as flowing water (symbolizing life and purity), shade from trees (providing relief and comfort), and a protective outer wall (creating a serene and sacred enclosure) all work together to evoke the abundance, tranquility, and beauty of a heavenly ideal in an often-arid earthly environment. This powerful design philosophy was later adopted and further developed by the Mughals in India.

Step 3: Final Answer:

The design and philosophy of Persian gardens are fundamentally based on the idea of Heaven.

 Quick Tip

The concept of 'paradise garden' is central to Islamic garden design, which includes both Persian and Mughal styles. The key elements are almost always water, shade, and a walled enclosure representing a protected, sacred space.

22. Wastage of fresh fruits and vegetables is estimated to be to the extent of

- (A) 5-10%
- (B) 20-25%
- (C) 40-45%
- (D) 50-60%

Correct Answer: (2) 20-25%

Solution:

Step 1: Understanding the Concept:

This question seeks to identify the commonly accepted estimated percentage of post-harvest losses for horticultural produce like fresh fruits and vegetables within the Indian agricultural context.

Step 2: Detailed Explanation:

In India, post-harvest losses of fresh produce are a significant challenge, primarily stemming from the perishable nature of the commodities combined with infrastructural gaps such as insufficient cold storage facilities, a lack of refrigerated transportation (a complete "cold chain"), and inefficient handling and supply chain management. While loss percentages can fluctuate based on the specific crop, season, and region, various government reports and academic studies provide a general estimate.

- The 5-10% range is generally considered too low for India and is more reflective of countries with highly developed and integrated cold chain infrastructure.
- The 40-60% range, while possible for extremely perishable items under very poor conditions, is too high to be considered a general average for all fruits and vegetables.
- The 20-25% range is the most frequently cited and widely accepted conservative estimate that acknowledges the substantial level of wastage without being an extreme figure.

Step 3: Final Answer:

The wastage of fresh fruits and vegetables is broadly estimated to be within the extent of 20-25%.

💡 Quick Tip

In questions about agricultural statistics, look for the most reasonable and commonly cited figure. Extremely low or extremely high percentages are often distractors. Post-harvest loss is a major problem, so the figure will be significant, making 20-25% a plausible answer.

23. Pre-cooling of fruits and vegetables is generally done to

- (A) Value addition
- (B) Remove field heat
- (C) Kill pathogens
- (D) Remove moisture

Correct Answer: (2) Remove field heat

Solution:

Step 1: Understanding the Concept:

The question asks for the principal and immediate objective of performing the pre-cooling procedure on freshly harvested produce.

Step 2: Detailed Explanation:

"Field heat" refers to the heat a fruit or vegetable holds from the ambient temperature and solar radiation at the moment of harvest. Since produce is alive, this heat accelerates its rate of respiration and other metabolic activities. This leads to a chain reaction of rapid quality degradation, moisture loss, and a shortened shelf life. Pre-cooling is the critical first step in post-harvest management, designed to rapidly and effectively remove this initial field heat. By quickly lowering the pulp temperature, pre-cooling immediately slows down these detrimental processes, effectively "slowing the clock" on senescence and preserving the produce's freshness and quality. While this action does contribute to value and can inhibit pathogen growth, its primary, specific purpose is to remove the field heat. Removing moisture is actively avoided as it causes wilting.

Step 3: Final Answer:

The primary reason for pre-cooling fruits and vegetables is to remove their field heat.

 Quick Tip

Remember the post-harvest mantra: "Cool it fast, keep it cool." The "cool it fast" part is pre-cooling, and its specific target is removing the initial field heat.

24. Maleic hydrazide is used to

- (A) Enhance ripening
- (B) Control sprouting
- (C) Enhance maturity
- (D) Value addition

Correct Answer: (2) Control sprouting

Solution:

Step 1: Understanding the Concept:

This question asks to identify the principal application of the chemical Maleic hydrazide (MH) within the field of agriculture, specifically in managing crops post-harvest.

Step 2: Detailed Explanation:

Maleic hydrazide is a systemic plant growth regulator whose primary mode of action is the inhibition of cell division (it is an anti-mitotic agent). In horticultural practice, it is applied as a foliar spray to crops like potatoes and onions while they are still in the field, shortly before harvest. The chemical is absorbed by the leaves and then translocated throughout the plant to the storage organs (the tubers or bulbs). Once there, it acts as a long-term "off switch" for the dormant buds. During subsequent storage, this inhibition of cell division effectively prevents the tubers or bulbs from sprouting, thereby maintaining their quality, reducing weight loss, and extending their storage life. While this certainly adds value, its specific function is sprout control.

Step 3: Final Answer:

Maleic hydrazide is used specifically to control the sprouting of stored produce like potatoes and onions.

💡 Quick Tip

Associate specific growth regulators with their primary functions. Ethylene/Ethephon for ripening, Auxins (IBA, NAA) for rooting, Gibberellins (GA3) for breaking dormancy and fruit size, and Maleic Hydrazide (MH) for sprout inhibition.

25. Vapour heat treatment given to mango fruits controls the

- (A) Mango hopper
- (B) Mango mealy bug
- (C) Mango fruit fly
- (D) Mango stem borer

Correct Answer: (3) Mango fruit fly

Solution:

Step 1: Understanding the Concept:

The question seeks to identify the specific insect pest that is the primary target of Vapour Heat Treatment (VHT) when applied to mangoes, especially in the context of international trade.

Step 2: Detailed Explanation:

Vapour Heat Treatment is a crucial phytosanitary (quarantine) measure required by many importing countries to prevent the introduction of invasive pests. The treatment involves exposing the fruit to heated, moisture-saturated air, which raises the fruit's core temperature to a level

lethal for insect pests without cooking the fruit. The main concern for many mango-importing nations is the potential presence of internal pests, which are impossible to detect through visual inspection. The Mango fruit fly (*Bactrocera dorsalis*) lays its eggs inside the fruit, where the larvae then develop. VHT is specifically designed to kill these internal life stages (eggs and larvae) of the fruit fly, ensuring the fruit is pest-free and meets quarantine security protocols for export. The other pests listed are external or borers and are not the main target of this specific post-harvest treatment.

Step 3: Final Answer:

Vapour heat treatment applied to mango fruits is a quarantine measure to control the Mango fruit fly.

💡 Quick Tip

Heat treatments (like VHT and hot water treatment) and irradiation are key quarantine measures for fruits. They primarily target internal pests that are difficult to detect, with fruit flies being the most common target globally.

26. In hypobaric storage, the produce is stored under

- (A) High pressure atmosphere
- (B) Low temperature atmosphere
- (C) Low pressure atmosphere
- (D) High temperature atmosphere

Correct Answer: (3) Low pressure atmosphere

Solution:

Step 1: Understanding the Concept:

The question asks to identify the defining atmospheric pressure condition of hypobaric storage. The term itself provides a clue: "hypo-" is a prefix meaning low or under, and "baric" relates to pressure.

Step 2: Detailed Explanation:

Hypobaric storage, also called low-pressure storage, is an advanced preservation method where produce is placed in a reinforced, refrigerated, and airtight chamber from which air is partially evacuated to maintain a pressure below the normal atmospheric level. This technique has a dual mechanism of action: 1) The reduced total pressure lowers the partial pressure of oxygen, which directly slows the rate of respiration in the produce. 2) The low-pressure environment creates a vacuum effect that actively pulls volatile gases produced by the fruit, such as the ripening hormone ethylene, out of the storage chamber. This two-pronged attack on the aging process—reducing oxygen for respiration and removing ethylene—makes it a very effective

method for extending shelf life.

Step 3: Final Answer:

In hypobaric storage, produce is maintained under a low pressure atmosphere.

💡 Quick Tip

Break down scientific terms. "Hypo-" means low, "Hyper-" means high. "Baric" refers to pressure. So, Hypobaric = Low pressure, Hyperbaric = High pressure. This helps in decoding many technical terms.

27. Zero Energy Cool Chamber is based on the principal of

- (A) Evaporative temperature
- (B) Evaporative cooling
- (C) High pressure temperature
- (D) Low pressure cooling

Correct Answer: (2) Evaporative cooling

Solution:

Step 1: Understanding the Concept:

This question asks to identify the fundamental scientific principle that enables a Zero Energy Cool Chamber (ZECC) to function without any external power source.

Step 2: Detailed Explanation:

The operation of a Zero Energy Cool Chamber is based on the physical principle of evaporative cooling. This principle states that when water evaporates (changes from a liquid to a gas), it absorbs a significant amount of heat energy from its surroundings, thereby cooling them. A ZECC is ingeniously designed to maximize this effect using simple, low-cost materials. It features a double brick wall structure, with the cavity between the walls filled with sand. This sand is kept saturated with water. The water continuously seeps to the outer surface of the bricks and evaporates, drawing heat from the inner chamber and lowering its temperature significantly below the outside ambient temperature. It is the same natural process that cools the human body through sweating.

Step 3: Final Answer:

The Zero Energy Cool Chamber functions based on the principle of evaporative cooling.

💡 Quick Tip

The word "Zero Energy" is a clue. It means the system doesn't use electricity. Evaporative cooling is a passive cooling method that doesn't require external energy input, unlike conventional refrigeration. Earthen pots (matkas) also work on the same principle.

28. Firmness of fruit during storage

- (A) Increases
- (B) Reduces
- (C) No change in firmness
- (D) Increases and reduces both

Correct Answer: (2) Reduces

Solution:

Step 1: Understanding the Concept:

The question asks to describe the typical change in the physical texture, specifically the firmness, of a fruit as it progresses through ripening and storage.

Step 2: Detailed Explanation:

As fruits ripen and age during storage, they undergo a natural process of softening, which leads to a reduction in firmness. This change is primarily due to the enzymatic degradation of the fruit's structural components. The fruit's cell walls can be visualized as a brick wall, where the cells are the "bricks" and a substance called pectin is the "mortar" holding them together. During ripening, specific enzymes, most notably polygalacturonase (PG) and pectin methylesterase (PME), become active. These enzymes act like mortar dissolvers, breaking down the complex pectin into simpler, soluble forms. This weakens the cell walls and the bonds between cells, causing the entire fruit structure to lose its rigidity and become softer.

Step 3: Final Answer:

During storage, the firmness of a fruit generally reduces.

💡 Quick Tip

Think about a practical example. A hard, unripe banana becomes soft as it ripens on your counter. This softening is a universal sign of ripening in many fruits and is due to the breakdown of pectin.

29. Which of the following hormones increases the respiration rate during storage?

- (A) GA3
- (B) Cytokinin
- (C) IBA
- (D) Ethylene

Correct Answer: (4) Ethylene

Solution:

Step 1: Understanding the Concept:

The question requires the identification of the specific plant hormone that is responsible for triggering an increase in the respiration rate of fruits during storage, a key event in the ripening process of certain fruits.

Step 2: Detailed Explanation:

In a category of fruits known as climacteric fruits (e.g., bananas, apples, mangoes), the ripening phase is characterized by a dramatic surge in the rate of respiration. This metabolic event is called the "climacteric rise." This rise is the metabolic "sprint" that provides the energy for the final ripening processes like colour development and softening. The "starting gun" for this sprint is the plant hormone ethylene. Ethylene is known as the "ripening hormone" because its production signals the start of this climacteric rise and the entire cascade of ripening events. In contrast, other hormones like GA3 (Gibberellin) and Cytokinin are generally associated with delaying aging and senescence, while IBA (an auxin) is primarily linked to root development.

Step 3: Final Answer:

The hormone that increases the respiration rate during fruit storage is Ethylene.

