

CUET PG 2024 Botany Question Paper with Solutions

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

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The examination duration is 105 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 Mathematics 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. The causal agent of Byssinosis is:

- (1) Pollen dust
- (2) Arsenic
- (3) Cotton dust
- (4) Iron dust

Correct Answer: (3) Cotton dust

Solution: Byssinosis, also known as "brown lung disease," is caused by inhaling cotton dust in textile industries. It affects the lungs and can lead to chronic respiratory issues.

 Quick Tip

Byssinosis is primarily a disease of people working in the cotton industry due to long-term exposure to cotton dust.

2. The important characteristic of k-selected population is:

- (A) Convex survivorship curve
- (B) Low fecundity
- (C) Exist close to their carrying capacity
- (D) Intraspecific competition

Choose the correct answer from the options given below:

- 1.(A). (B) and (D) only.
- 2. (A). (B) and (C) only.
- 3.(A). (B). (C) and (D).
- 4.(B). (C) and (D) only.

Correct Answer: (2) (B) and (C) only

Solution: K-selected species tend to have low fecundity, meaning they produce fewer offspring, and they exist close to their carrying capacity. This is in contrast to r-selected species, which produce many offspring and exploit abundant resources. K-selected species also experience high levels of intraspecific competition due to limited resources.

 Quick Tip

K-selected species typically have longer lifespans, fewer offspring, and invest more in their care, leading to higher competition for limited resources.

3. Match List I with List II

LIST I (Processes) LIST II (Changes)

- | | | | |
|----|---------------|------|---------------------------------|
| A. | Nudation | I. | Creation of barren area |
| B. | Ecesis | II. | Establishment of species |
| C. | Reaction | III. | Community equilibrium organisms |
| D. | Stabilization | IV. | Modification of habitat |

Choose the correct answer from the options given below:

- (1) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
- (2) (A) - (I), (B) - (III), (C) - (IV), (D) - (II)
- (3) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
- (4) (A) - (III), (B) - (I), (C) - (II), (D) - (III)

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

Solution: - Nudation refers to the creation of barren areas (I), as it is the initial stage where the area is uninhabited.

- Ecesis is the establishment of species (II) as it involves the settling of organisms in a new environment.

- Reaction refers to the modification of habitat (IV), as this phase involves the changes that occur due to the actions of the organisms.

- Stabilization leads to a community in equilibrium with organisms (III), where the community becomes stable over time.

 Quick Tip

In ecological succession, the sequence of processes starts with barren land (nudation) and progresses through establishment, modification, and stabilization of a balanced community.

4. Given below are two statements. One is labelled as Assertion (A) and the other as Reason (R).

Assertion (A): The zone of transition between two communities is called an ecotone.

Reason (R): The ecotone has more diversity than either of the two communities.

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).
- (3) (A) is true but (R) is false.
- (4) (A) is false but (R) is true.

Correct Answer: (2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).

Solution: - Assertion (A) is true because an ecotone is indeed the transition zone between two communities.

- Reason (R) is also true because ecotones generally have greater biodiversity due to the mixing of species from both adjacent communities.

However, the reason provided is not a correct explanation for the assertion, as the reason does not directly explain why an ecotone is a transition zone between communities. It is more of a consequence of the transition zone, rather than a reason for it.

💡 Quick Tip

Ecotones are regions where the environments of two communities overlap, and they often have higher biodiversity because they contain species from both communities.

5. The decreasing order of concentration of greenhouse gases (GHGs) in the atmosphere is:

- (A) CO₂
- (B) CH₄
- (C) CFCs
- (D) N₂O

Correct Answer: (A).CO₂

Solution: The correct order of greenhouse gases in terms of their concentration in the atmosphere is:

- CO₂ (Carbon dioxide) has the highest concentration.
- CH₄ (Methane) follows next in terms of concentration.
- CFCs (Chlorofluorocarbons) are present in very low concentrations but have high global warming potential.
- N₂O (Nitrous oxide) is also present in smaller amounts but contributes to the greenhouse effect.

💡 Quick Tip

Greenhouse gases are ranked based on their concentration in the atmosphere, with CO₂ being the most abundant followed by other gases like CH₄ and N₂O.

6. Inverted ovules are called as:

- (A) Orthotropus
- (B) Anatropus
- (C) Amphitropus
- (D) Hemianatropus

Correct Answer: (B) Anatropus

Solution: In the case of inverted ovules, the ovule is turned 180° and the micropyle faces downward. This condition is called Anatropus, which is the most common type of ovule in plants.

💡 Quick Tip

Anatropus ovules are characterized by their inverted orientation, where the micropyle points downwards.

7. The different methods to overcome self-incompatibility are:

- (1) Mixed pollination
- (2) Bud pollination
- (3) Stub pollination
- (4) Intra-ovarian pollination

Correct Answer: (3) Stub pollination

Solution: To overcome self-incompatibility in plants, the following methods are used:

- Mixed pollination (A): Involves transferring pollen from different sources to overcome incompatibility.
 - Bud pollination (B): Involves pollinating the buds, which may bypass the self-incompatibility barrier.
 - Intra-ovarian pollination (D): Pollination occurs within the ovary, reducing the effect of self-incompatibility.
- Other methods like stub pollination (C) are not typically used in overcoming self-incompatibility.

 Quick Tip

Self-incompatibility in plants is overcome by using different pollination techniques that introduce genetic diversity and ensure fertilization.

8. Match List I with List II

LIST I (Processes)	LIST II (Scientists)
A. Intra ovarian pollination	I. L. Haberlandt
B. Double fertilization	II. E. Strasburger
C. Syngamy	III. S. Nawaschin
D. Necrohormone theory	IV. Kanta

Choose the correct answer from the options given below:

- (1) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)
- (2) (A)-(II), (B)-(III), (C)-(I), (D)-(IV)
- (3) (A)-(III), (B)-(I), (C)-(II), (D)-(IV)
- (4) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

Correct Answer: 4

Solution:

- Intra ovarian pollination was studied by L. Haberlandt. Hence, (A)-(I) is correct.
 - Double fertilization was described by E. Strasburger. Hence, (B)-(II) is correct.
 - Syngamy was studied by S. Nawaschin. Hence, (C)-(III) is correct.
 - Necrohormone theory was given by Kanta. Hence, (D)-(IV) is correct.
- Thus, the correct matching is (A)-(I), (B)-(II), (C)-(III), (D)-(IV).

 Quick Tip

L. Haberlandt is considered one of the pioneers in plant physiology, particularly in the study of pollination.

9. Given below are two statements. One is labelled as Assertion (A) and the other one labelled as Reason (R).

Assertion (A): Male sterility in angiosperms can be induced by inserting a bacterial gene called BARNASE.

Reason (R): BARNASE causes premature breakdown of tapetum resulting in arrest of microspore development.

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).
- (3) (A) is true but (R) is false.
- (4) (A) is false but (R) is true.

Correct Answer: (1) Both (A) and (R) are true and (R) is the correct explanation of (A).

Solution: - The insertion of the bacterial gene BARNASE causes male sterility in angiosperms. BARNASE induces premature breakdown of the tapetum, leading to the arrest of microspore development. Hence, both Assertion (A) and Reason (R) are true and (R) correctly explains (A).

