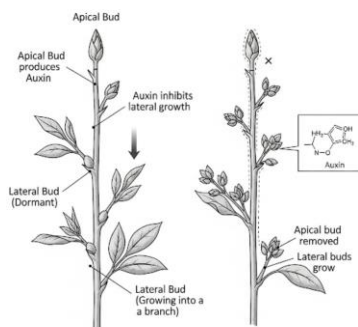


**CLASS 11- CBT -NOVEMBER  
(CBT QP)**



Based on the diagram and your understanding of the topic , answer the following questions. -

1. A gardener wants to create a bushier plant with more side branches. They decide to use a chemical spray. Based on your knowledge of apical dominance, which of the following chemicals would be most effective?

- A An inhibitor that prevents the production of Absciscic acid .
- B. A synthetic cytokinin, which counteracts auxin's effect.
- C. A low concentration of Auxin to stimulate growth.
- D. A high concentration of gibberellin to promote stem elongation.

EXPLANATION-

**Option A: An inhibitor that prevents the production of Absciscic acid is wrong.**

because abscisic acid (ABA) is a plant hormone primarily known for its role in inhibiting growth, promoting dormancy in seeds and buds, and closing stomata. It doesn't have a direct role in regulating apical dominance. Therefore, preventing its production wouldn't specifically lead to more side branches. While ABA can inhibit the growth of axillary buds, its primary function is not to suppress lateral growth in the same way auxin does.

**Option C: A low concentration of Auxin to stimulate growth is wrong.**

because auxin is the primary hormone responsible for establishing and maintaining apical dominance. While auxin does stimulate cell elongation, it does so at the plant's apex. Even a low concentration of externally applied auxin would likely reinforce the inhibitory signal that prevents lateral bud growth, rather than promoting it. To overcome apical dominance, the effect of auxin needs to be counteracted, not supplemented.

**Option D: A high concentration of gibberellin to promote stem elongation is wrong**

because gibberellins are plant hormones that primarily promote stem and leaf elongation, cell division in the shoots and roots, and seed germination. Applying a high concentration of gibberellin would likely cause the central stem to grow even taller and faster, reinforcing the tall, slender growth pattern. This would not promote the growth of lateral branches needed for a

bushier plant. Gibberellins work in concert with auxin to promote primary stem growth, not to counteract the effects of apical dominance.

**( Option B is correct - Cytokinins are known to promote cell division and lateral bud growth, thus acting antagonistically to the effects of auxin and promoting a bushier appearance.)**

2. If a plant's apical bud is removed, and a paste containing a synthetic auxin is immediately applied to the cut surface, what is the most likely outcome for the lateral buds?
- A. The lateral buds will grow and then die off quickly due to over-stimulation by the synthetic auxin.
  - B. The plant will stop all growth, as both the natural apical bud and the synthetic hormone have been removed.
  - C. The lateral buds will grow vigorously, as the plant attempts to compensate for the lost apical bud.
  - D. The lateral buds will remain dormant due to the continued presence of a high auxin concentration.

EXPLANATION -

**Option A : The lateral buds will grow and then die off quickly due to over-stimulation by the synthetic auxin is wrong** . The presence of a high concentration of auxin from the paste will inhibit the growth of the lateral buds, not stimulate it. High auxin levels are the very reason apical dominance exists and why lateral buds remain dormant. The buds won't grow at all, so they can't "die off quickly due to over-stimulation."

**Option B. The plant will stop all growth, as both the natural apical bud and the synthetic hormone have been removed is wrong** . The natural apical bud has been removed, but a synthetic hormone has been applied in its place. The plant will still exhibit some growth, particularly in the central stem area where the auxin paste is, but the key effect is the continued suppression of the lateral buds. The plant won't stop all growth; it will simply continue its established growth pattern of a dominant central stem.

**Option C. The lateral buds will grow vigorously, as the plant attempts to compensate for the lost apical bud is wrong** . This would be the expected outcome if no auxin paste were applied. When the apical bud is removed, the source of the growth-inhibiting auxin is eliminated, and the lateral buds are "released" from their dormancy. They would then begin to grow vigorously, making the plant bushier. However, the application of the synthetic auxin paste prevents this from happening by mimicking the presence of the apical bud and its inhibitory signal.