 Quick Tip

Remember the phrase "one bad apple spoils the bunch." This is because a ripening apple produces ethylene gas, which then triggers the ripening (and increased respiration) in the apples around it.

30. Ethylene absorbent used during storage is

- (A) CaCl
- (B) CaCO
- (C) KMnO
- (D) NH

Correct Answer: (3) KMnO

Solution:**Step 1: Understanding the Concept:**

The question asks to identify a specific chemical compound that is used to actively remove ethylene gas from the atmosphere within a storage facility for fresh produce.

Step 2: Detailed Explanation:

Ethylene gas accelerates the ripening and senescence of many fruits and vegetables. Therefore, removing it from the storage environment is a key strategy to extend shelf life. This is achieved using ethylene "scrubbers" or absorbents. Potassium permanganate (KMnO_4) is a powerful oxidizing agent that effectively neutralizes ethylene. It doesn't simply absorb the gas; it chemically reacts with it. KMnO_4 oxidizes the ethylene molecule (C_2H_4), breaking it down into harmless compounds like ethylene glycol and carbon dioxide, thus permanently removing its ripening effect. For practical use, the purple KMnO_4 chemical is typically infused onto an inert, porous carrier material like silica gel or alumina beads, which are then placed in the storage area.

Step 3: Final Answer:

The chemical used as an ethylene absorbent during storage is KMnO_4 (Potassium permanganate).

💡 Quick Tip

Potassium permanganate (KMnO_4) is well-known for its distinctive deep purple color and its strong oxidizing properties. In post-harvest, its main role is as an ethylene scavenger.

31. High humidity in storage can be reduced by keeping

- (A) CaCl_2
- (B) KMnO_4
- (C) KNO_3
- (D) Urea

Correct Answer: (1) CaCl_2

Solution:**Step 1: Understanding the Concept:**

The question asks to identify a chemical compound capable of lowering high humidity within a storage area. This requires a substance that can effectively absorb excess water vapor from the air, known as a desiccant.

Step 2: Detailed Explanation:

An analysis of the chemical properties of the given options reveals their functions:

- **CaCl_2 (Calcium chloride):** This salt is an extremely effective desiccant. It is highly hygroscopic, meaning it has a strong chemical affinity for water and readily attracts and absorbs water molecules from the atmosphere, thereby reducing humidity.
- **KMnO_4 (Potassium permanganate):** This is a strong oxidizing agent used primarily as an ethylene scavenger to slow down ripening. It does not function as a desiccant.
- **KNO_3 (Potassium nitrate):** This is a salt mainly used as a fertilizer. It is not an effective agent for dehumidification.
- **Urea:** This is a nitrogen-based fertilizer and is not used as a desiccant in storage applications.

Given its powerful hygroscopic properties, calcium chloride is the correct choice for reducing humidity.

Step 3: Final Answer:

High humidity in a storage environment can be effectively reduced by using Calcium chloride (CaCl_2).

💡 Quick Tip

In post-harvest and storage questions, remember the specific roles of common chemicals: Calcium chloride (CaCl_2) and silica gel are for absorbing moisture (desiccants), while Potassium permanganate (KMnO_4) is for absorbing ethylene (ethylene scavenger).

32. Sodium benzoate is used for

- (A) Value addition
- (B) Preservation
- (C) Fortification
- (D) Control of diseases

Correct Answer: (2) Preservation

Solution:

Step 1: Understanding the Concept:

The question seeks to identify the primary application of sodium benzoate as an additive in food products.

Step 2: Detailed Explanation:

Sodium benzoate is a widely used food additive categorized as a Class II chemical preservative. Its primary function is to act as a microbial growth inhibitor. It works by creating an environment where microorganisms such as yeast, molds, and certain bacteria cannot grow and reproduce, thus preventing spoilage and extending the shelf life of the food. Its effectiveness is pH-dependent; it is most active in acidic conditions (pH below 4.5). This characteristic makes it an ideal preservative for acidic foods and beverages like fruit juices, jams, jellies, pickles, and carbonated drinks. The other options describe different concepts: value addition is a broad economic term, and fortification is the addition of nutrients.

Step 3: Final Answer:

The primary use of sodium benzoate in the food industry is for preservation.

💡 Quick Tip

Remember the common class II chemical preservatives used in food processing: Sodium benzoate (for acidic foods), Potassium metabisulphite (KMS) (for juices, prevents browning), and Sorbic acid (against yeast and mold).

33. Match List-I with List-II

List-I Variety	List-II Crop
(A). Vengurla	(I). Tea
(B). Shinghara	(II). Cashew
(C). Arka Sahan	(III). Aonla
(D). Chakaiya	(IV). Custard Apple

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

Solution:

Step 1: Understanding the Concept:

This question tests specific knowledge of Indian horticulture by requiring the correct matching

of important crop varieties to their respective crops.

Step 2: Detailed Explanation:

Let's establish the correct association for each variety:

- **(A) Vengurla:** The 'Vengurla' series of varieties, such as the famous Vengurla-4 and Vengurla-7, are benchmark high-yielding varieties of **(II) Cashew**, developed by the research station in Vengurla, Maharashtra.
- **(D) Chakaiya:** This is a very popular and commercially important late-maturing variety of **(III) Aonla** (Indian Gooseberry), highly regarded for its large fruit size and suitability for making processed products like 'murabba'.
- **(C) Arka Sahan:** The "Arka" prefix is a clear indicator that the variety was developed by the Indian Institute of Horticultural Research (IIHR) in Bengaluru. Arka Sahan is their well-known hybrid variety of **(IV) Custard Apple**.
- **(B) Shinghara:** This is a recognized variety of **(I) Tea**.

The correct set of pairings is therefore: (A) with (II), (B) with (I), (C) with (IV), and (D) with (III).

Step 3: Final Answer:

The correct combination of matches is (A) - (II), (B) - (I), (C) - (IV), (D) - (III), which corresponds to option 2.

💡 Quick Tip

Pay attention to the prefixes of variety names. 'Arka' varieties are from IIHR, 'Pusa' varieties are from IARI, and 'Co' varieties are from TNAU, Coimbatore. Knowing these can help you quickly identify or eliminate options.

34. Match List-I with List-II

List-I Constituents	List-II Crops
(A). Beta Carotene	(I). Fig
(B). Ascorbic Acid	(II). Mango
(C). Riboflavin	(III). Bael
(D). Niacin	(IV). Barbados Cherry

Choose the correct answer from the options given below:

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

Correct Answer: (2) (A) - (II), (B) - (IV), (C) - (III), (D) - (I)

Solution:

Step 1: Understanding the Concept:

This question requires matching key nutritional components with the fruit crops that are considered to be exceptionally rich or "champion" sources of those specific nutrients.

Step 2: Detailed Explanation:

Let's pair each constituent with its most notable fruit source from the list:

- **(A) Beta Carotene:** This is a pro-vitamin A carotenoid. The quintessential fruit source for beta carotene is the **(II) Mango**, whose deep orange-yellow flesh color is indicative of its high concentration.
- **(B) Ascorbic Acid:** This is the chemical name for Vitamin C. Among all fruits, the **(IV) Barbados Cherry** (*Malpighia emarginata*) is renowned for having one of the highest concentrations of Vitamin C in the natural world.
- **(C) Riboflavin:** This is Vitamin B2. The pulp of the **(III) Bael** fruit (*Aegle marmelos*) is uniquely recognized in pomology for being an outstandingly rich source of riboflavin.
- **(D) Niacin:** This is Vitamin B3. Among the available choices, the **(I) Fig** is known to be a good source of niacin.

The correct pairings are: (A) with (II), (B) with (IV), (C) with (III), and (D) with (I).

Step 3: Final Answer:

The correct set of matches is (A) - (II), (B) - (IV), (C) - (III), (D) - (I), which corresponds to option 2.

💡 Quick Tip

For nutrition-based questions, remember the "champion" sources: Aonla and Barbados Cherry for Vitamin C, Mango and Papaya for Vitamin A (Beta Carotene), Bael for Riboflavin, and Avocado and nuts for fats.

35. Match List-I with List-II

List-I Physiological disorders	List-II Deficiency / Toxicity
(A). Blossom end rot	(I). B deficiency
(B). Fruit cracking	(II). Ca deficiency
(C). Interveinal chlorosis	(III). Cl toxicity
(D). Leaf scorching	(IV). Mg deficiency

Choose the correct answer from the options given below:

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

Correct Answer: (1) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

Solution:

Step 1: Understanding the Concept:

The question assesses knowledge of plant nutrition by requiring the matching of specific physiological disorders (abnormal plant conditions not caused by pests or diseases) with their direct nutritional cause.

Step 2: Detailed Explanation:

Let's diagnose the cause of each disorder:

- **(A) Blossom end rot:** This is a classic disorder in fruits like tomatoes, characterized by a dark, leathery patch at the blossom end. It is caused by a localized **(II) Ca deficiency** (Calcium deficiency) within the fruit tissue, often exacerbated by irregular watering.
- **(B) Fruit cracking:** This disorder in fruits like pomegranates and tomatoes is often linked to a **(I) B deficiency** (Boron deficiency). Boron is crucial for maintaining the elasticity and integrity of cell walls, and its deficiency makes the fruit skin unable to expand properly, leading to cracking.
- **(C) Interveinal chlorosis:** This symptom, where the leaf tissue between the veins turns yellow while the veins stay green, directly points to a **(IV) Mg deficiency** (Magnesium deficiency). This is because magnesium is the central atom in the chlorophyll molecule, which gives leaves their green color.
- **(D) Leaf scorching:** A burning or necrosis along the margins of leaves is a typical symptom of salt stress or toxicity from certain mobile ions. It is a well-known symptom of **(III) Cl toxicity** (Chloride toxicity).

The correct pairings are: (A) with (II), (B) with (I), (C) with (IV), and (D) with (III).

Step 3: Final Answer:

The correct set of matches is (A) - (II), (B) - (I), (C) - (IV), (D) - (III), which corresponds to option 1.

💡 Quick Tip

Create a chart of major nutrients (Macro & Micro) and the classic deficiency/toxicity symptom for each. For example: N-general chlorosis, Ca-death of growing points/BER, B-fruit cracking, Mg-interveinal chlorosis, Cl-leaf scorching.

36. Match List-I with List-II

List-I Root stock	List-II Characteristics
(A). M-9	(I). Frost resistant
(B). BUD 9	(II). Woolly aphid resistant
(C). M-27	(III). Compatible with all apple scions
(D). MM-106	(IV). Ultra dwarf

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

Correct Answer: (4) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

Solution:

Step 1: Understanding the Concept:

This question evaluates knowledge of pomology, specifically focusing on widely used apple rootstocks and their primary horticultural characteristics.

Step 2: Detailed Explanation:

Let's match each rootstock with its defining characteristic, using their names as clues:

- **(B) BUD 9 (Budagovsky 9):** The 'BUD' prefix indicates its origin from the Budagovsky series in Russia, which were specifically bred for extreme cold tolerance. Therefore, it is highly **(I) Frost resistant**.

- **(C) M-27 (Malling 27):** From the Malling series, this rootstock is at the extreme end of the size-control spectrum, producing the smallest trees. It is thus classified as an **(IV) Ultra dwarf** rootstock.
- **(D) MM-106 (Malling-Merton 106):** The 'MM' prefix signifies the Malling-Merton series, which was a joint breeding program specifically to incorporate resistance to a major pest. They are known for being **(II) Woolly aphid resistant**.
- **(A) M-9 (Malling 9):** This is the world's most famous dwarfing rootstock and the industry standard. A key reason for its widespread adoption is its **(III) Compatibility with all apple scions**, making it a versatile choice for growers.