 Quick Tip

BARNASE is a bacterial ribonuclease that can be used to induce male sterility in plants by disrupting microspore development.

10. The most effective sugar in promoting pollen germination is

- (1) Glucose
- (2) Fructose
- (3) Sucrose
- (4) Maltose

Correct Answer: (3) Sucrose

Solution: - Sucrose is the most effective sugar in promoting pollen germination. It is commonly used in pollen germination media because it provides the necessary energy and osmotic pressure for the process.

 Quick Tip

Sucrose is often preferred for pollen germination studies because of its role in providing energy and proper osmotic conditions.

11. The specimen collected from the same locality from where the holotype was collected is called as

- (1) Isotype
- (2) Topotype
- (3) Syntype
- (4) Paratype

Correct Answer: (2) Topotype

Solution: - A topotype is a specimen that is collected from the same locality where the holotype was originally collected. This term is used to indicate specimens that are from the type locality, ensuring consistency in species classification.

 Quick Tip

Topotypes are important in taxonomy as they represent specimens from the original collection site of the holotype.

12. Free central placentation is present in the family of

- (1) Brassicaceae
- (2) Cucurbitaceae
- (3) Caryophyllaceae
- (4) Capparaceae

Correct Answer: (3) Caryophyllaceae

Solution: - Free central placentation is a type of placentation found in the family Caryophyllaceae, where the ovules are attached to a central column, free from the surrounding carpel walls.

 Quick Tip

Caryophyllaceae is known for exhibiting free central placentation, a feature used for identifying species in this family.

13. Match List I with List II

LIST I (Taxonomic characters)	LIST II (Families)
A. Jaculators	I. Apiaceae
B. Caryopsis fruits	II. Euphorbiaceae
C. Cyathium	III. Poaceae
D. Cremocarp fruit	IV. Acanthaceae

- (1) (A)-(IV), (B)-(III), (C)-(II), (D)-(I)
(2) (A)-(I), (B)-(III), (C)-(II), (D)-(I)
(3) (A)-(I), (B)-(II), (C)-(I), (D)-(III)
(4) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

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

Solution: - Jaculators are a characteristic feature of the Acanthaceae family. Hence, (A)-(IV) is correct.

- Caryopsis fruits are found in the Poaceae family. Hence, (B)-(III) is correct.

- Cyathium is a characteristic structure of the Euphorbiaceae family. Hence, (C)-(II) is correct.

- Cremocarp fruit is found in the Apiaceae family. Hence, (D)-(I) is correct.

Thus, the correct matching is (A)-(IV), (B)-(III), (C)-(II), (D)-(I).

 Quick Tip

The cyathium is a specialized inflorescence found in the Euphorbiaceae family.

14. Given below are two statements. One is labelled as Assertion (A) and the other one labelled as Reason (R).

Assertion (A): APG classification system is not useful for adoption in herbaria and flora.

Reason (R): APG system taxa have been classified only up to the level of family.

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A).
(2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).
(3) (A) is true but (R) is false.
(4) (A) is false but (R) is true.

Correct Answer: (1) Both (A) and (R) are true and (R) is the correct explanation of (A).

Solution: - The APG system is not widely adopted in herbaria and flora because it classifies plants only up to the family level and does not provide detailed species or genus-level classifications. Hence, both Assertion (A) and Reason (R) are true, and Reason (R) correctly explains Assertion (A).

 Quick Tip

The APG classification system is based on molecular data and focuses on family-level classification, which limits its applicability in herbaria and flora that require species or genus-level details.

15. The important character of the family Asteraceae is

- (A). Inflorescence is a racemose head or capitulum
- (B). Presence of cypsela fruit
- (C). Presence of gynostegium
- (D). Placentation is free central

Choose the correct answer from the options given below:

- (1) (A) and (B) only.
- (2) (A), (B) and (C) only.
- (3) (A), (B), (C) and (D).
- (4) (B), (C) and (D) only.

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

Solution: - The Asteraceae family is characterized by having a racemose head or capitulum as the inflorescence (A), and the presence of cypsela fruits (B). These two features are key characteristics of the Asteraceae family. The other options (C) and (D) are not relevant for Asteraceae.

 Quick Tip

The capitulum is a characteristic inflorescence type in Asteraceae, and cypsela is a characteristic fruit type of this family.

16. Hanstein proposed

- (1) Apical cell theory
- (2) Histogen theory
- (3) Tunica corpus theory
- (4) Histogen layer theory

Correct Answer: (2) Histogen theory

Solution: - Hanstein proposed the Histogen theory, which explains the organization of plant tissues during development. This theory categorizes plant tissue development into three distinct layers, each responsible for forming different tissue types.

 Quick Tip

The Histogen theory is one of the classical theories in plant developmental biology, explaining tissue differentiation during growth.

17. Given below are two statements. One is labelled as Assertion (A) and the other one labelled as Reason (R).

Assertion (A): Root apical cell theory of Nageli does not hold good for flowering plants.

Reason (R): In flowering plants, a group of initials has been observed.

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).
- (3) (A) is true but (R) is false.
- (4) (A) is false but (R) is true.

Correct Answer: (1) Both (A) and (R) are true and (R) is the correct explanation of (A).

Solution: - The Root apical cell theory of Nageli, which suggests that the root apex is formed by a single apical cell, does not hold good for flowering plants, as flowering plants have a group of initials that contribute to the growth of the root. Hence, Assertion (A) is true.

- In flowering plants, a group of initials is indeed observed at the root apex, which is why Reason (R) is true.

 Quick Tip

In flowering plants, the root apex consists of a group of initials, not just a single apical cell, leading to a different growth pattern.

18. Match List I with List II

LIST I (Stomata type)	LIST II (Family)
A. Anomocytic	I. Acanthaceae
B. Anisocytic	II. Magnoliaceae
C. Paracytic	III. Apiaceae
D. Diacytic	IV. Papaveraceae

- (1) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)
- (2) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)
- (3) (A)-(I), (B)-(II), (C)-(I), (D)-(III)
- (4) (A)-(IV), (B)-(III), (C)-(II), (D)-(I)

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

Solution: - Anomocytic stomata are found in the Papaveraceae family. Hence, (A)-(IV) is correct.

- Anisocytic stomata are found in the Apiaceae family. Hence, (B)-(III) is correct.

- Paracytic stomata are found in the Magnoliaceae family. Hence, (C)-(II) is correct.

- Diacytic stomata are found in the Acanthaceae family. Hence, (D)-(I) is correct.

Thus, the correct matching is (A)-(IV), (B)-(III), (C)-(II), (D)-(I).

 Quick Tip

The arrangement of stomata types is an important diagnostic feature for distinguishing different plant families.

19. The anomalous distribution of vascular tissues in the older stem of Bougainvillea is due to

- (1) (A) only.
- (2) (A), (B) and (C) only.
- (3) (A), (B), (C) and (D).
- (4) (B), (C) and (D) only.

Correct Answer: (1) (A) only.

Solution: - The anomalous distribution of vascular tissues in the older stem of Bougainvillea is due to the formation of accessory cambial rings. These rings of cambium contribute to the formation of additional vascular tissues, which results in abnormal distribution. Hence, the correct answer is (A) only.

 Quick Tip

In Bougainvillea, the formation of accessory cambial rings causes anomalous vascular tissue distribution.

