5. NUTRITION IN PLANTS

TEACHING TASK (Page 77 – 79)

SINGLE CORRECT ANSWER TYPE

1. Raw materials for photosynthesis:

Answer: D) All of them **Explanation**: Photosynthesis requires carbon dioxide (CO_2), water (H_2O), and sunlight as raw materials. CO_2 is absorbed from the atmosphere, water is taken up by roots, and sunlight provides the energy to drive the process.

2. An example of an autotrophic plant:

Answer: D) Neem **Explanation**: Autotrophic plants produce their own food via photosynthesis. Neem is a green plant capable of photosynthesis. Mushroom and mould are fungi (heterotrophic), and dodder is a parasitic plant.

3. An example of a saprophytic plant:

Answer: C) Mushroom **Explanation**: Saprophytic plants obtain nutrients from dead organic matter. Mushrooms, being fungi, are saprophytic. Dodder is parasitic, and Monotropa is mycoheterotrophic, not strictly saprophytic.

4. The life processes that provide energy:

Answer: C) Both nutrition and respiration **Explanation**: Nutrition (e.g., photosynthesis in plants) provides raw materials, and respiration (cellular respiration) breaks down these materials to release energy in the form of ATP.

5. Which of these is not necessary for photosynthesis?:

Answer: D) Nitrogen **Explanation**: Photosynthesis requires carbon dioxide, chlorophyll, and light. Nitrogen is not directly involved in the photosynthesis process, though it is essential for plant growth.

6. Identify the carnivorous plant:

Answer: C) Both of them **Explanation**: Both pitcher plants and Venus flytraps are carnivorous, trapping and digesting insects to supplement their nutrient intake.

7. CO_2 and O_2 balance in atmosphere is due to:

Answer: B) Photosynthesis **Explanation**: Photosynthesis consumes CO_2 and releases O_2, maintaining the balance of these gases in the atmosphere, while respiration consumes O_2 and releases CO_2.

8. The oxygen in glucose comes from:

Answer: B) Carbon dioxide **Explanation**: During photosynthesis, the oxygen atoms in the glucose molecule ($C_6H_{12}O_6$) are derived from CO_2, as confirmed by isotopic studies.

9. The source of O_2 liberated in photosynthesis:

Answer: C) Water **Explanation**: The oxygen released during photosynthesis comes from the photolysis of water molecules (H_2O) in the light-dependent reactions.

10. Grana refers to:

Answer: C) Stacks of thylakoids **Explanation**: Grana are stacks of thylakoids, the membrane-bound structures in chloroplasts where the light-dependent reactions of photosynthesis occur.

11. Wavelength of light absorbed maximum for photosynthesis:

Answer: A) Red light **Explanation**: Chlorophyll absorbs red light (around 650–700 nm) most effectively, followed by blue light, making it critical for photosynthesis.

12. Least effective in photosynthesis:

Answer: C) Green light **Explanation**: Chlorophyll reflects green light (hence the green color of plants) and absorbs it minimally, making it the least effective for photosynthesis.

13. Assimilatory power in photosynthesis:

Answer: C) ATP and NADPH2 **Explanation**: ATP and NADPH (often referred to as NADPH2 in older texts) are produced in the light-dependent reactions and used as energy and reducing power in the Calvin cycle (dark reaction).

14. Specific function of light energy in photosynthesis:

Answer: A) Activate chlorophyll **Explanation**: Light energy excites chlorophyll molecules, enabling them to transfer electrons, initiating the light-dependent reactions.

15. ATP formation during photosynthesis:

Answer: B) Photophosphorylation **Explanation**: ATP is formed during the light-dependent reactions through photophosphorylation, driven by light energy in the thylakoid membranes.

16. Dark reaction is called so because:

Answer: A) It does not require light energy **Explanation**: The dark reaction (Calvin cycle) does not directly require light, as it uses ATP and NADPH produced in the light-dependent reactions.

17. Dark reaction of photosynthesis occurs in:

Answer: A) Stroma of the chloroplast outside the lamellae **Explanation**: The Calvin cycle (dark reaction) occurs in the stroma, the fluid-filled space surrounding the thylakoids in chloroplasts.

18. Holophytic nutrition means:

Answer: A) Autotrophism **Explanation**: Holophytic nutrition refers to autotrophic nutrition, where organisms (like plants) produce their own food via photosynthesis.

19. Autotrophic nutrition occurs in:

Answer: D) Both B and C **Explanation**: Autotrophic nutrition occurs in plants (via photosynthesis) and some protists and prokaryotes (e.g., cyanobacteria, algae).

20. Mushroom, Rhizopus, and Yeast are:

Answer: D) Saprophytic **Explanation**: These are fungi that obtain nutrients by decomposing dead organic matter, making them saprophytic.

21. Chlorophyll is present:

Answer: A) In the grana of chloroplast **Explanation**: Chlorophyll is located in the thylakoid membranes within the grana of chloroplasts, where light-dependent reactions occur.

22. Chlorophyll cannot absorb:

Answer: D) Green light **Explanation**: Chlorophyll reflects green light, which is why plants appear green, and absorbs red and blue light most effectively.

23. Oxygen in photosynthesis is released from:

Answer: B) H2O **Explanation**: Oxygen is released during the photolysis of water in the light-dependent reactions of photosynthesis.