The correct pairings are: (A) with (III), (B) with (I), (C) with (IV), and (D) with (II).

Step 3: Final Answer:

The correct set of matches is (A) - (III), (B) - (I), (C) - (IV), (D) - (II), which corresponds to option 4.

💡 Quick Tip

For apple rootstocks, remember the series: 'M' (Malling) are the original series. 'MM' (Malling-Merton) are woolly aphid resistant. 'BUD' (Budagovsky) are Russian and cold-hardy. 'G' (Geneva) are modern, disease-resistant rootstocks.

37. Match List-I with List-II

List-I Use of PBR/ Chemical	List-II Name of PBR/ Chemical
(A). Rooting of cuttings	(I). Acid treatment
(B). Seed scarification	(II). BA+ Beta NOA
(C). Parthenocarpy in Mango	(III). IBA
(D). Induction of flowering in Pineapple	(IV). Ethephon

Choose the correct answer from the options given below:

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

Correct Answer: (2) (A) - (III), (B) - (I), (C) - (II), (D) - (IV)

Solution:

Step 1: Understanding the Concept:

This question tests the practical application of various Plant Bioregulators (PBRs) and chemical treatments in specific horticultural practices.

Step 2: Detailed Explanation:

Let's link each horticultural use to the appropriate chemical agent:

- **(A) Rooting of cuttings:** The stimulation of adventitious root growth on vegetative cuttings is a primary commercial application of the plant hormone class, auxins. The most common and effective synthetic auxin used for this is **(III) IBA** (Indole-3-butyric acid).
- **(B) Seed scarification:** This term refers to the process of breaking the physical dormancy of seeds caused by a hard, impermeable seed coat. One method to achieve this is chemical scarification, which involves using a **(I) Acid treatment** (typically with concentrated sulfuric acid) to etch and weaken the seed coat.
- **(C) Parthenocarpy in Mango:** Parthenocarpy refers to the development of fruit without prior fertilization, resulting in seedless fruit. Inducing this in mango can be attempted experimentally using a hormonal cocktail, such as a combination of a cytokinin like **(II) BA** (Benzyladenine) and an auxin like **Beta NOA**.
- **(D) Induction of flowering in Pineapple:** In commercial pineapple cultivation, it is crucial to induce uniform flowering to manage harvesting schedules. This is achieved by applying **(IV) Ethephon**, a chemical that slowly releases ethylene gas. Ethylene is the natural hormone that triggers flower induction in pineapple plants.

The correct pairings are: (A) with (III), (B) with (I), (C) with (II), and (D) with (IV).

Step 3: Final Answer:

The correct set of matches is (A) - (III), (B) - (I), (C) - (II), (D) - (IV), which corresponds to option 2.

💡 Quick Tip

Associate key chemicals with their "killer app": IBA → Rooting, Ethephon → Ripening/Pineapple flowering, GA3 → Grape size/Breaking dormancy, MH → Sprout suppression.

38. Match List-I with List-II

List-I PGR	List-II Practical utility
(A). Auxins	(I). Fruit ripening
(B). Gibberellins	(II). Root induction
(C). Cytokinin	(III). Germination
(D). Ethephon	(IV). Shoot proliferation

Choose the correct answer from the options given below:

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

Correct Answer: (1) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)

Solution:

Step 1: Understanding the Concept:

This question requires matching the major classes of Plant Growth Regulators (PGRs) with their most prominent and characteristic practical utility in horticulture and agriculture.

Step 2: Detailed Explanation:

Let's pair each PGR class with its primary function:

- **(A) Auxins:** This class of hormones is fundamentally involved in cell elongation and differentiation, particularly in root development. Their most widespread practical application is for the stimulation of adventitious roots in vegetative propagation, a process known as **(II) Root induction**.
- **(B) Gibberellins:** Gibberellins act as the "wake-up call" for dormant seeds and buds. They stimulate the production of enzymes that break down stored food reserves, thus promoting **(III) Germination**.
- **(C) Cytokinin:** Named for their role in promoting cell division (cytokinesis), cytokinins are a cornerstone of plant tissue culture. They are used to stimulate rapid cell division and induce the development of multiple shoots from a single tissue piece, a technique called **(IV) Shoot proliferation**.
- **(D) Ethephon:** Ethephon is a synthetic chemical that is valued because it breaks down to release ethylene gas, the natural ripening hormone. Its primary commercial use is to synchronize and accelerate **(I) Fruit ripening** in a wide range of crops.

The correct pairings are: (A) with (II), (B) with (III), (C) with (IV), and (D) with (I).

Step 3: Final Answer:

The correct set of matches is (A) - (II), (B) - (III), (C) - (IV), (D) - (I), which corresponds to option 1.

💡 Quick Tip

Remember the 5 classic plant hormones and their main jobs: Auxin (Roots & Tropisms), Gibberellin (Stem elongation & Germination), Cytokinin (Cell division & Shoot growth), Ethylene (Ripening & Senescence), and Absciscic Acid (Dormancy & Stress).

39. What is the descending order of rate of respiration in following vegetables?

- (A). Bean
- (B). Onion
- (C). Asparagus
- (D). Beet

Choose the correct answer from the options given below:

- (A) (A), (B), (C), (D).
- (B) (A), (C), (B), (D).
- (C) (B), (A), (D), (C).
- (D) (C), (A), (D), (B).

Correct Answer: (4) (C), (A), (D), (B).

Solution:

Step 1: Understanding the Concept:

The objective is to arrange the given vegetables in order from the highest to the lowest rate of post-harvest respiration. A vegetable's respiration rate is a key indicator of its metabolic activity and, consequently, its perishability and shelf life.

Step 2: Detailed Explanation:

The rate of respiration is closely tied to the physiological function of the plant part. Tissues that are actively growing or developing have much higher metabolic rates than those designed for long-term storage or dormancy.

- **(C) Asparagus:** The edible portion is the rapidly growing shoot or spear of the plant. As an actively growing tissue, it has an exceptionally high respiration rate, making it highly perishable.
- **(A) Bean:** Green beans are immature pods that are still actively developing and contain growing seeds. This makes them metabolically active with a high rate of respiration, al-

though generally less than that of asparagus.

- **(D) Beet:** This is a root modified for energy storage. Its primary function is to store nutrients, so its metabolic activity is significantly lower than that of growing shoots or pods, resulting in a low to moderate respiration rate.
- **(B) Onion:** A dry onion bulb is a dormant organ, specifically adapted for long-term survival through a period of inactivity. It has one of the lowest respiration rates among common vegetables, which is why it can be stored for long periods.

Thus, arranging them from highest to lowest respiration rate gives the sequence: Asparagus $\downarrow$ Bean $\downarrow$ Beet $\downarrow$ Onion. This corresponds to (C), (A), (D), (B).

Step 3: Final Answer:

The correct descending order of respiration rate is Asparagus, Bean, Beet, and Onion, corresponding to option (C), (A), (D), (B).

💡 Quick Tip

A simple rule for perishability: Flowers (e.g., broccoli) and Shoots (e.g., asparagus) are most perishable (highest respiration), followed by Fruits (e.g., beans, tomatoes), then Roots (e.g., carrots, beets), and finally Bulbs/Tubers (e.g., onions, potatoes) which are least perishable (lowest respiration).

40. Demography is the study of factors that affect _____ and _____ patterns.

- (A) Population density, dispersion
- (B) Population size, dispersion
- (C) Population density, distribution
- (D) Population size, distribution

Correct Answer: (4) Population size, distribution

Solution:

Step 1: Understanding the Concept:

The question requires completing the definition of demography by identifying the two primary characteristics of a population that it studies.

Step 2: Detailed Explanation:

Demography, whether in human sciences or in ecology, is the statistical analysis of populations and their changing structures. The two most fundamental aspects it examines are:

- **Population size:** This refers to the total number of individuals within a defined population. Demography studies the factors that cause this number to change, such as birth rates, death rates, and migration.
- **Population distribution:** This describes the geographic arrangement or spread of individuals across a particular area. It answers the question of "where" the population is located.

While other metrics like population density (size per unit area) and dispersion (the spacing of individuals relative to one another) are also crucial demographic variables, they are essentially derivatives of the two core concepts of how many individuals there are (size) and where they are (distribution). Therefore, the most comprehensive answer is population size and distribution.

Step 3: Final Answer:

Demography is the study of factors that affect population size and distribution patterns.

💡 Quick Tip

Think of a national census. What are the two main things it measures? First, "how many people live in the country?" (population size), and second, "where do they live?" (population distribution). This is the essence of demography.

41. Arrange the following disease causing agents in order of their discovery

- (A). *Yersinia pestis* (Plague)
- (B). *Salmonella typhi* (Typhoid fever)
- (C). *Treponema pallidum* (Syphilis)
- (D). *Clostridium tetani* (Tetanus)

Choose the correct answer from the options given below:

- (A) (A), (B), (C), (D).
- (B) (A), (C), (B), (D).
- (C) (B), (D), (A), (C).
- (D) (C), (B), (D), (A).

Correct Answer: (3) (B), (D), (A), (C).

Solution:

Step 1: Understanding the Concept:

The question requires arranging four pathogenic bacteria chronologically based on when they were first identified and described by scientists. This tests knowledge of the historical timeline of microbiology, particularly during its "Golden Age."

Step 2: Detailed Explanation:

The discovery dates for these significant pathogens are as follows:

- **(B) *Salmonella typhi*:** This bacterium, the cause of typhoid fever, was first visualized in the tissues of typhoid victims by Karl Joseph Eberth in the year **1880**.
- **(D) *Clostridium tetani*:** The bacterium responsible for tetanus was first isolated from a soil sample and described by Arthur Nicolaier in **1884**.
- **(A) *Yersinia pestis*:** The causative agent of the bubonic plague was independently discovered by both Alexandre Yersin and Kitasato Shibasaburō in **1894** during an outbreak in Hong Kong.
- **(C) *Treponema pallidum*:** This distinctive spirochete bacterium, which causes syphilis, was first identified by zoologist Fritz Schaudinn and dermatologist Erich Hoffmann in Germany in **1905**.

Placing these discoveries in chronological order results in the sequence: (B) 1880, (D) 1884, (A) 1894, (C) 1905.

Step 3: Final Answer:

The correct chronological order of discovery for these agents is (B), (D), (A), (C).

💡 Quick Tip

The late 1800s was a period of intense discovery for bacteriology, thanks to the work of pioneers like Koch and Pasteur. Most major bacterial pathogens for diseases known since antiquity were identified during this time.

42. Which of the following statements is true regarding drying and dehydration of fruits and vegetables?

- (A). Freeze drying is not covered under the methods of preservation of fruits and vegetables by drying or dehydration.
- (B). Microorganisms and enzymes need water in order to be active.
- (C). Dried, dessicated or low moisture foods are the traditional dried foods
- (D). Intermediate moisture or IM foods contain between 15% to 50% moisture.

Choose the correct answer from the options given below:

- (A) (A), (B) and (D) only.
- (B) (A), (B) and (C) only.
- (C) (A), (C) and (D) only.

(D) (B), (C) and (D) only.

Correct Answer: (4) (B), (C) and (D) only.

Solution:

Step 1: Understanding the Concept:

The question asks to evaluate four statements related to the principles and terminology of preserving food by removing water, and to identify which of them are factually correct.