**(D is correct - By applying the synthetic auxin, the hormonal signal for apical dominance is artificially maintained, preventing the lateral buds from breaking dormancy and growing)**

3. In the diagram, what happens to the plant's growth pattern when the apical bud is removed?
- A. The plant stops growing entirely.
  - B. The production of auxin increases throughout the plant.
  - C. The leaves on the stem fall off.
  - D. The lateral buds begin to grow and form side branches

EXPLANATION -

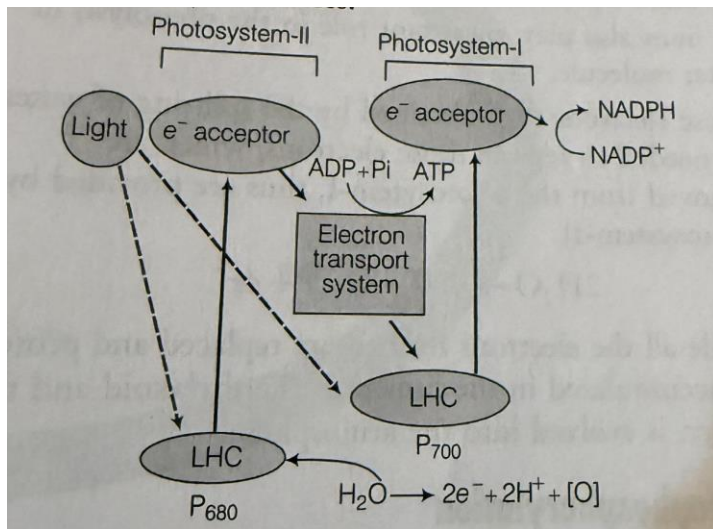
**Option A. The plant stops growing entirely, is wrong.** Removing the apical bud does not stop the plant from growing; it simply redirects the growth. While the primary vertical growth from the apical meristem ceases, the plant still has meristematic tissues in its lateral buds and roots that are capable of growth. In fact, removing the apical bud often leads to increased overall biomass and a bushier appearance

**Option B. The production of auxin increases throughout the plant is wrong.** The apical bud is the primary site of auxin production in the shoot. When the apical bud is removed, the primary source of auxin is eliminated. Therefore, the overall concentration of auxin in the upper parts of the plant would decrease, not increase. It's this decrease in auxin that releases the lateral buds from inhibition.

**Option C. The leaves on the stem fall off is wrong.** The removal of the apical bud does not directly cause leaves to fall off (abscise). Leaf abscission is typically influenced by a balance of hormones like auxin and ethylene, and while a significant shock to the plant could indirectly affect leaves, it's not the immediate and primary outcome of removing the apical bud. The main effect is on the growth of lateral buds

**(Option D is correct .- The diagram on the right side shows that with the apical bud removed, the lateral buds are no longer inhibited and grow into side branches)**

BASED ON THE FIGURE BELOW ,ANSWER THE FOLLOWING QUESTIONS -



4. According to the diagram, what is the source of the electrons that replenish Photosystem II (P680), and what is the fate of the oxygen atom from the water molecule?

- A. Electrons come from ATP; oxygen is used to make ATP.
- B. Electrons come from NADPH; oxygen is converted to NADPH.
- C. Electrons come from water; oxygen is released as a byproduct. CORRECT
- D. Electrons come from Photosystem I; oxygen becomes part of a water molecule.

**Option A. Electrons come from ATP; oxygen is used to make ATP is incorrect.** ATP (adenosine triphosphate) is a molecule that stores and transports energy within cells; it is not a source of electrons for Photosystem II. Also, oxygen released during photosynthesis is a waste product and is not used to create ATP. ATP is produced during the light-dependent reactions using the energy from a proton gradient.

**Option B : Electrons come from NADPH; oxygen is converted to NADPH is incorrect.** NADPH (nicotinamide adenine dinucleotide phosphate) is an electron carrier molecule that is actually a product of the light-dependent reactions, not a source of electrons for Photosystem II. It carries electrons from Photosystem I to the Calvin cycle. The oxygen atom from water is released as O<sub>2</sub> gas, not converted into NADPH.

**Option D: Electrons come from Photosystem I; oxygen becomes part of a water molecule is incorrect.** Electrons flow from Photosystem II to Photosystem I, not the other way around. Photosystem I receives electrons that have been energized by light and passed through an electron transport chain. The oxygen atoms from the water molecule are released as oxygen gas (O<sub>2</sub>), not reincorporated into a water molecule.

**( Option C is correct - The splitting of water molecules (H<sub>2</sub>O) provides electrons to Photosystem II, and the resulting oxygen atoms combine and are released as O<sub>2</sub> gas.)**

5. The diagram shows that the electrons from Photosystem I (P700 ) are transferred to an electron acceptor, which eventually leads to the formation of what final product?

- A. H<sub>2</sub>O
- B. NADPH
- C. NADP<sup>+</sup>
- D. ATP

EXPLANATION -

**Option A. H<sub>2</sub>O is incorrect.** Water is a reactant in the light-dependent reactions, not a final product of Photosystem I. It is split to provide electrons to Photosystem II, which then flow through the electron transport chain to Photosystem I.