20. Malacophyllous leaves are found in

- (1) submerged hydrophytes
- (2) xerophytes
- (3) amphibious plants
- (4) free floating hydrophytes

Correct Answer: (2) xerophytes

Solution: - Malacophyllous leaves are soft, thin, and delicate leaves, typically found in xerophytes. These plants have adapted to dry environments and often have leaves that are not as thick or waxy as those of other plants. Therefore, the correct answer is (2) xerophytes.

 Quick Tip

Malacophyllous leaves are typical of xerophytes, which thrive in dry environments.

21. Which amino acid(s) contain/s the amino group (-NH₂) attached as a side chain?

- (1) Lys
- (2) Arg
- (3) Asn

(4) Lys and Arg

Correct Answer: (2) Arg

Solution: - Arginine (Arg) is the amino acid that contains the amino group (-NH_2) attached as a side chain. Lysine (Lys) also has an amino group, but it is part of the main chain, not the side chain. Hence, the correct answer is (2) Arg.

 Quick Tip

Arginine is the amino acid with an amino group attached to its side chain.

22. The ideal value for the backbone dihedral angles for antiparallel β -sheets are:

- (A) $\phi = -120^\circ$ and $\psi = +125^\circ$,
- (B) $\phi = -139^\circ$ and $\psi = +135^\circ$,
- (C) $\phi = -120^\circ$ and $\psi = +130^\circ$,
- (D) $\phi = -115^\circ$ and $\psi = +140^\circ$.

- (1) (A) and (D) only.
- (2) (B) only.
- (3) (A), (B) and (C) only.
- (4) (B), (C) and (D) only.

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

Solution: - The backbone dihedral angles for antiparallel β -sheets are ideally:

- (B) $\phi = -139^\circ$ and $\psi = +135^\circ$,
- (C) $\phi = -120^\circ$ and $\psi = +130^\circ$,
- (D) $\phi = -115^\circ$ and $\psi = +140^\circ$.

Thus, the correct answer is (4), which includes (B), (C), and (D) only.

 Quick Tip

In antiparallel β -sheets, the ideal dihedral angles are typically around $\phi = -120^\circ$ to -115° and $\psi = +130^\circ$ to $+140^\circ$.

23. Match List I with List II

LIST I (Chemical nature of side chain)	LIST II (Amino Acid)
A. Aliphatic amino acid	I. Pro
B. Sulphur containing	II. Gln
C. Imino	III. Val
D. Amide	IV. Cys

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

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

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

Solution: - Aliphatic amino acids include Valine (Val), which has an aliphatic side chain. Hence, (A)-(III) is correct.

- Sulphur-containing amino acid is Cysteine (Cys), which contains a sulfur atom in its side chain. Hence, (B)-(IV) is correct.

- Imino amino acid is Proline (Pro), which has an imino group as part of its side chain. Hence, (C)-(I) is correct.

- Amide amino acid is Glutamine (Gln), which has an amide group in its side chain. Hence, (D)-(II) is correct.

Thus, the correct matching is (A)-(III), (B)-(IV), (C)-(I), (D)-(II).

💡 Quick Tip

Proline is the only amino acid with an imino group, which makes it unique among the amino acids.

24. Which of the following is the correct statement about ATP?

- (1) (A) - (II), (B) - (IV), (C) - (III), (D) - (I)
 (2) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
 (3) (A) - (III), (B) - (II), (C) - (IV), (D) - (I)
 (4) (A) - (IV), (B) - (I), (C) - (II), (D) - (III)

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

Solution: - ATP contains ribose sugar (C) and adenosine as the nucleoside (D). Hence, (C)-(II) and (D)-(III) are correct.

- ATP has one phosphate ester bond (B). Hence, (B)-(I) is correct.

- ATP does not contain two phosphodiester bonds (A). Hence, (A)-(IV) is correct.

💡 Quick Tip

ATP consists of ribose, adenine, and three phosphate groups, with one phosphate ester bond and two phosphoanhydride bonds.

25. Myoglobin is a globular protein, which is made up of how many amino acids?

- (1) 159
 (2) 153
 (3) 160

(4) 170

Correct Answer: (3) 160

Solution: - Myoglobin is a globular protein consisting of 160 amino acids, which allows it to function effectively in muscle cells by storing oxygen.

 Quick Tip

Myoglobin is a single polypeptide chain containing 160 amino acids, crucial for oxygen storage in muscles.

26. Which types of proteins are commonly found in RBCs?

- (1) Glycoprotein
- (2) Spectrin
- (3) Ankyrin
- (4) Spectrin and Ankyrin

Correct Answer: (4) Spectrin and Ankyrin

Solution: - The proteins commonly found in red blood cells (RBCs) are Spectrin and Ankyrin. These proteins provide structural support and help maintain the shape of RBCs.

 Quick Tip

Spectrin and Ankyrin are essential for the structural integrity of RBCs and help them maintain their biconcave shape.

27. N-acetylglucosamine (NAG) and N-acetylmuramic acid (NAM) in the cell wall of bacteria are connected by:

- (1) β -1.4 glycosidic bond
- (2) β -1.2 glycosidic bond
- (3) β -1.3 glycosidic bond
- (4) β -2.4 glycosidic bond

Correct Answer: (4) β -2.4 glycosidic bond

Solution: - In bacterial cell walls, N-acetylglucosamine (NAG) and N-acetylmuramic acid (NAM) are connected by a β -1,4 glycosidic bond, which is key for the stability of the peptidoglycan structure.

💡 Quick Tip

The β -1,4 glycosidic bond connects NAG and NAM in the bacterial cell wall, forming the backbone of peptidoglycan.

28. What are the basic properties of Gram positive (+ve) bacteria?

- (1) (A), (B) and (C) only.
- (2) (A), (B) and (D) only.
- (3) (A), (B), (C) and (D).
- (4) (B), (C) and (D) only.

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

Solution: - Gram-positive bacteria are characterized by a thick peptidoglycan layer (A), which gives them structural integrity.

- They also contain teichoic acids (B), which are found in their cell walls.
- The periplasmic space is generally negligible in Gram-positive bacteria (C).
- However, Gram-positive bacteria do not have an outer membrane, which is a characteristic of Gram-negative bacteria. Hence, (D) is not applicable.

💡 Quick Tip

Gram-positive bacteria have a thick peptidoglycan layer and teichoic acids, but lack an outer membrane.

29. Match List I with List II

LIST I (Terms)	LIST II (Example)
A. Halophile	I. <i>Thermus aquaticus</i>
B. Acidophile	II. <i>Treponema</i>
C. Thermophile	III. <i>Halobacterium</i>
D. Microaerophile	IV. <i>Sulfolobus</i>

- (1) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
- (2) (A) - (I), (B) - (III), (C) - (II), (D) - (IV)
- (3) (A) - (I), (B) - (II), (C) - (I), (D) - (III)
- (4) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

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

Solution: - Halophiles are organisms that thrive in high salt concentrations, such as *Halobacterium* (III). Hence, (A) - (III) is correct.

- Acidophiles thrive in acidic environments, such as *Treponema* (II). Hence, (B) - (II) is correct.

- Thermophiles thrive at high temperatures, such as *Thermus aquaticus* (I). Hence, (C) - (I) is correct.
 - Microaerophiles thrive in environments with low oxygen concentrations, such as *Sulfolobus* (IV). Hence, (D) - (IV) is correct.
- Thus, the correct matching is (A) - (I), (B) - (III), (C) - (II), (D) - (IV).