Step 2: Detailed Explanation:

A critical analysis of each statement is as follows:

- **(A):** This statement is definitively **false**. Freeze drying, or lyophilization, is a highly sophisticated method of dehydration. It involves freezing the product and then removing the water by sublimation (transitioning it directly from solid ice to water vapor) under a vacuum. It is a form of preservation by drying.
- **(B):** This statement is **true**. It describes the fundamental principle behind this preservation method. All metabolic processes, including microbial growth and enzymatic activity, are water-dependent. By removing water, we lower the "water activity" (a_w) to a point where spoilage organisms and enzymes are inhibited.
- **(C):** This statement is **true**. Foods that have had most of their water removed through traditional methods like sun drying (e.g., raisins, dried herbs) are categorized as low-moisture, dried, or desiccated foods.
- **(D):** This statement is **true**. Intermediate Moisture (IM) foods represent a category of products that are shelf-stable without refrigeration, yet retain a soft texture. They achieve this with a moisture content typically ranging from 15% to 50%, combined with other factors like high sugar or salt content that lower water activity.

Therefore, the correct statements are (B), (C), and (D).

Step 3: Final Answer:

The correct option is the one that includes the true statements (B), (C), and (D).

💡 Quick Tip

The key to preservation by drying isn't just removing moisture, but reducing 'water activity' (a_w), which is the available water for biological reactions. This is the scientific principle that makes drying effective.

43. Which of the following is NOT a component of the Endomembrane system?

- (A) Golgi apparatus
- (B) Endoplasmic reticulum
- (C) Lysosome
- (D) Mitochondrion

Correct Answer: (4) Mitochondrion

Solution:

Step 1: Understanding the Concept:

The question requires identifying which of the listed organelles is excluded from the endomembrane system of a eukaryotic cell. This system is a network of membranes and organelles that work in concert to process and transport proteins and lipids.

Step 2: Detailed Explanation:

The endomembrane system is a functionally integrated group of cellular components that includes:

- The nuclear envelope
- The **Endoplasmic reticulum** (both rough and smooth)
- The **Golgi apparatus**
- **Lysosomes** and vacuoles
- The plasma membrane

These components are interconnected, either through direct physical contact or through the exchange of membrane-bound sacs called vesicles. The **Mitochondrion** is not part of this system. It is a semi-autonomous organelle responsible for cellular respiration and ATP production. According to the endosymbiotic theory, mitochondria (along with chloroplasts) originated as free-living prokaryotes and thus have their own distinct membranes and DNA, separate from the endomembrane trafficking system.

Step 3: Final Answer:

The Mitochondrion is not considered a component of the endomembrane system.

💡 Quick Tip

Think of the endomembrane system as a "cellular factory and shipping service" for proteins and lipids. Mitochondria are the "power plants," operating independently of this production line.

44. Honey bees are efficient pollinators because of following characters

- (A). It does not have a hairy body and is smooth and waxy
- (B). They adapt themselves to different climates
- (C). Length of proboscis is suitable for many crops
- (D). Body parts are modified to pick up pollen

Choose the correct answer from the options given below:

- (A) (A), (B) and (D) only.
- (B) (A), (B) and (C) only.
- (C) (B), (C) and (D) only
- (D) (A), (C) and (D) only.

Correct Answer: (3) (B), (C) and (D) only

Solution:

Step 1: Understanding the Concept:

The question requires identifying the specific biological and behavioral traits that make honey bees such effective and widespread pollinators.

Step 2: Detailed Explanation:

Let's assess the validity of each statement:

- **(A):** This statement is factually **incorrect**. A key feature that makes bees excellent pollinators is that their bodies are covered in plumose, or branched, hairs. These hairs build up an electrostatic charge that causes pollen grains to cling to them effectively. A smooth body would be very poor at passive pollen collection.
- **(B):** This statement is **true**. Honey bees are highly adaptable and have successfully established populations in nearly every climate on Earth where flowering plants exist, which makes them a globally reliable pollination service.
- **(C):** This statement is **true**. The honey bee's tongue, or proboscis, is of a medium length, which allows it to be a generalist forager, capable of accessing nectar from a vast array of flower shapes and sizes, thus pollinating many different crops.
- **(D):** This statement is **true**. Bees possess specialized anatomical features for pollen collection. The most prominent is the corbicula, or "pollen basket," which is a concave area on their hind legs surrounded by stiff hairs, used to pack and transport large loads of pollen back to the hive.

The statements that accurately describe the pollinating prowess of honey bees are (B), (C), and (D).

Step 3: Final Answer:

The correct combination of characters that make honey bees efficient pollinators is (B), (C), and (D).

 Quick Tip

The fuzzy, hairy body of a bee is one of its most important tools for pollination. Pollen sticks to the hairs as the bee forages, allowing for transfer between flowers. Remember: hairy = good pollinator.

45. Which of the following is considered as the main disadvantage in the application of remote sensing methods?

- (A) It saves time and manpower as larger area can be covered
- (B) It provides only a synoptic overview or bird's eye view of a larger area
- (C) It cannot provide all the information needed for any scientific study
- (D) The collection and interpretation is expensive

Correct Answer: (4) The collection and interpretation is expensive

Solution:

Step 1: Understanding the Concept:

The question asks to identify the most significant drawback or primary limiting factor associated with the use of remote sensing technology.

Step 2: Detailed Explanation:

Let's evaluate each option to determine if it's an advantage or disadvantage:

- **(A) ...saves time and manpower...:** This is a core **advantage**. A single satellite image can cover a vast area that would take ground crews weeks or months to survey.
- **(B) ...provides a synoptic overview...:** The ability to get a "bird's eye view" of large-scale phenomena (like deforestation or urban sprawl) is a key **advantage**.
- **(C) ...cannot provide all the information...:** While true that remote sensing data often requires field validation ("ground-truthing"), this is a limitation common to many scientific tools, not necessarily its main disadvantage.

- **(D) The collection and interpretation is expensive:** This represents the most significant and universal **disadvantage**. The entire remote sensing pipeline, from designing and launching satellites with sophisticated sensors to acquiring data, using powerful computers and specialized software for processing, and employing highly skilled analysts for interpretation, involves substantial financial investment. This high cost is often the primary barrier to its adoption.

While (C) is a limitation, the high cost (D) is a more fundamental and prohibitive disadvantage.

Step 3: Final Answer:

The main disadvantage in the application of remote sensing methods is that the collection and interpretation of data are expensive.

💡 Quick Tip

When evaluating pros and cons, consider the fundamental barriers. For many advanced technologies like remote sensing, the high initial and operational cost is a primary limiting factor that restricts its widespread use.

46. For the examination of microbial cells we require the use of?

- (A) High-power microscope
- (B) Low-power microscope
- (C) High-power microscope at a magnification of about 1,000 X
- (D) Low-power microscope at a magnification of about 1,000 X

Correct Answer: (3) High-power microscope at a magnification of about 1,000 X

Solution:

Step 1: Understanding the Concept:

The question asks for the standard laboratory equipment and specific magnification level required to visualize individual microbial cells, such as bacteria.

Step 2: Detailed Explanation:

Individual bacterial cells are extremely small, typically measuring only a few micrometers (μm) in length. To resolve and observe them, a powerful microscope is essential.

- A low-power microscope or low magnification objectives (e.g., 4x, 10x) would only show bacteria as indistinct specks, if at all. Therefore, a high-power microscope is needed.

- The standard instrument for this task is a compound light microscope. The maximum effective magnification is achieved using the "oil immersion" objective lens, which has a magnifying power of 100x.
- This objective lens is used in combination with the eyepiece (ocular lens), which typically has a magnification of 10x. The total magnification is the product of these two values: $100x \times 10x = 1,000X$.

This 1,000X total magnification is the standard for routine bacteriology. Therefore, option (C) is the most complete and accurate description of the requirement. Option (D) is internally contradictory.

Step 3: Final Answer:

The examination of microbial cells requires the use of a high-power microscope at a total magnification of about 1,000X.

💡 Quick Tip

In microbiology labs, the term "oil immersion" is synonymous with viewing bacteria. The oil is used with the 100x objective lens to achieve the 1000x total magnification needed to see these tiny cells clearly.

47. Arrange the following stages in Remote Sensing Data Acquisition in correct sequence
 (A). Extraction of the information contents from the data products and conversion of information into various forms
 (B). Propagation of reflected/emitted energy through the atmosphere and detection of the reflected/emitted energy by the sensor
 (C). Source of energy and transmission of energy from the source to the surface of the earth
 (D). Conversion of energy received into photographic/digital form of data
 Choose the correct answer from the options given below:

- (A) (C), (B), (D), (A).
- (B) (C), (A), (B), (D).
- (C) (C), (D), (A), (B).
- (D) (D), (C), (B), (A).

Correct Answer: (1) (C), (B), (D), (A).

Solution:

Step 1: Understanding the Concept:

The question asks to organize the fundamental steps of the remote sensing process into their

correct logical and chronological order, from start to finish.

Step 2: Detailed Explanation:

The entire remote sensing workflow can be broken down into a sequence of events:

1. **(C) Source of energy...:** The process must logically begin with an energy source. In passive remote sensing, this is the Sun, which provides electromagnetic radiation that travels to and illuminates the Earth's surface. This is the absolute first step.
2. **(B) Propagation... and detection...:** Once the energy interacts with the surface, it is reflected or emitted back into space. This energy must then travel back through the atmosphere before it is captured and detected by a sensor mounted on a platform like a satellite.
3. **(D) Conversion... into data...:** After the sensor detects the energy, it must be recorded in a usable format. The sensor converts the detected energy levels into raw data, which can be photographic film or, more commonly, a digital file.
4. **(A) Extraction of information...:** The raw data itself is not information. This final step involves processing, analyzing, and interpreting the data to extract meaningful information, such as creating a map of forest cover or assessing crop health.

This logical flow establishes the correct sequence as $C \rightarrow B \rightarrow D \rightarrow A$.

Step 3: Final Answer:

The correct sequence of stages in Remote Sensing Data Acquisition is (C), (B), (D), (A).

💡 Quick Tip

Think of the process like taking a picture: (C) Sun provides light. (B) Light bounces off your friend and enters the camera lens. (D) The camera sensor records the light as a digital image file. (A) You look at the image on your phone to see your friend's face.

48. On the basis of the size of the waves and frequency, arrange the following energy waves in correct sequence in Electromagnetic Spectrum.

- (A). Infrared rays
- (B). Microwaves, Radio waves
- (C). Gamma rays, X-rays
- (D). Ultraviolet rays, Visible rays

Choose the correct answer from the options given below:

- (A) (C), (A), (D), (B).
- (B) (C), (D), (A), (B).

(C) (C), (B), (D), (A).
(D) (D), (C), (A), (B).

Correct Answer: (2) (C), (D), (A), (B).

Solution:

Step 1: Understanding the Concept:

The question requires arranging groups of electromagnetic (EM) waves according to their standard position in the EM spectrum. The spectrum is ordered by wavelength, frequency, and energy, which are interrelated (short wavelength = high frequency = high energy). The standard scientific convention is to list them from highest energy to lowest energy.

Step 2: Detailed Explanation:

The electromagnetic spectrum is organized as follows, from highest energy/frequency to lowest energy/frequency:

1. Gamma rays
2. X-rays
3. Ultraviolet (UV) rays
4. Visible light
5. Infrared (IR) rays
6. Microwaves
7. Radio waves

Let's map the given groups onto this established order:

- **(C) Gamma rays, X-rays:** These are at the highest-energy end of the spectrum. This group must come first.
- **(D) Ultraviolet rays, Visible rays:** These waves have less energy than X-rays and come next in the sequence.
- **(A) Infrared rays:** These waves have less energy than visible light and follow next.
- **(B) Microwaves, Radio waves:** These are at the lowest-energy, longest-wavelength end of the spectrum. This group must come last.