**Option C. NADP<sup>+</sup> is incorrect.** NADP<sup>+</sup> is the oxidised form of the electron carrier and acts as a reactant in this process. It accepts the electrons and a proton to become NADPH. The diagram shows the electrons being transferred to an electron acceptor that ultimately leads to the formation of the reduced form, NADPH, not the oxidized form, NADP<sup>+</sup>

**Option D. ATP is incorrect.** While ATP is also a final product of the light-dependent reactions, it is formed by a different process. The energy to create ATP comes from a proton gradient that is generated as electrons move through the electron transport chain, specifically between Photosystem II and Photosystem I. The electrons from Photosystem I are used to reduce NADP<sup>+</sup> to NADPH, not to produce ATP.

**(Option B-NADPH is correct . The energized electrons from Photosystem I are used to reduce NADP+ to form the energy-rich molecule NADPH, which is the final product of this linear electron flow.)**

6. Which of the following best describes the process that produces ATP in the diagram?

- A. The splitting of water by an enzyme complex.
- B. The conversion of NADP+ to NADPH.
- C. The direct transfer of a phosphate group from a molecule to ADP.
- D. The movement of electrons through the electron transport system, creating a proton gradient.

EXPLANATION -

**Option A. The splitting of water by an enzyme complex is wrong .** While the splitting of water (photolysis) by the oxygen-evolving complex in Photosystem II does provide electrons for the electron transport chain, it does not directly produce ATP. It's the subsequent flow of these electrons that indirectly contributes to ATP synthesis.

**Option B. The conversion of NADP+ to NADPH is wrong .** This process, occurring at the end of the electron transport chain (after Photosystem I), involves the reduction of NADP+ to NADPH. This is an energy-storing step, but it does not directly produce ATP. NADPH is another energy carrier molecule, vital for the Calvin cycle.

**Option C. The direct transfer of a phosphate group from a molecule to ADP is wrong .** This describes substrate-level phosphorylation, a process that occurs in glycolysis and the Krebs cycle to produce ATP. However, in the context of the light-dependent reactions of photosynthesis, ATP is primarily produced via chemiosmosis, not by direct phosphate transfer from another organic molecule.

**( Option D is correct The energy from the moving electrons is used to pump protons, building a gradient that powers ATP synthase (not shown) to create ATP.)**

**7. Assertion (A):** In the Z-scheme of photosynthesis, the final electron acceptor is NADP+.

**Reason (R):** The electrons that started from Photosystem II are eventually used to reduce NADP+ to NADPH.

- A. Both (A) and (R) are true, and (R) is the correct explanation of (A).
- B. Both (A) and (R) are true, but (R) is not the correct explanation of (A).

C. (A) is true, but (R) is false. d) (A) is false, but (R) is true.

D. Both (A) and (R) are false.

**Explanation:**

**Option A is correct.**

- **Assertion (A)** is true. The terminal step of the linear electron flow (the Z-scheme) involves the enzyme NADP<sup>+</sup>-reductase, which catalyzes the transfer of electrons to NADP<sup>+</sup>, making it the final electron acceptor.
- **Reason (R)** is also true. The electrons originally excited in Photosystem II are passed through an electron transport chain, re-energized in Photosystem I, and ultimately transferred to NADP<sup>+</sup>. This reduction process forms NADPH, a key energy-storage molecule for the Calvin cycle.
- **Reason (R) correctly explains Assertion (A)** because the process described in the reason—the use of electrons to reduce NADP<sup>+</sup> to NADPH—is precisely why NADP<sup>+</sup> is considered the final electron acceptor in the overall pathway.

Electron transport system is a metabolic pathway through which electrons pass from one carrier to another. It is a part of aerobic respiration in which electrons removed from intermediate compounds in glucose catabolism. It consists of four large multiprotein complexes and two small diffusible electron carriers. The electrons passing through ETS gradually lose energy. The end products of ETS are water and ATP.