 Quick Tip

Halophiles, acidophiles, thermophiles, and microaerophiles each thrive in distinct extreme environments, making them important models for studying extremophilic adaptations.

30. *Agrobacterium rhizogenes* is used to genetically engineer the plant because of the following statement:

- (1) It contains a Ti plasmid
- (2) It causes gene transfer to plants
- (3) It infects all types of plants
- (4) Infects plants and produce a good root system

Correct Answer: (4) Infects plants and produce a good root system

Solution: - *Agrobacterium rhizogenes* is used because it infects plants and induces the formation of a robust root system. It is commonly used for root transformation in plants, making it a valuable tool in plant genetic engineering.

 Quick Tip

Agrobacterium rhizogenes is important for root induction in plant genetic transformation, especially for creating transgenic rootstocks.

31. Which of the following technique is used to inactivate a gene by altering the DNA?

- (1) Homologous recombination
- (2) Antisense nucleic acid block
- (3) Antibody microinjection
- (4) Introduction of dominant inhibitory mutant

Correct Answer: (4) Introduction of dominant inhibitory mutant

Solution: - The introduction of dominant inhibitory mutants is used to inactivate genes by altering the DNA. This technique prevents the expression of the gene, effectively silencing it.

 Quick Tip

Inserting a dominant inhibitory mutant is a powerful method to knock down gene expression and study gene function.

32. Which is not a transmembrane protein?

- (1) ATP synthase
- (2) LHC
- (3) PSII
- (4) Ferredoxin

Correct Answer: (4) Ferredoxin

Solution: - Ferredoxin is not a transmembrane protein. It is a soluble protein involved in electron transport, but it does not span the membrane like the other proteins listed.

 Quick Tip

Ferredoxin is involved in electron transfer but is not associated with the membrane, unlike transmembrane proteins like ATP synthase and PSII.

33. 'B' gene of ABCD flower model is made silenced in a plant. Which of the whorl is absent in the plant?

- (1) Sepals
- (2) Carpels
- (3) Stamens
- (4) Petals

Correct Answer: (4) Petals

Solution: - The 'B' gene in the ABCD model is responsible for the formation of petals and stamens. Silencing this gene results in the absence of petals.

 Quick Tip

In the ABCD model, the 'B' gene is required for the development of petals and stamens. Silencing it removes petals.

34. The total number of ATP required for the conversion of one N_2 to 2 NH_3 during biological N_2 fixation?

- (1) 8 ATP
- (2) 10 ATP
- (3) 12 ATP
- (4) 16 ATP

Correct Answer: (4) 16 ATP

Solution: - The biological nitrogen fixation process requires 16 ATP to convert one molecule of nitrogen (N_2) to two molecules of ammonia (NH_3).

 Quick Tip

Biological nitrogen fixation is ATP-intensive, requiring 16 ATP molecules to convert nitrogen gas to ammonia.

35. Lignin

- (1) Is a polysaccharide
- (2) Is second most abundant organic compound
- (3) Is a polymer of aromatic alcohols
- (4) Synthetic pathway is peroxidase dependent

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

Solution: - Lignin is the second most abundant organic compound, a polymer of aromatic alcohols, and its synthesis is peroxidase-dependent. It is not a polysaccharide.

 Quick Tip

Lignin plays a key role in providing structural support to plants and is synthesized via a peroxidase-dependent pathway.

36. Jasmonic acid

- (1) is synthesized from linolenic acid
- (2) is a growth promoter
- (3) delays leaf senescence
- (4) is present in the mosses and ferns

Correct Answer: (1) is synthesized from linolenic acid

Solution:

- Jasmonic acid is synthesized from linolenic acid and plays a crucial role in regulating various growth processes in plants. - It acts as a growth promoter and can also delay leaf senescence, but it is not necessarily present in mosses and ferns.

Conclusion: The correct answer is (1), as jasmonic acid is synthesized from linolenic acid.

 Quick Tip

Jasmonic acid is an important plant hormone that regulates growth, stress responses, and senescence. It is synthesized from linolenic acid in plants.

37. The enzyme which converts citrate to isocitrate in TCA cycle is:

- (1) Aconitase
- (2) Isocitrate dehydrogenase
- (3) Fumarase
- (4) Trans ketolase

Correct Answer: (1) Aconitase

Solution:

- Aconitase is the enzyme responsible for converting citrate to isocitrate in the citric acid cycle (TCA cycle). - It catalyzes the isomerization reaction by removing and adding a water molecule.

Conclusion: The correct answer is (1), as aconitase is the enzyme that converts citrate to isocitrate.

 Quick Tip

Aconitase catalyzes the conversion of citrate to isocitrate in the TCA cycle, which is a crucial step for the continuation of cellular respiration.

38. The amount of DNA present in the genome of a species is called as:

- (1) D-value
- (2) C-value
- (3) B-value
- (4) T-value

Correct Answer: (2) C-value

Solution:

- The amount of DNA present in the genome of a species is referred to as the C-value. - The C-value is often used to describe the total amount of DNA in the haploid set of chromosomes in a species.

Conclusion: The correct answer is (2), as the amount of DNA present in the genome is known as the C-value.

 Quick Tip

The C-value refers to the total amount of DNA in a haploid genome, which varies between species.

39. Which of the following is the most common form of DNA?

- (1) Z-DNA
- (2) A-DNA
- (3) B-DNA
- (4) C-DNA

Correct Answer: (3) B-DNA

Solution:

- The most common form of DNA in nature is B-DNA, which is the right-handed double helix structure. - This is the predominant structure found in living cells under physiological conditions.

Conclusion: The correct answer is (3), as B-DNA is the most common form of DNA.

 Quick Tip

B-DNA is the standard form of DNA in living organisms, characterized by a right-handed helix and a stable structure under physiological conditions.

40. Which of the following is true about Poly(A) tail?

- (A). Synthesizes post transcriptionally
- (B). Usually shorter than 300 nt
- (C). Its function is to protect the mRNA from cytoplasmic RNAases
- (D). Its function is to stimulate translation

Choose the correct answer from the options given below:

- (1) (A), (B) and (D) only.
- (2) (A), (B) and (C) only.
- (3) (A), (B), (C) and (D).
- (4) (B), (C) and (D) only.

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

Solution:

- The Poly(A) tail is synthesized post-transcriptionally, which means it is added after the mRNA is transcribed.

- The length of the Poly(A) tail is usually longer than 300 nucleotides, making option (B) incorrect.

- Its main functions include protecting the mRNA from degradation by cytoplasmic RNases (option C), and stimulating translation (option D).

Conclusion: The correct answer is (3), as all of the statements about the Poly(A) tail are correct.

 Quick Tip

The Poly(A) tail plays an important role in stabilizing mRNA and promoting translation, in addition to protecting it from degradation.