The correct sequence, therefore, is (C), then (D), then (A), and finally (B).

Step 3: Final Answer:

The correct sequence of energy waves in the Electromagnetic Spectrum from highest to lowest energy is (C), (D), (A), (B).

💡 Quick Tip

A useful mnemonic to remember the order of the EM spectrum from longest wavelength to shortest (lowest energy to highest) is: "Raging Martians Invaded Venus Using X-ray Guns" (Radio, Microwave, Infrared, Visible, UV, X-ray, Gamma). The question asks for the reverse order.

49. Match List-I with List-II

List-I	List-II
(A). Population size	(I). It refers to how many individuals reside in a particular area
(B). Population density	(II). It yields helpful information about how species interact with each other
(C). Population distribution	(III). It represents the total number of individuals in a habitat
(D). Population dispersion	(IV). It describes how individuals of a species are spread out, whether they are close to each other or far apart, or clustered into groups

Choose the correct answer from the options given below:

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

Correct Answer: (4) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

Solution:

Step 1: Understanding the Concept:

The question requires matching four key terms used in population ecology with their correct definitions or descriptions.

Step 2: Detailed Explanation:

Let's find the most accurate match for each term in List-I:

- **(A) Population size:** This term refers to the absolute total count of individuals within the population. This perfectly matches with definition **(III) It represents the total number of individuals in a habitat.**
- **(B) Population density:** This is a measure of how crowded a population is, defined as the number of individuals per unit of area or volume. This perfectly matches with definition **(I) It refers to how many individuals reside in a particular area.**

- **(C) Population distribution:** This describes the geographic area or range where a species is found. In the context of the options, it is matched with **(IV) It describes how individuals of a species are spread out...**, which is a reasonable fit.
- **(D) Population dispersion:** This describes the fine-scale spacing pattern of individuals within their distribution (e.g., clumped, uniform, random). The statement **(II) It yields helpful information about how species interact...** is a consequence of studying dispersion (e.g., uniform dispersion suggests competition), and serves as the best remaining match.

Based on the clear matches for (A) and (B), and the logical remaining pairs, the only option that aligns is (4).

Step 3: Final Answer:

The correct combination of matches is (A) - (III), (B) - (I), (C) - (IV), (D) - (II).

Quick Tip

Focus on the most unambiguous matches first. Population size is the total count (III), and population density is the count per area (I). This will often help you narrow down the options to the correct answer, even if other parts of the question are slightly confusing.

50. Two important characteristics for estimating any population of animals and plants are _____ and _____ of individuals.

- (A) Density, dispersion
- (B) Density, size
- (C) Density, distribution
- (D) Dispersion, distribution

Correct Answer: (2) Density, size

Solution:

Step 1: Understanding the Concept:

The question asks to identify the two most fundamental quantitative properties that are typically measured or estimated when an ecologist begins to study a population.

Step 2: Detailed Explanation:

When characterizing any population, ecologists are interested in several attributes. However, the two most basic and crucial quantitative estimates are:

- **Size (N):** This is the absolute number of individuals in the population. It's the most fundamental measure of a population's abundance and is essential for assessing its viability and impact.
- **Density:** This is the number of individuals per unit of area or volume. It provides context to the population size and is critical for understanding resource availability, social interactions, and competition.

While dispersion (pattern of spacing) and distribution (geographic range) are also vital characteristics, they are often described qualitatively or are studied after the foundational estimates of size and density have been established.

Step 3: Final Answer:

Two important characteristics for estimating any population of animals and plants are the density and size of individuals.

💡 Quick Tip

When an ecologist goes to the field to study a new population, the first two questions they try to answer are "How many are there?" (Size) and "How crowded are they?" (Density). These are the foundational estimates.

51. Which eukaryotic cell-cycle event is missing in Binary Fission?

- (A) Cell growth
- (B) DNA duplication
- (C) Cytokinesis
- (D) Mitosis

Correct Answer: (4) Mitosis

Solution:

Step 1: Understanding the Concept:

The question requires a comparison between the process of cell division in prokaryotes (binary fission) and eukaryotes (the cell cycle), to identify which key eukaryotic step is absent in the simpler prokaryotic process.

Step 2: Detailed Explanation:

Let's compare the key events in both processes:

- **Cell growth:** Both prokaryotic and eukaryotic cells must increase in size and synthesize new components before they can divide. This step is common to both.
- **DNA duplication:** Both must replicate their entire genome to ensure each daughter cell receives a full set of genetic instructions. This is common to both.
- **Cytokinesis:** Both processes conclude with the physical division of the cytoplasm, separating the parent cell into two daughter cells. This is common to both.
- **Mitosis:** This is a highly complex and organized process exclusive to eukaryotes. It involves the condensation of multiple linear chromosomes and their precise segregation into two separate nuclei using a spindle apparatus. Since prokaryotes lack a nucleus and have a single circular chromosome, they do not perform mitosis.

Therefore, mitosis is the distinguishing event of the eukaryotic cell cycle that is absent in binary fission.

Step 3: Final Answer:

The eukaryotic cell-cycle event that is missing in Binary Fission is Mitosis.

💡 Quick Tip

Remember the key difference: Binary fission is simple division in prokaryotes (no nucleus). Mitosis is complex nuclear division in eukaryotes (have a nucleus). If there's no nucleus, there can't be mitosis.

52. Which of the following statements is NOT correct?

- (A) All organisms are composed of one or more cells
- (B) Cytotechnologists study cells
- (C) New cells arise from existing cells
- (D) Viruses display all the properties of life outside of a host cell

Correct Answer: (4) Viruses display all the properties of life outside of a host cell

Solution:

Step 1: Understanding the Concept:

The question asks to identify the statement that is factually incorrect from a set of options related to fundamental biological principles, including the Cell Theory and the nature of viruses.

Step 2: Detailed Explanation:

Let's evaluate the truthfulness of each statement:

- **(A) All organisms are composed of one or more cells:** This is a central tenet of the universally accepted Cell Theory and is considered a correct statement.
- **(B) Cytotechnologists study cells:** This is a correct statement. Cytotechnology is a specialized medical field focused on the microscopic examination of cells to detect disease, particularly cancer.
- **(C) New cells arise from existing cells:** This principle, famously articulated by Rudolf Virchow as "Omnis cellula e cellula," is another cornerstone of the modern Cell Theory and is correct.
- **(D) Viruses display all the properties of life outside of a host cell:** This statement is **incorrect**. Viruses are defined as obligate intracellular parasites, meaning they are completely dependent on a host cell for reproduction. Outside a host, a virus exists as an inert, non-living particle called a virion. It lacks the machinery for metabolism, growth, and replication, and can only perform these functions by hijacking a living cell's resources.

Step 3: Final Answer:

The statement that is not correct is: "Viruses display all the properties of life outside of a host cell."

Quick Tip

Viruses are often described as being on the "borderline of life" precisely because they are completely inactive outside a host cell but can replicate and evolve once inside. They lack the cellular machinery for independent life.

53. The difficulties encountered in a roof garden are as follows

- (A). Soil depth is limited
- (B). Large trees and shrubs can be grown with greater ease than any other garden
- (C). Drainage needs to be ensured
- (D). Frequent watering is required

Choose the correct answer from the options given below:

- (A) (A), (B) and (D) only.
- (B) (A), (B) and (C) only.
- (C) (A), (C) and (D) only.

(D) (B), (C) and (D) only.

Correct Answer: (3) (A), (C) and (D) only.

Solution:

Step 1: Understanding the Concept:

The question requires identifying the genuine practical challenges and constraints one faces when designing, installing, and maintaining a garden on a rooftop.

Step 2: Detailed Explanation:

Let's critically assess each statement to see if it represents a difficulty:

- **(A) Soil depth is limited:** This is a primary and unavoidable difficulty. The structural load-bearing capacity of a roof dictates that only a shallow layer of a specially formulated lightweight growing medium can be used. This significantly restricts the root space available for plants.
- **(B) Large trees and shrubs can be grown with greater ease...:** This statement is patently **false** and the opposite of the truth. The combination of limited soil depth and severe weight restrictions makes growing large trees and shrubs one of the biggest challenges, and it is often impossible without significant structural reinforcement.
- **(C) Drainage needs to be ensured:** This is a critical difficulty of paramount importance. An effective drainage system is non-negotiable to prevent water from saturating the growing medium (killing roots) and, more importantly, to protect the building's roof membrane from water damage and structural overload.
- **(D) Frequent watering is required:** This is a significant operational difficulty. Rooftop environments are exposed to more intense sun, heat, and wind, which causes the shallow growing medium to dry out much faster than a conventional garden, thus demanding more frequent irrigation.

Therefore, the true difficulties are (A), (C), and (D).

Step 3: Final Answer:

The correct option that accurately lists the difficulties of a roof garden is (A), (C), and (D) only.

 Quick Tip

When thinking about rooftop gardening, always consider the two biggest constraints: weight and water. Limited weight capacity restricts soil depth and plant size. Exposure to elements increases water needs and necessitates excellent drainage.

54. Which of the following organelles is most likely to aid in the digestion of food particles?

- (A) Rough endoplasmic reticulum
- (B) Nucleus
- (C) Lysosome
- (D) Ribosome

Correct Answer: (3) Lysosome

Solution:

Step 1: Understanding the Concept:

The question asks to identify the specific cellular organelle whose primary function is to break down materials, including ingested food particles, within the cell.

Step 2: Detailed Explanation:

Let's review the main roles of the listed organelles:

- **(A) Rough endoplasmic reticulum (RER):** Its primary role, due to the attached ribosomes, is the synthesis and modification of proteins that will be exported from the cell or embedded in its membranes.
- **(B) Nucleus:** This acts as the cell's control center, housing the genetic material (DNA) and directing all cellular activities.
- **(C) Lysosome:** This organelle is essentially a membrane-enclosed sac filled with powerful hydrolytic (digestive) enzymes. Its function is to fuse with vesicles containing food particles, old organelles, or engulfed pathogens and break them down into smaller, reusable molecules. It is the cell's digestive system.
- **(D) Ribosome:** These are molecular machines responsible for protein synthesis, translating the code from messenger RNA into amino acid chains.

Given these functions, the lysosome is clearly the organelle responsible for digestion.

Step 3: Final Answer:

The lysosome is the organelle most likely to be involved in the digestion of food particles.

💡 Quick Tip

Associate the suffix "-lys-" with breakdown. "Lysosome" contains enzymes for lysis (breaking down). This simple word association can help you remember its primary function.

55. Which of the following organelles are NOT present in plant cells?

- (A) Peroxisomes
- (B) Golgi apparatus
- (C) Smooth endoplasmic reticulum
- (D) Lysosome

Correct Answer: (4) Lysosome

Solution:

Step 1: Understanding the Concept:

The question requires identifying which of the listed organelles is a characteristic feature of animal cells but is generally considered absent in typical plant cells.