Read the above paragraph and answer the questions given below -

8. The main purpose of electron transport chain is to

A. release and utilise energy stored in NADH+H<sup>\*</sup> and FADH<sub>2</sub>

B. use the intermediate from TCA cycle. Correct

C. breakdown pyruvic acid

D. All of the above

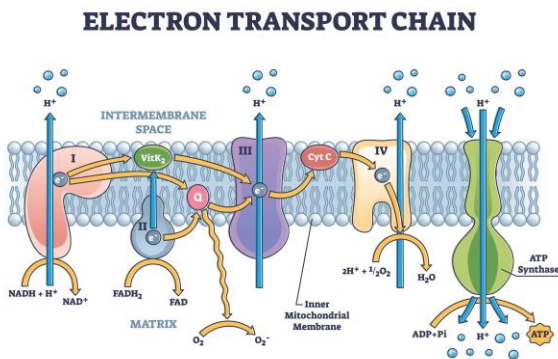
EXPLANATION -

**Option (b) is incorrect.** While the ETC is directly preceded by the TCA (Tricarboxylic Acid) cycle, which produces the NADH and FADH<sub>2</sub> it uses, its purpose isn't to "use the intermediate from the TCA cycle." Its primary goal is energy extraction from these coenzymes.

**Option (c) is incorrect.** The breakdown of pyruvic acid occurs during glycolysis and the link reaction, which takes place before the ETC. Pyruvic acid is converted to acetyl-CoA, which then enters the TCA cycle.

**Option (d) is incorrect.** Since options (b) and (c) are incorrect, "All of the above" cannot be the right answer.

**Option A is correct.** The ETC is the final stage of aerobic respiration, where high-energy electrons from NADH and FADH<sub>2</sub> are passed down a series of protein complexes. This process pumps protons from the mitochondrial matrix into the intermembrane space, creating a proton motive force that drives ATP synthesis.



9. The fourth complex of ETC has

- A. cytochrome-b only
- B. cytochrome-a only
- C. cytochromes-a, c and a<sub>3</sub>
- D. cytochromes-a and b.

**EXPLANATION** -<https://www.youtube.com/watch?v=E0YGTODEKeE>

**Option A cytochrome-b only is wrong.** Cytochrome-b is a component of Complex III, not Complex IV.

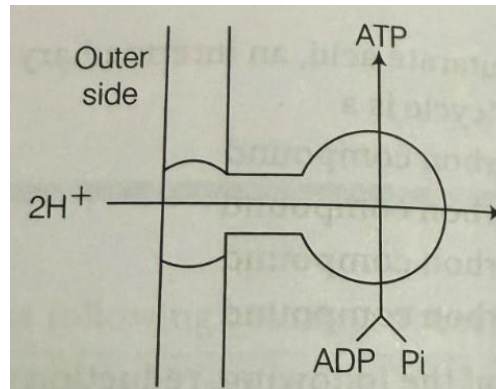
**Option B cytochrome-a only is wrong :** While cytochrome-a is present, it is not the only cytochrome in Complex IV. It works in conjunction with cytochrome-a<sub>3</sub>.

**Option D cytochromes-a and b is wrong** : As mentioned, cytochrome-b is a part of Complex III. Therefore, this option incorrectly includes cytochrome-b as a component of Complex IV.

**(Option C is correct)** . Complex IV, also known as cytochrome c oxidase, is the final protein complex in the electron transport chain. Its primary role is to transfer electrons from cytochrome c to oxygen, the final electron acceptor. This complex is composed of several subunits, including the cytochromes that facilitate the electron transfer. Specifically, it contains cytochrome a and cytochrome a<sub>3</sub>. The electron carrier cytochrome c is not a permanent part of the complex but acts as a shuttle, delivering electrons to Complex IV. So, the complex works with cytochromes-a, a<sub>3</sub> and the electron carrier c.

10. **Assertion (A)** It is ATP synthase having two parts; one called the F<sub>1</sub>, is embedded in the mitochondrial membrane of thylakoid and the other portion is called F<sub>0</sub> that protrudes on the mitochondrial membrane towards the matrix.

**Reason (R)** The passage of protons through the channel F<sub>0</sub>, is coupled to the catalytic site of F<sub>1</sub>, component for the production of ATP.



EXPLANATION-

**The assertion (A) is incorrect.** ATP synthase has two main parts: the F<sub>0</sub> and the F<sub>1</sub> components. The **F<sub>0</sub> portion is embedded in the inner mitochondrial membrane**, forming a proton channel. The **F<sub>1</sub> portion protrudes into the mitochondrial matrix** and contains the catalytic sites for ATP synthesis. The assertion incorrectly switches the names and locations of these two parts.

**The reason (R) is correct.** The flow of protons (H<sup>+</sup>) down their electrochemical gradient through the F<sub>0</sub> channel causes the rotation of the F<sub>0</sub> and its stalk. This mechanical rotation is coupled to the catalytic sites in the F<sub>1</sub> component, inducing conformational changes that drive the

phosphorylation of ADP to produce ATP. This process is the core mechanism of oxidative phosphorylation, also known as the binding-change mechanism.

**(Option D is correct - , Assertion (A) is false, but Reason (R) is true)**

-----**XXX**-----**XXX**-----**XXX**-----