41. Match List I with List II:

LIST I (Group-1)	LIST II (Group-2)
A. VNTR sequence	I. Gene regulation of the same chromosome
B. Leader sequence	II. Ribosome binding site
C. SD sequence	III. DNA fingerprinting
D. Cis-acting sequence	IV. Function in attenuation

- (1) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
(2) (A) - (III), (B) - (IV), (C) - (II), (D) - (I)
(3) (A) - (I), (B) - (II), (C) - (I), (D) - (III)
(4) (A) - (I), (B) - (IV), (C) - (I), (D) - (II)

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

Solution:

- The VNTR sequence is related to DNA fingerprinting, hence matched with (III).
- The leader sequence is involved in the ribosome binding site, so it is matched with (II).
- The SD sequence functions in the initiation of translation, hence it is matched with (IV).
- The cis-acting sequence is involved in gene regulation, hence it is matched with (I).

Conclusion: The correct match is (2) (A) - (III), (B) - (IV), (C) - (II), (D) - (I).

 Quick Tip

Understanding the role of different sequences in gene regulation and translation initiation is key to matching the correct functions in molecular biology.

42. Given below are two statements. One is labelled as Assertion (A) and the other one labelled as Reason (R).

Assertion (A): Euchromatin is transcriptionally active and contains most of the protein-coding DNA.

Reason (R): Heterochromatin is light staining and less condensed portion of the chromatin.

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A).
(2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).
(3) (A) is true but (R) is false.
(4) (A) is false but (R) is true.

Correct Answer: (3) (A) is true but (R) is false.

Solution:

- Assertion (A) is correct as euchromatin is indeed transcriptionally active and contains most of the protein-coding DNA.
- However, Reason (R) is incorrect. Heterochromatin is a highly condensed region of chromatin, not a light-staining region.

Conclusion: The correct answer is (3) (A) is true but (R) is false.

 Quick Tip

Euchromatin is actively transcribed due to its less condensed nature, whereas heterochromatin is tightly packed and usually transcriptionally inactive.

43. Selenocysteine is an amino acid, which is:

- (1) present in only prokaryotes
- (2) coded by UGA
- (3) derived from cysteine
- (4) present in many eukaryotic proteins

Correct Answer: (2) coded by UGA

Solution:

- Selenocysteine is known as the 21st amino acid and is encoded by the UGA codon, which is usually a stop codon in translation.
- It is derived from cysteine and is present in both prokaryotes and eukaryotes, not just prokaryotes.

Conclusion: The correct answer is (2) as selenocysteine is encoded by UGA.

 Quick Tip

Selenocysteine, often called the 21st amino acid, is essential for certain enzymatic functions and is encoded by the UGA codon.

44. Given below are two statements, one is labelled as Assertion (A) and the other one labelled as Reason (R).

Assertion (A): Osmosis is a special type of diffusion in which movement of substances occurs from higher solute concentration to lower solute concentration.

Reason (R): Diffusion is dominant mode of transport at the scale of a cell.

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).
- (3) (A) is true but (R) is false.
- (4) (A) is false but (R) is true.

Correct Answer: (4) (A) is false but (R) is true.

Solution:

- Assertion (A) is incorrect because osmosis is the movement of water from lower solute concentration to higher solute concentration, not the reverse.
- Reason (R) is correct as diffusion is indeed the primary mode of transport for small molecules across the cell membrane.

Conclusion: The correct answer is (4) (A) is false but (R) is true.

 Quick Tip

Osmosis involves the movement of water from lower to higher solute concentration, while diffusion refers to the movement of molecules from higher to lower concentration.

45. Given below are two statements, one is labelled as Assertion (A) and the other one labelled as Reason (R). Assertion (A): The application of transgenic plants is in delayed ripening, production of bioplastics, and plant as a bioreactor for the production of antibodies, etc. **Reason (R):** Agrobacteria that carries a recombinant plasmid with both a selectable marker and a desired transgene are used to make plant transgenic.

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).
- (3) (A) is true but (R) is false.
- (4) (A) is false but (R) is true.

Correct Answer: (1) Both (A) and (R) are true and (R) is the correct explanation of (A).

Solution:

- Assertion (A) is true as transgenic plants have various applications, such as delayed ripening, bioplastic production, and as bioreactors for antibodies.
- Reason (R) is also true. Agrobacterium tumefaciens is widely used to create transgenic plants by transferring a recombinant plasmid with the desired gene.

Conclusion: The correct answer is (1) as both (A) and (R) are true, and (R) correctly explains (A).

 Quick Tip

Agrobacterium-mediated transformation is a common technique for creating transgenic plants, which allows for the insertion of foreign genes and the development of novel plant traits.

46. The role of ethylene in plants is:

- (1) senescence of leaves and ripening of fruits
- (2) cell division
- (3) inhibition of root growth
- (4) production of tuber and bulb formation

Correct Answer: (1) senescence of leaves and ripening of fruits

Solution:

- Ethylene is a gaseous plant hormone that plays a critical role in regulating the senescence of leaves and the ripening of fruits.
- It is known as the "ripening hormone" because it accelerates the ripening process in fruits such as bananas and tomatoes.

- Ethylene is not involved in cell division or inhibition of root growth, nor is it directly responsible for tuber and bulb formation.

Conclusion: The correct answer is (1), as ethylene is involved in senescence of leaves and ripening of fruits.

💡 Quick Tip

Ethylene is the only gaseous plant hormone and has a significant role in fruit ripening and leaf senescence. It is used in agriculture to control the timing of fruit ripening.

47. Match the plants source in List I with their corresponding uses in List II:

LIST I (Plants source)	LIST II (Uses)
A. Allium sativa	I. Anticarcinogenic
B. Coptis japonica	II. Cardiac medicine
C. Taxus baccata	III. Insecticidal
D. Digitalis lanata	IV. Antibacterial

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

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

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

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

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

Solution:

(A) Allium sativa - I. Anticarcinogenic

(B) Coptis japonica - IV. Antibacterial

(C) Taxus baccata - III. Insecticidal

(D) Digitalis lanata - II. Cardiac medicine

💡 Quick Tip

Allium sativa (garlic) has anticancer properties, while Digitalis lanata is used in cardiac medicine. Taxus baccata is known for its insecticidal properties, and Coptis japonica has antibacterial effects.

48. The shape of chloroplast in Spirogyra is

(1) Cup-shaped

(2) Spiral

(3) Girdle shaped

(4) Discoid

Correct Answer: (2) Spiral

Solution:

- In Spirogyra, the chloroplast is typically spiral in shape, wrapping around the central vacuole.
- This unique spiral arrangement is characteristic of this genus of green algae and aids in the efficient absorption of light.

Conclusion: The correct answer is (2), as the shape of the chloroplast in Spirogyra is spiral.

 Quick Tip

The spiral shape of chloroplasts in Spirogyra helps maximize light absorption for photosynthesis and is a distinctive feature of this alga.

49. Which of the following algae are used as bio-fertilizers?

- (1) Spirogyra, Gloiopeltis, Ulothrix
- (2) Ulothrix, Chara and Anabaena
- (3) Anabaena, Azolla, Nostoc
- (4) Nostoc, Volvox, Anabaena

Correct Answer: (3) Anabaena, Azolla, Nostoc

Solution:

- Anabaena, Azolla, and Nostoc are well-known algae used as bio-fertilizers.
- These organisms are capable of nitrogen fixation, which enriches the soil by converting atmospheric nitrogen into a form usable by plants.

Conclusion: The correct answer is (3), as Anabaena, Azolla, and Nostoc are used as bio-fertilizers.