Step 2: Detailed Explanation:

Let's examine the presence of each organelle in a standard plant cell:

- **(A) Peroxisomes:** These are present and active in plant cells, playing a key role in metabolic functions like photorespiration.
- **(B) Golgi apparatus:** Plant cells possess a Golgi apparatus (often called dictyosomes) which is vital for processing proteins and lipids and for synthesizing polysaccharides for the cell wall.
- **(C) Smooth endoplasmic reticulum:** This is present in plant cells and is involved in lipid synthesis and detoxification processes.
- **(D) Lysosome:** Lysosomes are the primary digestive organelles in animal cells. In plant cells, this role is predominantly fulfilled by the large central vacuole, which contains its own set of hydrolytic enzymes. Therefore, distinct, separate organelles identifiable as lysosomes are generally considered to be absent in mature plant cells.

Step 3: Final Answer:

Among the given options, Lysosomes are the organelles not typically present in plant cells.

💡 Quick Tip

Remember the three key structures present in plant cells but absent in animal cells: the cell wall, chloroplasts, and a large central vacuole. Conversely, lysosomes and centrioles are typically found in animal cells but not in plant cells.

56. Which microbiologist made first simple microscope to see the presence of tiny living organisms present in pond water?

- (A) Antonie van Leeuwenhoek
- (B) Zaccharias Janssen
- (C) Robert Hooke
- (D) Robert Brown

Correct Answer: (1) Antonie van Leeuwenhoek

Solution:

Step 1: Understanding the Concept:

The question asks to identify the historical figure who is credited with being the first person to observe and describe living microorganisms.

Step 2: Detailed Explanation:

A review of the contributions of these key figures in the history of microscopy reveals the answer:

- **(A) Antonie van Leeuwenhoek (1632-1723):** A Dutch draper and amateur scientist, he is celebrated as the "Father of Microbiology." He did not invent the microscope, but he perfected the art of grinding single lenses to achieve unprecedented magnification (over 200x). With these simple microscopes, he was the very first human to witness and provide detailed descriptions and drawings of single-celled life forms, which he famously termed "animalcules," from samples of pond water, rainwater, and dental plaque.
- **(B) Zaccharias Janssen (c. 1585-1632):** He was a spectacle-maker credited with inventing the first compound microscope, but he is not associated with any significant biological observations.
- **(C) Robert Hooke (1635-1703):** He was the first to use the word "cell" to describe the box-like structures he saw in a thin slice of cork. However, he was observing the dead cell walls of plant tissue, not living microorganisms.
- **(D) Robert Brown (1773-1858):** He was a botanist who provided the first detailed description of the cell nucleus.

Thus, Leeuwenhoek was the pioneer who opened up the microbial world to human observation.

Step 3: Final Answer:

Antonie van Leeuwenhoek was the microbiologist who made the first simple microscope powerful enough to see tiny living organisms in pond water.

💡 Quick Tip

Associate names with key discoveries: Leeuwenhoek → "animalcules" (microbes), Hooke → "cell" (from cork), Brown → nucleus.

57. Which of the fixatives is NOT used for sample preparation in TEM?

- (A) Formaldehyde
- (B) Glutaraldehyde
- (C) Osmium tetroxide
- (D) Coating with gold and palladium

Correct Answer: (4) Coating with gold and palladium

Solution:

Step 1: Understanding the Concept:

The question requires identifying which of the listed techniques is not a fixation method used in preparing biological samples for Transmission Electron Microscopy (TEM). Fixation is a critical step to preserve the sample's structure in a life-like state.

Step 2: Detailed Explanation:

Let's analyze the role of each option in electron microscopy:

- **(A) Formaldehyde & (B) Glutaraldehyde:** These are aldehyde fixatives and represent the standard primary step in TEM sample preparation. Their function is to create chemical cross-links between protein molecules, which effectively freezes the cellular ultrastructure in place and prevents degradation.
- **(C) Osmium tetroxide:** This is used as a secondary fixative after the initial aldehyde fixation. It serves a dual purpose: it stabilizes and preserves lipids (especially in cell membranes) which aldehydes do poorly, and as a heavy metal, it stains the tissue, significantly increasing the contrast of the final image.
- **(D) Coating with gold and palladium:** This technique, known as sputter coating, involves depositing a very thin layer of conductive metal onto a sample's surface. This is

done to prevent the buildup of electrical charge on the specimen when it is scanned by an electron beam. This is a mandatory step for **Scanning Electron Microscopy (SEM)**, which visualizes the surface topography of a sample. It is not used for TEM, where the electron beam must pass *through* an ultra-thin section of the sample.

Step 3: Final Answer:

Coating with gold and palladium is a preparation technique for Scanning Electron Microscopy (SEM), not a method of fixation for Transmission Electron Microscopy (TEM).

💡 Quick Tip

Remember the key difference: TEM (Transmission) looks *through* a very thin slice of the sample. SEM (Scanning) looks *at the surface* of the sample. Therefore, coating the surface with metal is an SEM technique.

58. Negative staining method is used for examining very small objects. It is generally used in -----

- (A) TEM
- (B) SEM
- (C) Confocal Microscopy
- (D) ESEM

Correct Answer: (1) TEM

Solution:

Step 1: Understanding the Concept:

The question asks to identify the specific type of microscopy that utilizes the "negative staining" technique for sample visualization.

Step 2: Detailed Explanation:

Negative staining is a sample preparation method where the background is stained, leaving the actual specimen untouched and unstained. In this technique, a sample of very small particles (like viruses or macromolecules) is mixed with a solution of a heavy metal salt (e.g., uranyl acetate) which is electron-dense. When this mixture is dried on a grid, the heavy metal salt forms a dark, electron-opaque "puddle" around the electron-transparent specimen. When the electron beam passes through, it is scattered by the dark background but passes easily through the light specimen. This creates a high-contrast, reversed image (a bright object on a dark background), revealing the specimen's size and shape. Since this method relies on the transmission of electrons through the sample and its surroundings, it is a technique exclusively used for **Transmission Electron Microscopy (TEM)**.

Step 3: Final Answer:

The negative staining method is a technique generally used in TEM (Transmission Electron Microscopy).

💡 Quick Tip

Think "negative" means staining the background, not the object itself. This method is perfect for seeing the outline or silhouette of tiny things like viruses, and it requires the "through-the-sample" view of a TEM.

59. The change of source of illumination from light to electrons significantly improved the _____ of the microscope.

- (A) Resolving power
- (B) Resolution
- (C) Numerical aperture
- (D) Magnification

Correct Answer: (1) Resolving power

Solution:

Step 1: Understanding the Concept:

The question asks to identify the most fundamental property of a microscope that was enhanced by the transition from using light (photons) to using electrons for illumination.

Step 2: Detailed Explanation:

The ultimate limit of a microscope's ability to distinguish fine details is its resolving power (or resolution). This is determined by the physical properties of the illumination source, specifically its wavelength. According to the principles of optics (specifically the Abbe diffraction limit), the minimum distance that can be resolved is directly proportional to the wavelength of the illumination. Electrons, when accelerated, exhibit wave-like properties and have a de Broglie wavelength that is thousands of times shorter than that of visible light photons. This dramatically shorter wavelength is the key to the electron microscope's superiority. It allows the microscope to overcome the diffraction limit of light, thereby vastly increasing its ability to distinguish between two very closely spaced points. This fundamental improvement in clarity and detail is its resolving power. While magnification also increased, it is only the improved resolving power that makes that high magnification useful.

Step 3: Final Answer:

The transition from light to electrons as an illumination source led to a significant improvement in the resolving power of the microscope.

💡 Quick Tip

Think of it this way: Resolution/Resolving Power is about clarity, while Magnification is about size. You can magnify a blurry image, but it just gets bigger and blurrier. The switch to electrons improved the fundamental clarity (resolving power), which then made higher magnifications meaningful.

60. Arrange the following in the order of their occurrence in TCA cycle

- (A). Isocitric Acid
- (B). Citric Acid
- (C). Fumaric Acid
- (D). Malic Acid

Choose the correct answer from the options given below:

- (A) (B), (A), (C), (D).
- (B) (A), (B), (D), (C).
- (C) (B), (A), (D), (C).
- (D) (C), (B), (D), (A).

Correct Answer: (1) (B), (A), (C), (D).

Solution:

Step 1: Understanding the Concept:

The question requires arranging four key intermediate molecules in the correct sequence as they are produced during one turn of the Tricarboxylic Acid (TCA) cycle, also known as the Krebs cycle.

Step 2: Detailed Explanation:

The TCA cycle follows a specific, unvarying sequence of reactions. Let's trace the path of the listed compounds:

1. The cycle is initiated when a two-carbon acetyl-CoA molecule condenses with a four-carbon oxaloacetate molecule to form the six-carbon compound **(B) Citric Acid**. This is the first product of the cycle.
2. In the next step, the citric acid molecule is rearranged by the enzyme aconitase into its isomer, **(A) Isocitric Acid**.
3. The cycle then proceeds through several other intermediates (alpha-ketoglutarate, succinyl-CoA, succinate).

4. The four-carbon succinate is then oxidized to form (C) **Fumaric Acid**.
5. In the subsequent reaction, a water molecule is added to fumaric acid to form (D) **Malic Acid**.
6. Malic acid is then oxidized to regenerate oxaloacetate, completing the cycle.

Therefore, the correct order in which these specific compounds appear is Citric Acid, then Isocitric Acid, followed later by Fumaric Acid, and then Malic Acid.

Step 3: Final Answer:

The correct order of occurrence in the TCA cycle for the given compounds is (B), (A), (C), (D).

Quick Tip

A helpful mnemonic for the TCA cycle intermediates is: "Citrate Is Krebs' Starting Substrate For Making Oxaloacetate". (Citrate, Isocitrate, α -Ketoglutarate, Succinyl-CoA, Succinate, Fumarate, Malate, Oxaloacetate). This can help you quickly place the given compounds in the correct order.

61. Arrange the following spices in increasing order of their production based on Area and Production estimates of Horticulture Crops 2021-22 (Final) -

- (A). Turmeric
- (B). Tamarind
- (C). Garlic
- (D). Coriander

Choose the correct answer from the options given below:

- (A) (B), (D), (A), (C).
- (B) (D), (B), (A), (C).
- (C) (B), (D), (C), (A).
- (D) (D), (B), (C), (A).

Correct Answer: (1) (B), (D), (A), (C).

Solution:

Step 1: Understanding the Concept:

The question requires organizing four different spices from the lowest production volume to the highest, based on the final official production data for India for the 2021-22 period.

Step 2: Key Formula or Approach:

The method to solve this is to recall or access the production figures (in lakh tonnes) for each spice from the "Area and Production Estimates of Horticulture Crops 2021-22 (Final)" and then arrange them in ascending order.

Step 3: Detailed Explanation:

Based on the final production estimates from the Ministry of Agriculture Farmers Welfare for 2021-22, the approximate production quantities are:

- **(B) Tamarind:** As a tree spice, its production is the lowest among the options, estimated to be approximately 2.01 lakh tonnes.
- **(D) Coriander:** A major seed spice, its production is estimated at approximately 8.04 lakh tonnes.
- **(A) Turmeric:** A major rhizomatous spice, its production is considerably higher, estimated at approximately 13.31 lakh tonnes.
- **(C) Garlic:** A major bulb spice, its production is the highest of the four, estimated at a very large volume of approximately 32.09 lakh tonnes.

Arranging these from smallest to largest production gives the sequence: Tamarind ; Coriander ; Turmeric ; Garlic.

Step 4: Final Answer:

The correct sequence representing increasing order of production is (B) Tamarind, (D) Coriander, (A) Turmeric, and (C) Garlic.

💡 Quick Tip

For questions based on production data, it's helpful to have a general idea of the scale of cultivation. Major bulb and rhizome spices like Garlic and Turmeric generally have much higher production volumes than seed spices like Coriander or tree spices like Tamarind.

62. Arrange the following Citrus fruits in increasing order of their area of cultivation based on Area and Production estimates of Horticulture Crops 2021-22 (Final) -

- (A). Lime/Lemon
- (B). Mandarin
- (C). Sweet Mosambi
- (D). Other Citrus

Choose the correct answer from the options given below:

- (A) (D), (C), (A), (B).
- (B) (C), (D), (B), (A).
- (C) (B), (A), (D), (C).
- (D) (C), (B), (D), (A).

Correct Answer: (1) (D), (C), (A), (B).

Solution:

Step 1: Understanding the Concept:

The question asks to arrange different categories of citrus fruits from the smallest area of cultivation to the largest area, based on India's final horticulture statistics for 2021-22.

Step 2: Key Formula or Approach:

The methodology is to retrieve the estimated area of cultivation for each citrus group from the specified report and then sequence them in ascending order.

Step 3: Detailed Explanation:

According to the final estimates for horticulture crops for 2021-22, the approximate areas under cultivation in India for these citrus categories are:

- **(D) Other Citrus:** This miscellaneous category, which includes fruits like pummelo and grapefruit, occupies the smallest land area, estimated at about 37,000 hectares.
- **(C) Sweet Orange (Mosambi):** The area dedicated to this fruit is next, estimated to be around 202,000 hectares.
- **(A) Lime/Lemon:** This category has the second-largest area of cultivation, estimated at approximately 332,000 hectares.
- **(B) Mandarin:** This group, which includes major commercial varieties like Kinnow and Nagpur Santra, dominates citrus cultivation in India with the largest area, estimated at around 439,000 hectares.

Arranging these from smallest to largest area under cultivation yields the order: Other Citrus ; Sweet Mosambi ; Lime/Lemon ; Mandarin.

Step 4: Final Answer:

The correct sequence showing the increasing order of cultivation area is (D), (C), (A), (B).

 Quick Tip

In India, Mandarin oranges (especially Kinnow and Nagpur Santra) dominate citrus cultivation in terms of area, followed by Limes/Lemons. Sweet Oranges (Mosambi) are third, with other minor citrus fruits occupying the smallest area.

63. Sapota fruits are highly perishable and ripen within 5-7 days.

- (A). Sapota is a climacteric fruit
- (B). Fruits of sapota can be harvested at physiological maturity
- (C). Sapota can be ripened artificially for use as table fruit
- (D). Sapota can be stored in a refrigerator for nearly six months

Choose the correct answer from the options given below:

- (A) (A), (B) and (D) only.
- (B) (A), (B) and (C) only.
- (C) (B), (C) and (D).
- (D) (A), (C) and (D) only.

Correct Answer: (2) (A), (B) and (C) only.

Solution:

Step 1: Understanding the Concept:

The question requires evaluating a series of statements about the post-harvest physiology and handling of Sapota (also known as Chikoo) to determine which are factually correct.

Step 2: Detailed Explanation:

Let's analyze the validity of each statement:

- **(A) Sapota is a climacteric fruit:** This statement is **correct**. Sapota exhibits a classic climacteric ripening pattern, meaning it shows a dramatic increase in respiration rate and ethylene production after being harvested, which drives the ripening process.
- **(B) Fruits of sapota can be harvested at physiological maturity:** This statement is **correct**. Because it is a climacteric fruit, it can be harvested when it is mature but still firm and inedible. It will then continue to ripen off the tree to become soft and sweet.
- **(C) Sapota can be ripened artificially for use as table fruit:** This statement is **correct**. As a climacteric fruit, its ripening is triggered by ethylene. Therefore, growers can use ethylene-releasing agents like ethephon to induce uniform and rapid ripening after harvest.

- **(D) Sapota can be stored in a refrigerator for nearly six months:** This statement is definitively **incorrect**. As stated in the premise, sapota is a highly perishable fruit. Even with optimal refrigerated storage, its shelf life is limited to a few weeks (typically 2-3 at most), not several months.

Based on this analysis, statements (A), (B), and (C) are correct.

Step 3: Final Answer:

The correct option is the one that groups the true statements: (A), (B), and (C) only.

💡 Quick Tip

For any fruit, if you know it's climacteric (like banana, mango, sapota), you can infer that it can be harvested mature-green and ripened artificially with ethylene. This links statements A, B, and C together.

64. Which of the following is a hybrid guava with pink flesh used for table as well as processing purpose?

- (A) Arka Anmol
- (B) Lucknow 49
- (C) Shweta
- (D) Arka Kiran

Correct Answer: (4) Arka Kiran

Solution:

Step 1: Understanding the Concept:

The question asks to identify a specific guava variety that meets three criteria: it must be a hybrid, it must have pink-colored flesh, and it must be suitable for both fresh eating and industrial processing.

Step 2: Detailed Explanation:

Let's examine the characteristics of the listed varieties:

- **(A) Arka Anmol:** This is a hybrid variety developed at IIHR, but it is known for having white flesh.
- **(B) Lucknow 49:** Also known famously as 'Sardar', this is a selection, not a hybrid, and is the benchmark for high-quality, white-fleshed guavas in India.

- **(C) Shweta:** As the name suggests ('Shwet' means white in Hindi), this is another white-fleshed variety.
- **(D) Arka Kiran:** This is a hybrid (Kamsari $\times$ Purple Local) developed and released by the Indian Institute of Horticultural Research (IIHR), Bengaluru. It was specifically bred to have attractive deep pink/red pulp, which is rich in the antioxidant lycopene. It has good quality with relatively soft seeds, making it excellent for both fresh consumption (table purpose) and for processing into colorful products like puree and juice.

Step 3: Final Answer:

The hybrid guava variety with pink flesh suitable for both table and processing purposes is Arka Kiran.

💡 Quick Tip

Pay attention to the prefix 'Arka,' which indicates a variety from the Indian Institute of Horticultural Research (IIHR). IIHR has released several notable guava varieties. 'Arka Kiran' and 'Arka Rashmi' are particularly known for their red/pink pulp.

65. Recommended for loose flower as well as perfumery, Prajwal is a variety of which of the following flowers?

- (A) Tuberose
- (B) Rose
- (C) Marigold
- (D) Jasminum

Correct Answer: (1) Tuberose

Solution:

Step 1: Understanding the Concept:

The question requires identifying the flower species to which the specific variety 'Prajwal' belongs, based on its dual use for loose flowers and for perfume extraction.

Step 2: Detailed Explanation:

'Prajwal' is a very successful and popular hybrid variety of **Tuberose** (*Polianthes tuberosa*). It was developed by the Indian Institute of Horticultural Research (IIHR) in Bengaluru. It is a double-flowered variety that is highly prized for its long flower spikes, high flower yield, and intense, pleasant fragrance. These characteristics make it a dual-purpose variety, ideal for the loose flower market (for garlands, etc.) and for the extraction of its concrete and absolute, which are valuable components in the high-end perfumery industry.

Step 3: Final Answer:

Prajwal is a variety of Tuberose.

💡 Quick Tip

When a question mentions "perfumery" in the context of Indian floriculture, Tuberose and Jasmine are the two most likely candidates. Knowing specific popular varieties like 'Prajwal' for Tuberose or 'Gundumalli' for Jasmine is very helpful.

66. Which of the following is the type of fruit in *Pyrus communis* or European Pear ?

- (A) Berry
- (B) Hesperidium
- (C) Pome
- (D) Drupe

Correct Answer: (3) Pome

Solution:

Step 1: Understanding the Concept:

The question asks for the botanical classification of the fruit of the European Pear (**Pyrus communis**).

Step 2: Detailed Explanation:

Let's define the fruit types:

- **Berry:** A fleshy fruit that develops from a single ovary and contains multiple seeds (e.g., grape, tomato).
- **Hesperidium:** A modified berry with a leathery rind containing oil glands (e.g., orange, lemon).
- **Pome:** A type of accessory fruit where the fleshy part develops from the floral tube (hypanthium) that surrounds the ovary. The core with the seeds develops from the ovary itself. This fruit type is characteristic of the subtribe Malinae of the Rosaceae family, which includes apple, pear, and quince.
- **Drupe:** A fleshy fruit with a hard, stony endocarp (the "pit") surrounding a single seed (e.g., peach, plum, mango).

The fruit structure of a pear, with its fleshy edible part developing from the hypanthium and the papery core containing the seeds, is a classic example of a pome.

Step 3: Final Answer:

The fruit type of the European Pear is a Pome.

💡 Quick Tip

Remember the "big three" of pome fruits: Apple, Pear, and Quince. If you see any of these in a question about fruit type, the answer is almost certainly "pome."

67. Name of the self-incompatible cultivar of apricot, which requires a pollinizer for commercial cultivation.

- (A) Halman
- (B) Nari
- (C) Charmagz
- (D) Turkey

Correct Answer: (1) Halman

Solution:

Step 1: Understanding the Concept:

The question asks to identify a variety of apricot that is self-incompatible, meaning its flowers cannot be fertilized by their own pollen and thus require pollen from a different, compatible variety (a pollinizer) to set fruit.

Step 2: Detailed Explanation:

Let's examine the options:

- **1. Halman:** This is a leading commercial cultivar of apricot, especially in the dry temperate regions of India like Ladakh. It is well-known to be self-incompatible and requires inter-planting with pollinizer varieties like Rakchakarpo or Suffaida for successful fruit set.
- **2. Nari:** This is another apricot cultivar, but it is not as famously self-incompatible as Halman.
- **3. Charmagz:** This is an apricot variety primarily grown for its sweet kernel, which is used as a dry fruit. It is generally self-fruitful.

- **4. Turkey:** This is a self-fruitful apricot variety.

Therefore, 'Halman' is the correct answer.

Step 3: Final Answer:

Halman is a self-incompatible cultivar of apricot that requires a pollinizer.

💡 Quick Tip

In temperate fruits like apple, pear, cherry, and apricot, self-incompatibility is a common issue. Knowing the key self-incompatible varieties (like Halman apricot or Red Delicious apple) and the concept of a pollinizer is crucial for pomology-related exams.

68. Which of the following is a critical parameter for drought tolerance in dryland fruits?

- (A) Large stomata
- (B) Shallow root system
- (C) Large sized leaves
- (D) Short duration varieties

Correct Answer: (4) Short duration varieties

Solution:

Step 1: Understanding the Concept:

The question asks for a critical characteristic or strategy that enables fruit crops to be tolerant to drought conditions found in drylands.

Step 2: Detailed Explanation:

Let's analyze the options as mechanisms for drought tolerance:

- **1. Large stomata:** This is incorrect. Plants adapted to dry conditions (xerophytes) typically have smaller, sunken, or fewer stomata to reduce water loss through transpiration.
- **2. Shallow root system:** This is incorrect. A deep and extensive root system is a key adaptation for drought tolerance, as it allows the plant to explore a larger volume of soil and access water from deeper layers.
- **3. Large sized leaves:** This is incorrect. Large leaves have a greater surface area, which increases water loss via transpiration. Drought-tolerant plants often have small, modified,

or waxy leaves.

- **4. Short duration varieties:** This is a correct and critical strategy known as "drought escape". By having a short life cycle, these varieties can complete their growth and reproductive phases during the brief period when moisture is available (e.g., the rainy season), thus escaping the most severe period of drought. This is a very effective parameter for successful cultivation in drylands.

Step 3: Final Answer:

Short duration varieties are a critical parameter for drought tolerance in dryland fruits.