 Quick Tip

Bio-fertilizers such as Anabaena and Nostoc are valuable for sustainable agriculture as they help increase soil fertility by fixing nitrogen.

50. Name the fungus whose extract from the sclerotia can be used to produce a powerful hallucinogenic drug?

- (1) Agaricus
- (2) Claviceps purpurea
- (3) Alternaria solani
- (4) Neurospora crassa

Correct Answer: (2) Claviceps purpurea

Solution:

- Claviceps purpurea is the fungus whose sclerotia contain ergot, a hallucinogenic compound.
- Ergot is used to produce a powerful hallucinogenic drug and has been historically significant in both medicinal and illicit contexts.

Conclusion: The correct answer is (2), as *Claviceps purpurea* is the fungus used to produce a hallucinogenic drug from its sclerotia.

 Quick Tip

Claviceps purpurea, commonly known as ergot fungus, has been used for its medicinal properties but can also cause poisoning when consumed in large amounts.

51. Who discovered the heterothallism in fungi?

- (1) A.F. Blakeslee
- (2) Alexander Flemming
- (3) M.P. Iyenger
- (4) Alexopoulos and Mims

Correct Answer: (1) A.F. Blakeslee

Solution:

- A.F. Blakeslee is credited with discovering heterothallism in fungi.
- Heterothallism refers to the condition in which two genetically distinct strains are required for sexual reproduction in certain fungal species.

Conclusion: The correct answer is (1), as A.F. Blakeslee discovered heterothallism in fungi.

 Quick Tip

Heterothallism in fungi ensures genetic diversity during sexual reproduction, as it requires the interaction between different mating types.

52. Match List I with List II:

LIST I	LIST II
A. Penicillin	III. <i>Penicillium notatum</i>
B. Fermentation of sucrose and molasses to produce citric acid	I. <i>Aspergillus niger</i>
C. Fermentation of carbohydrates to produce ethyl alcohol and CO ₂	IV. <i>Saccharomyces cerevisiae</i>
D. Irish potato famine	II. <i>Phytophthora infestans</i>

- (1) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
- (2) (A) - (III), (B) - (II), (C) - (I), (D) - (IV)
- (3) (A) - (III), (B) - (I), (C) - (IV), (D) - (II)
- (4) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

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

Solution:

- Penicillin is produced by the fungus *Penicillium notatum*, so (A) matches with (III).

- The fermentation of sucrose and molasses to produce citric acid is carried out by *Aspergillus niger*, hence (B) matches with (I).
- The fermentation of carbohydrates to produce ethyl alcohol and CO₂ is carried out by *Saccharomyces cerevisiae*, so (C) matches with (IV).
- The Irish potato famine was caused by *Phytophthora infestans*, so (D) matches with (II).

Conclusion: The correct answer is (3), as the correct matches are (A) - (III), (B) - (I), (C) - (IV), (D) - (II).

💡 Quick Tip

Penicillium notatum is the source of penicillin, while *Aspergillus niger* is used for citric acid fermentation. *Saccharomyces cerevisiae* is key for alcohol fermentation, and *Phytophthora infestans* caused the Irish potato famine.

53. The alternate host for *Puccinia graminis* is

- (1) *Delonix regia*
- (2) *Thalictrum flavum*
- (3) *Muehlenbergia hugeli*
- (4) *Berberis vulgaris*

Correct Answer: (4) *Berberis vulgaris*

Solution:

- *Puccinia graminis*, a wheat rust fungus, has *Berberis vulgaris* (barberry) as its alternate host.
- Barberry plays a crucial role in the life cycle of the fungus, facilitating its reproduction.

Conclusion: The correct answer is (4), as *Berberis vulgaris* is the alternate host for *Puccinia graminis*.

💡 Quick Tip

The life cycle of many rust fungi, like *Puccinia graminis*, involves two hosts: a primary host and an alternate host. Barberry is known to be the alternate host for this wheat rust.

54. Which of the following is/are prophylactic (preventive) methods of plant disease control?

- (1) (A) and (D) only.
- (2) (A) and (C) only.
- (3) (A), (B), (C) and (D).
- (4) (B) and (D) only.

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

Solution:

- Prophylactic (preventive) methods include:
- Eradication of alternate host (A), which reduces the spread of disease.
- Crop rotation practices to control soil-borne diseases (C), which helps disrupt the life cycle of pathogens.
- Regular spraying of pesticides and fungicides (B) is a curative measure, not a preventive one.
- Growing antagonistic plants (D) is another preventive method.

Conclusion: The correct answer is (2), as (A) and (C) are prophylactic methods.

💡 Quick Tip

Prophylactic methods are preventive measures that aim to reduce the chances of disease occurrence, while curative methods address diseases after they have developed.

55. Bryophytes are distinct from all other land plants in having an independent and a dependent

- (1) sporophyte, gametophyte
- (2) female, male
- (3) gametophyte, sporophyte
- (4) antherozoid, oogonia

Correct Answer: (3) gametophyte, sporophyte

Solution:

- In bryophytes, the gametophyte is the dominant and independent phase, while the sporophyte is dependent on the gametophyte for nutrition and survival.
- This characteristic sets bryophytes apart from other land plants, where the sporophyte is usually the dominant phase.

Conclusion: The correct answer is (3), as bryophytes have an independent gametophyte and a dependent sporophyte.

💡 Quick Tip

In bryophytes, the gametophyte is the main plant structure and is independent, while the sporophyte is small and dependent on the gametophyte for nutrition.

56. Pseudoelators, which help in the dispersal of spores, are present in

- (1) Psilotum
- (2) Marchantia
- (3) Riccia
- (4) Anthoceros

Correct Answer: (4) Anthoceros

Solution:

- Pseudoelators are special structures that help in the dispersal of spores, and they are found in some bryophytes.
- In Anthoceros, pseudoelators assist in the movement of spores by helping to release them effectively.

Conclusion: The correct answer is (4), as pseudoelators are present in Anthoceros.

 Quick Tip

Pseudoelators in bryophytes like Anthoceros aid in effective spore dispersal, playing a critical role in reproduction.

57. Which of the following is not an identifying feature of Cycas?

- (1) Antherozoids are motile
- (2) Anatomical features of the leaflet indicating it as a mesophyte
- (3) Circinate venation of the foliage leaves
- (4) Xylem lacking vessels

Correct Answer: (2) Anatomical features of the leaflet indicating it as a mesophyte

Solution:

- Cycas has several distinct features, including motile antherozoids, circinate venation in foliage leaves, and xylem lacking vessels.
- However, Cycas is adapted to dry environments, and its leaflets are not characteristic of mesophytes.

Conclusion: The correct answer is (2), as the anatomical features of Cycas leaflets do not indicate it as a mesophyte.

 Quick Tip

Cycas is a xerophyte with features suited to dry environments, unlike mesophytes which thrive in moderate water availability.

58. Which of the following Gymnosperms possess winged pollen grains?

- (1) Dandelion
- (2) Cycas
- (3) Pinus
- (4) Ephedra

Correct Answer: (3) Pinus

Solution:

- Pinus, like many other conifers, produces winged pollen grains that help in the dispersal of pollen by wind.
- Other gymnosperms such as Cycas and Ephedra do not produce winged pollen grains.

Conclusion: The correct answer is (3), as Pinus produces winged pollen grains.