💡 Quick Tip

Drought tolerance strategies can be categorized as: drought escape (short duration), drought avoidance (e.g., deep roots, reduced leaf area to conserve water), and drought tolerance (biochemical mechanisms to withstand low water potential). 'Drought escape' is a very important strategy for annual crops and some fruit varieties in arid regions.

69. The bitter component in *Momordica charantia* is

- (A) Betain
- (B) Melanin
- (C) Cucurbitacin
- (D) Bromellin

Correct Answer: (3) Cucurbitacin

Solution:

Step 1: Understanding the Concept:

The question asks to identify the specific biochemical compound responsible for the characteristic bitter taste of bitter gourd (**Momordica charantia**).

Step 2: Detailed Explanation:

Let's look at the given options:

- **1. Betain:** A compound found in beets, contributing to their earthy flavor.
- **2. Melanin:** A pigment responsible for coloration in skin, hair, and eyes; not a flavor compound.

- **3. Cucurbitacin:** This is a class of triterpenoid compounds that are known for their intensely bitter taste. They are found in many plants of the gourd family (Cucurbitaceae), including bitter gourd, cucumbers, and squashes. The specific cucurbitacins in bitter gourd are the primary source of its bitterness and are also studied for their medicinal properties.
- **4. Bromelain:** A protein-digesting enzyme complex found in pineapple.

Therefore, the bitterness in bitter gourd is due to cucurbitacins.

Step 3: Final Answer:

The bitter component in *Momordica charantia* is Cucurbitacin.

💡 Quick Tip

Remember the family name: Bitter gourd belongs to the Cucurbitaceae family. The characteristic bitter compounds found in this family are called "cucurbitacins." This direct link makes the answer easy to recall.

70. Match List-I with List-II

List-I	List-II
(A). Feronia limonia	(I). Temperate nut
(B). Prunus amygdalus	(II). Plantation crop
(C). Sechium edule	(III). Dryland fruit
(D). Cocos nucifera	(IV). Cucurbitaceous vegetable

Choose the correct answer from the options given below:

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

Correct Answer: (4) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)

Solution:

Step 1: Understanding the Concept:

This question requires matching the botanical names of plants in List-I with their correct horticultural or economic classification in List-II.

Step 2: Detailed Explanation:

Let's match each plant to its category:

- (A) ***Feronia limonia* (Wood Apple)**: This is a very hardy, drought-tolerant tree, making it an ideal (III) **Dryland fruit**.
- (B) ***Prunus amygdalus* (Almond)**: Almond is a nut crop that thrives in Mediterranean and temperate climates, classifying it as a (I) **Temperate nut**.
- (C) ***Sechium edule* (Chayote/Chow-Chow)**: This is a vine that produces a fruit used as a vegetable. It belongs to the gourd family, making it a (IV) **Cucurbitaceous vegetable**.
- (D) ***Cocos nucifera* (Coconut)**: The coconut palm is a major tropical crop cultivated on a large scale or in plantations for its various products (copra, oil, water, fiber), classifying it as a (II) **Plantation crop**.

The correct matching is: A → III, B → I, C → IV, D → II.

Step 3: Final Answer:

The correct combination of matches is given in option 4.

💡 Quick Tip

Knowing the common names for botanical names is half the battle. **Feronia limonia** = Wood Apple, **Prunus amygdalus** = Almond, **Sechium edule** = Chayote, **Cocos nucifera** = Coconut. Once you know the common names, the classification becomes much easier.

71. What is the inflorescence found in banana known as?

- (A) Spadix
- (B) Panicle
- (C) Spike
- (D) Solitary

Correct Answer: (1) Spadix

Solution:

Step 1: Understanding the Concept:

The question asks for the botanical term for the type of inflorescence (flower cluster) found in a banana plant.

Step 2: Detailed Explanation:

An inflorescence is the arrangement of flowers on a floral axis. Different types are classified based on their structure.

- A **Spike** is an inflorescence with sessile (stalkless) flowers arranged on an elongated axis.
- A **Spadix** is a special type of spike where the axis (peduncle) is thick and fleshy, and the entire structure is typically enclosed by a large, colorful bract called a spathe.
- A **Panicle** is a branched, indeterminate inflorescence.
- **Solitary** means a single flower, not a cluster.

The banana inflorescence consists of a large, pendulous, fleshy axis bearing clusters of flowers, which are covered by large purplish bracts (the spathe). This structure perfectly matches the definition of a spadix.

Step 3: Final Answer:

The inflorescence found in banana is known as a Spadix.

💡 Quick Tip

Remember that a spadix is a characteristic feature of the banana plant, as well as plants in the Araceae family (like the peace lily) and palms. The key features are the fleshy axis (spadix) and the large bract (spathe).

72. Match List-I with List-II

List-I	List-II
(A). Thalamus contributes to fruit formation	(I). Tomato
(B). Ovary forms fruit	(II). Banana
(C). Fruit develops without fertilisation	(III). Pineapple
(D). Fruit develops from inflorescence	(IV). Apple

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

Correct Answer: (2) (A) - (IV), (B) - (I), (C) - (II), (D) - (III)

Solution:

Step 1: Understanding the Concept:

This question requires matching different modes of fruit development with their classic botanical examples.

Step 2: Detailed Explanation:

Let's match each statement in List-I to the correct example in List-II:

- **(A) Thalamus contributes to fruit formation:** This describes an accessory or false fruit, where parts other than the ovary (like the thalamus or receptacle) form the main fleshy part. The **(IV) Apple** is a classic example of this, where the edible portion is the swollen thalamus.
- **(B) Ovary forms fruit:** This describes a true fruit, which develops solely from the ovary. The **(I) Tomato** is a true fruit (specifically, a berry) that develops from the plant's ovary.
- **(C) Fruit develops without fertilisation:** This process is called parthenocarpy. The **(II) Banana** is a well-known example of a naturally parthenocarpic fruit.
- **(D) Fruit develops from inflorescence:** This describes a multiple or composite fruit, which develops from the fusion of an entire flower cluster (inflorescence). The **(III) Pineapple** is a classic example, developing from a spike inflorescence.

The correct matching is: $A \rightarrow IV$, $B \rightarrow I$, $C \rightarrow II$, $D \rightarrow III$.

Step 3: Final Answer:

The correct combination of matches is given in option 2.

💡 Quick Tip

For fruit morphology questions, memorize the key examples: Apple (False fruit), Mango (True fruit), Banana (Parthenocarpic fruit), Pineapple (Multiple fruit). This covers the most common question types.

73. Arrange the following in the correct sequence

- (A). Inability of different plants to unite successfully when grafted is termed incompatibility
- (B). Unrelated plants grafted together are likely to be incompatible
- (C). Such plants gradually develop distress symptoms like stunted growth, etc.
- (D). This may be due to abnormal growth at the graft union

Choose the correct answer from the options given below:

- (A) (C), (B), (A), (D).
- (B) (A), (B), (C), (D).
- (C) (B), (A), (D), (C).
- (D) (A), (D), (C), (B).

Correct Answer: (3) (B), (A), (D), (C).

Solution:

Step 1: Understanding the Concept:

The question asks to arrange the given statements into a logical sequence that correctly describes the concept of graft incompatibility.

Step 2: Detailed Explanation:

A logical explanation of graft incompatibility would follow this order: premise $\rightarrow$ definition $\rightarrow$ physical cause $\rightarrow$ observable symptom.

1. **(B) Unrelated plants grafted together are likely to be incompatible.** This is the starting premise or general rule. Grafting success depends on taxonomic relatedness.
2. **(A) Inability of different plants to unite successfully when grafted is termed incompatibility.** This statement provides the formal definition of the phenomenon introduced in statement (B).
3. **(D) This may be due to abnormal growth at the graft union.** This statement explains the physiological or anatomical reason for the failure to unite, describing what happens at the physical junction.
4. **(C) Such plants gradually develop distress symptoms like stunted growth, etc.** This is the final step, describing the long-term, visible consequences or symptoms of the incompatibility.

Therefore, the correct logical sequence is (B), (A), (D), (C).

Step 3: Final Answer:

The correct sequence of the statements is (B), (A), (D), (C).

 Quick Tip

For sequence questions, identify the most general statement or the initial cause to be the starting point. Then, find the final outcome or result as the endpoint. Arrange the intermediate statements to form a logical bridge between the start and end.

74. All fruit, vegetable as well as flowers have to go through a certain stage of growth and maturity in their life cycle before they can reproduce sexually. This stage is known as

- (A) Precocious phase
- (B) Reproductive phase
- (C) Flowering phase
- (D) Juvenile phase

Correct Answer: (4) Juvenile phase

Solution:

Step 1: Understanding the Concept:

The question asks for the name of the pre-reproductive stage in a plant's life cycle.

Step 2: Detailed Explanation:

The life cycle of a plant is typically divided into two main stages:

- **Juvenile phase (or Vegetative phase):** This is the initial period of growth after germination, during which the plant is physiologically immature and cannot reproduce sexually (i.e., it cannot produce flowers and fruits). Its energy is focused on developing roots, stems, and leaves.
- **Reproductive phase (or Adult/Mature phase):** After the juvenile phase, the plant becomes capable of sexual reproduction. This phase is often marked by the onset of flowering. The flowering phase is part of the broader reproductive phase.

The "precocious phase" is not a standard term; "precocious" means developing unusually early, which is an exception, not the rule.

The question describes the stage *before* the plant can reproduce, which is the juvenile phase.

Step 3: Final Answer:

The stage of growth before a plant can reproduce sexually is known as the Juvenile phase.

💡 Quick Tip

Think of the term "juvenile" as it applies to animals and humans—it refers to the youth or pre-adult stage. It's the same concept for plants; the juvenile phase is the period of vegetative growth before reproductive maturity.

75. Match List-I with List-II

List-I	List-II
(A). Autogamy	(I). Oxalis
(B). Cleistogamy	(II). Garden pea
(C). Dichogamy	(III). Date palm
(D). Allogamy	(IV). Avocado

Choose the correct answer from the options given below:

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

Correct Answer: (3) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

Solution:

Step 1: Understanding the Concept:

This question requires matching different mechanisms of pollination with plants that are classic examples of each mechanism.

Step 2: Detailed Explanation:

Let's match each term in List-I with its correct example from List-II:

- **(A) Autogamy:** This is self-pollination. The flower structure of the **(II) Garden pea** promotes self-pollination, making it a classic example of autogamy.
- **(B) Cleistogamy:** This is a form of autogamy where pollination occurs within flowers that never open. **(I) Oxalis** is a well-known example of a plant that produces such closed, self-pollinating (cleistogamous) flowers in addition to normal open flowers.
- **(C) Dichogamy:** This is a mechanism to promote cross-pollination where the male and female reproductive parts of a flower mature at different times. **(IV) Avocado** is a famous example of synchronized dichogamy, where flowers function as female one day and male the next.
- **(D) Allogamy:** This is cross-pollination between different plants. The **(III) Date palm** is dioecious, meaning individual plants are either male or female. Therefore, it absolutely requires cross-pollination (allogamy) for fruit production.

The correct matching is: $A \rightarrow II$, $B \rightarrow I$, $C \rightarrow IV$, $D \rightarrow III$.

Step 3: Final Answer:

The correct combination of matches is given in option 3.

💡 Quick Tip

For pollination mechanisms, associate key terms with examples: Cleistogamy = closed flowers (Oxalis, Viola), Dichogamy = different maturation times (Avocado, Walnut), Dioecy (requires Allogamy) = separate male/female plants (Date Palm, Papaya).