 Quick Tip

Winged pollen grains in gymnosperms like *Pinus* help in the efficient wind-mediated dispersal of pollen, ensuring successful fertilization.

59. A stele which does NOT contain a central pith is called as:

- (1) Solenostele
- (2) Dictyostele
- (3) Protostele
- (4) Siphonostele

Correct Answer: (3) Protostele

Solution:

- A protostele is a type of stele where the vascular tissue is centrally located without a central pith.
- This structure is found in some lower plants like ferns and some gymnosperms.

Conclusion: The correct answer is (3), as protostele does not contain a central pith.

 Quick Tip

Protosteles lack a central pith, while other types of stele, such as siphonosteles, include a pith region in their structure.

60. What is the major secondary metabolite present in Clove buds?

- (1) Thymol
- (2) Eugenol
- (3) Zingiberine
- (4) Piperine

Correct Answer: (2) Eugenol

Solution:

- The major secondary metabolite present in clove buds is eugenol, which gives cloves their characteristic aroma and medicinal properties.
- Eugenol is commonly used in perfumes and essential oils.

Conclusion: The correct answer is (2), as eugenol is the major secondary metabolite in clove buds.

 Quick Tip

Eugenol is a key compound in cloves, widely used for its antimicrobial, analgesic, and aromatic properties.

61. Reserpine is obtained from the roots?

- (1) Rauwolfia serpentina
- (2) Datura innoxia
- (3) Withania somnifera
- (4) Digitalis purpurea

Correct Answer: (1) Rauwolfia serpentina

Solution:

- Reserpine, an alkaloid used for its tranquilizing and antihypertensive properties, is obtained from the roots of Rauwolfia serpentina.
- This plant is commonly known as the "Indian snakeroot" and has been historically used in traditional medicine for treating high blood pressure.

Conclusion: The correct answer is (1), as reserpine is obtained from the roots of Rauwolfia serpentina.

 Quick Tip

Rauwolfia serpentina has been traditionally used in medicine for its calming effects and to treat hypertension, with reserpine being one of its key bioactive compounds.

62. Which of the following statement(s) is/are TRUE for Retting in Jute?

- (A). It is a kind of fermentation process
 - (B). It employs the action of bacteria on plants
 - (C). In this, the cortical tissues and phloem tissues of the bark of the plants which contains free strands are decomposed to separate fibre from non-fibrous woody stem
 - (D). This process does not involve any microorganisms and is purely the outcome of long soaking hours
- (1) (A), (B) and (D) only.
 - (2) (A), (B) and (C) only.
 - (3) (A), (B), (C) and (D).
 - (4) (B), (C) and (D) only.

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

Solution:

- Retting is a process used in the extraction of fibres from jute and involves fermentation.
- It employs bacteria to decompose the cortical and phloem tissues of the plant, separating the fibre from the non-fibrous woody stem.
- Statement (D) is incorrect as microorganisms are involved in the process, not just soaking.

Conclusion: The correct answer is (2), as statements (A), (B), and (C) are true for the Retting process in Jute.

 Quick Tip

Retting involves the action of bacteria breaking down non-fibrous tissues in the plant, making the fibres easier to separate for use in textiles.

63. Match the economically useful plants in List I with their corresponding families in List II:

LIST I (Economically useful plant)	LIST II (Family)
A. Corchorus sp.	II. Malvaceae
B. Rosa damascena	III. Rosaceae
C. Piper nigrum	I. Piperaceae
D. Curcuma longa	IV. Zingiberaceae

Correct Answer: 2

Solution: (A) Corchorus sp. - II. Malvaceae

(B) Rosa damascena - III. Rosaceae

(C) Piper nigrum - I. Piperaceae

(D) Curcuma longa - IV. Zingiberaceae

 Quick Tip

Corchorus sp. belongs to the Malvaceae family, Rosa damascena to the Rosaceae family, Piper nigrum to the Piperaceae family, and Curcuma longa to the Zingiberaceae family.

64. According to Vavilov, crop plants evolved from the wild species in the area which shows greater diversity and richness in variation. That area is called as:

- (1) Secondary gene centre
- (2) Non-centre
- (3) Primary gene centre
- (4) Centre for plant genome

Correct Answer: (3) Primary gene centre

Solution:

- According to Vavilov's theory, the primary gene centres are the regions where the wild ancestors of crops show the greatest diversity and richness in variation.

- These centres are considered the places of origin for many cultivated plants and are crucial for crop breeding.

Conclusion: The correct answer is (3), as the area with the greatest diversity and variation is called the primary gene centre.

 Quick Tip

Vavilov's concept of primary gene centres refers to regions where crop plants have originated, showcasing significant genetic variation which is essential for plant breeding and conservation.

65. Match List I with List II:

- (1) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
(2) (A) - (I), (B) - (III), (C) - (IV), (D) - (II)
(3) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)
(4) (A) - (III), (B) - (IV), (C) - (I), (D) - (III)

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

Solution:

- Autotetraploid involves doubling of the chromosomes from a single species, represented by (I) $4x$.
- Nullisomy refers to the loss of both homologous chromosomes, represented by (III) $2n-2$.
- Monosomy refers to the loss of one chromosome from a pair, represented by (IV) $2n-1$.
- Allohexaploid is the result of hybridization of two different species with a chromosome doubling, represented by (II) $2x(1) + 2x(2) + 2x(3)$.

Conclusion: The correct answer is (2), as the matches are (A) - (I), (B) - (III), (C) - (IV), (D) - (II).

 Quick Tip

Understanding numerical changes in chromosomes and their symbolic representations is key to grasping genetic variation and polyploidy in plants.

66. In sweet pea, the development of purple colored flowers requires the presence of two dominant genes. C and R. e.g. CCRR. When either C (e.g. ccRR) or R (e.g. CCrr) or both the genes (e.g. ccrr) are present in homozygous state, the purple color of flowers CANNOT be produced. If CCrr (white) is crossed with ccRR (white), what will be the modified dihybrid ratio at F₂ generation?

- (1) 1:15:1
(2) 13:3
(3) 9:3:4
(4) 9:7

Correct Answer: (2) 13:3

Solution:

- In this case, when CCrr is crossed with ccRR, the F₁ generation will all have the genotype CcRr.
- In the F₂ generation, the modified dihybrid ratio will be 13:3 due to epistasis, where the white flowers can be caused by either a homozygous recessive C or R allele.

Conclusion: The correct answer is (2), as the modified dihybrid ratio is 13:3.

 Quick Tip

In cases of epistasis, the expression of one gene can mask the expression of another gene, modifying the expected Mendelian dihybrid ratio.

67. Given below are two statements. One is labelled as Assertion (A) and the other one labelled as Reason (R). Assertion (A): Penetrance and Expressivity are terms which can be used interchangeably. **Reason (R):** Expressivity is the degree to which a genotype is expressed as a phenotype within an individual, while penetrance refers to the percentage of individuals with a particular genotype who express the associated phenotype.

- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are correct but (R) is NOT the correct explanation of (A).
- (3) (A) is correct but (R) is not correct.
- (4) (A) is not correct but (R) is correct.

Correct Answer: (4) (A) is not correct but (R) is correct.

Solution:

- Assertion (A) is incorrect, as penetrance and expressivity are not interchangeable terms.
- Reason (R) is correct, as it accurately describes the difference between expressivity and penetrance.
- Penetrance refers to the proportion of individuals with a given genotype who express the associated phenotype, while expressivity describes the degree of expression of the phenotype.

Conclusion: The correct answer is (4), as (A) is incorrect and (R) is correct.

 Quick Tip

Penetrance and expressivity are distinct concepts in genetics. Penetrance refers to the likelihood of a genotype being expressed as a phenotype, while expressivity describes the intensity or variation in expression.

68. Calculate the degree of freedom if the given data set represents a dihybrid cross?

- (1) 3
- (2) 2
- (3) 4
- (4) 5

Correct Answer: (3) 4

Solution:

- The degree of freedom for a dihybrid cross is calculated as $(n-1)(m-1)$, where n and m are the number of phenotypic classes for each gene.
- For a dihybrid cross with two genes showing two phenotypic traits, there are 4 possible phenotypic outcomes, resulting in 4 degrees of freedom.

Conclusion: The correct answer is (3), as the degree of freedom for a dihybrid cross is 4.

 Quick Tip

The degree of freedom in a chi-square test for genetics is calculated using the formula $(n-1)(m-1)$, where n and m represent the number of phenotypic classes for the genes involved.

69. The transfer of DNA from one bacterial strain to another by a virus and the subsequent recombination between the chromosomes of the recipient cells and the introduced DNA is called as:

- (1) Transformation
- (2) Transduction
- (3) Conjugation
- (4) Recombination

Correct Answer: (2) Transduction

Solution:

- Transduction is the process by which DNA is transferred from one bacterial strain to another by a virus, followed by recombination with the recipient's chromosomes.
- Transformation involves the uptake of free DNA, and conjugation refers to the transfer of DNA via direct contact between bacterial cells.

Conclusion: The correct answer is (2), as the transfer of DNA by a virus is called transduction.

 Quick Tip

Transduction is a form of horizontal gene transfer facilitated by viruses, which can lead to genetic recombination between bacterial strains.

70. In Polyacrylamide Gel Electrophoresis, what is the role of APS (ammonium persulphate)?

- (1) It is an alkylating agent that is used with TEMED to catalyze the polymerization of acrylamide and bisacrylamide
- (2) It is a reducing agent that is used with TEMED to catalyze the polymerization of acrylamide and bisacrylamide
- (3) It is an oxidizing agent that is used with TEMED to catalyze the polymerization of acrylamide and bisacrylamide
- (4) It is a mutagenic agent that is used with TEMED to catalyze the polymerization of acrylamide and bisacrylamide

Correct Answer: (3) It is an oxidizing agent that is used with TEMED to catalyze the polymerization of acrylamide and bisacrylamide

Solution:

- APS (ammonium persulphate) acts as an oxidizing agent in the polymerization of acrylamide and bisacrylamide in polyacrylamide gel electrophoresis.
- It works in conjunction with TEMED (N,N,N',N'-tetramethylethylenediamine) to initiate and catalyze the polymerization process.

Conclusion: The correct answer is (3), as APS is an oxidizing agent in the polymerization of acrylamide and bisacrylamide.

💡 Quick Tip

APS acts as an oxidizing agent that activates the polymerization of acrylamide in gel electrophoresis, with TEMED helping to speed up the process.

71. What is the correct sequence of the steps which takes place in Polymerase Chain Reaction (PCR)?

- (1) Annealing, Extension, Denaturation
- (2) Denaturation, Annealing, Extension
- (3) Extension, Denaturation, Annealing
- (4) Denaturation, Extension, Annealing

Correct Answer: (2) Denaturation, Annealing, Extension

Solution:

- The correct sequence of steps in PCR is:
 1. Denaturation (heating to separate the DNA strands)
 2. Annealing (binding of primers to the single-stranded DNA)
 3. Extension (synthesis of new DNA strand by DNA polymerase).

Conclusion: The correct answer is (2), as the proper order is Denaturation, Annealing, and Extension.

💡 Quick Tip

In PCR, the sequence of denaturation, annealing, and extension is crucial for amplifying DNA. Denaturation separates the strands, annealing allows primers to bind, and extension extends the DNA strand.

72. During the germination of cereal seeds, what is the role of -amylase present in the aleurone layer?

- (1) It directly gets converted into sugars
- (2) It is a reserve food material
- (3) It hydrolyzes the endosperm starch into sugars, which provide the energy for the growth of roots and shoots
- (4) It is responsible for seed dormancy

Correct Answer: (3) It hydrolyzes the endosperm starch into sugars, which provide the energy for the growth of roots and shoots

Solution:

- Amylase in the aleurone layer of cereal seeds breaks down starch stored in the endosperm into sugars.
- These sugars provide the necessary energy for the growth of roots and shoots during seed germination.

Conclusion: The correct answer is (3), as -amylase helps in hydrolyzing starch into sugars, providing energy for growth.

💡 Quick Tip

-Amylase plays a crucial role in converting stored starches into fermentable sugars during seed germination, fueling the growth of the young plant.

73. Which disease is a severe form of protein-energy malnutrition that results when a person does not consume enough protein and calories?

- (1) Lathyrism
- (2) Marasmus
- (3) Favism
- (4) Night blindness

Correct Answer: (2) Marasmus

Solution:

- Marasmus is a form of severe protein-energy malnutrition where the body lacks both protein and calories.
- This condition results in extreme weight loss, muscle wasting, and stunted growth, usually in infants and young children.

Conclusion: The correct answer is (2), as marasmus is caused by severe malnutrition.

💡 Quick Tip

Marasmus is a severe form of malnutrition where there is a lack of both protein and calories, leading to muscle wasting and stunted growth.

74. There are different possible glucuronides that can be used as substrates for the -glucuronidase (GUS-reporter system). Depending on the type of detection needed, the most common substrate for GUS histochemical staining is?

- (1) Galactic acid
- (2) 5-chloro-4-bromo-3-indolyl glucuronide
- (3) 5-bromo-4-chloro-3-indolyl glucuronide
- (4) 5,5"-dibromo-4,4'-dichloro-indigo

Correct Answer: (3) 5-bromo-4-chloro-3-indolyl glucuronide

Solution:

- The most common substrate used in the GUS-reporter system for histochemical staining is 5-bromo-4-chloro-3-indolyl glucuronide.
- This substrate is used for detecting the presence of -glucuronidase activity in cells.

Conclusion: The correct answer is (3), as 5-bromo-4-chloro-3-indolyl glucuronide is the common substrate for GUS histochemical staining.

 Quick Tip

5-bromo-4-chloro-3-indolyl glucuronide is frequently used as a substrate in GUS assays to visualize gene expression in plant cells.

75. Which of the following cell organelles is regarded as semi-autonomous?

- (1) Chloroplast
- (2) Peroxisomes
- (3) Ribosomes
- (4) Lysosome

Correct Answer: (1) Chloroplast

Solution:

- Chloroplasts are considered semi-autonomous because they have their own DNA and can replicate independently, but they still depend on the cell for some functions.
- Peroxisomes, ribosomes, and lysosomes do not possess their own DNA and are not considered semi-autonomous.

Conclusion: The correct answer is (1), as chloroplasts are semi-autonomous organelles.

 Quick Tip

Chloroplasts, like mitochondria, contain their own DNA and can replicate independently of the cell, but they still rely on the cell for certain proteins and functions.