24. Dark reaction of photosynthesis occurs in:

Answer: B) Stroma **Explanation**: The Calvin cycle (dark reaction) takes place in the stroma of the chloroplast, where CO_2 is fixed into glucose.

25. Photosynthesis proceeds in sequence of:

Answer: C) Light phase and dark phase **Explanation**: Photosynthesis occurs in two stages: the light-dependent reactions (light phase) followed by the light-independent reactions (dark phase or Calvin cycle).

26. In bacterial photosynthesis, the hydrogen donor is:

Answer: D) H_2S **Explanation**: In bacterial photosynthesis (e.g., in purple sulfur bacteria), H_2S is often used as a hydrogen donor instead of H_2O, producing sulfur instead of oxygen.

27. Chlorophyll in chloroplasts is located in:

Answer: A) Grana **Explanation**: Chlorophyll is embedded in the thylakoid membranes within the grana, where light-dependent reactions occur.

28. Best equation representing photosynthesis:

Answer: C) energy + 6 CO_2 + 12 H_2O → $C_6H_{12}O_6$ + 6H_2O + 6 O_2
Explanation: This is the balanced equation for photosynthesis, accounting for the production of glucose, water, and oxygen from CO_2 and water using light energy.

29. Part of chloroplast where light reaction occurs:

Answer: A) Grana **Explanation**: The light-dependent reactions occur in the thylakoid membranes of the grana, where chlorophyll absorbs light.

30. Raw materials for photosynthesis are:

Answer: D) CO_2 and water **Explanation**: The primary raw materials for photosynthesis are carbon dioxide (CO_2) and water (H_2O), with sunlight providing the energy.

LEARNER'S TASK (Page 79 - 81)

Single Correct Answer Type

Solutions with Explanations:

1. Holophytic nutrition means-

Correct Answer: (A) autotrophism

Explanation: Holophytic nutrition refers to the mode of nutrition in which organisms, such as green plants, synthesize their own food using sunlight, carbon dioxide, and water through photosynthesis. This is characteristic of autotrophs, which are self-sustaining organisms.

2. The process represented by the equation is-

Correct Answer: (A) Photosynthesis

Explanation: The equation provided in the passage ($6CO_2 + 12H_2O \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$) represents photosynthesis, where green plants use sunlight and chlorophyll to convert carbon dioxide and water into glucose, oxygen, and water.

3. The gas produced in the above process is-

Correct Answer: (A) Oxygen

Explanation: During photosynthesis, oxygen (O_2) is released as a byproduct when water molecules are split (photolysis) to provide electrons for the light-dependent reactions.

4. The essential factors for the above process are-

Correct Answer: (B) Sunlight and Chlorophyll

Explanation: Photosynthesis requires sunlight as the energy source and chlorophyll as the pigment that captures light energy. While CO_2 and water are raw materials, the question asks for essential factors, making sunlight and chlorophyll the best choice.

5. This process is stopped at night because-

Correct Answer: (D) Sunlight is not available

Explanation: Photosynthesis is a light-dependent process. At night, the absence of sunlight halts the light-dependent reactions, stopping the process.

6. In which substance is the chemical energy stored by the above process?

Correct Answer: (C) C6H12O6

Explanation: During photosynthesis, chemical energy is stored in glucose (C6H12O6), which is produced as the primary energy-rich compound.

7.Autotrophic nutrition occurs in-

Correct Answer: (D) Both B and C

Explanation: Autotrophic nutrition occurs in green plants (B) and some protists and prokaryotes (C), such as algae and cyanobacteria, which can perform photosynthesis or chemosynthesis.

8. Mushroom, Rhizopus, and Yeast are-

Correct Answer: (D) Saprophytic

Explanation: These organisms are fungi that obtain nutrients by decomposing dead organic matter, a process known as saprophytic nutrition.

9. Which statement about autotrophs is incorrect?

Correct Answer: (C) They convert carbon dioxide and water into carbohydrates in the absence of sunlight

Explanation: Autotrophs, such as plants, require sunlight for photosynthesis to convert CO2 and water into carbohydrates. This process cannot occur in the absence of sunlight, making option C incorrect.

10. Select the correct statement-

Correct Answer: (A) Heterotrophs do not synthesise their own food

Explanation: Heterotrophs rely on consuming other organisms for food, as they cannot synthesize their own food through processes like photosynthesis. Options B, C, and D are incorrect as they describe autotrophic traits.

11. Chlorophyll is present-

Correct Answer: (A) in the grana of chloroplast

Explanation: Chlorophyll is located in the thylakoid membranes of the grana within chloroplasts, where it captures light for photosynthesis.

12. Chlorophyll cannot absorb one of the following-

Correct Answer: (D) green light

Explanation: Chlorophyll absorbs red and blue light efficiently but reflects green light, which is why plants appear green.

13. The process in which water is split during photosynthesis is-

Correct Answer: (A) Photolysis

Explanation: Photolysis is the process during the light-dependent reactions of photosynthesis where water molecules are split into oxygen, protons, and electrons using light energy.

14. The oxygen in photosynthesis is released from-

Correct Answer: (B) H2O

Explanation: Oxygen released during photosynthesis comes from the photolysis of water molecules, not from CO2 or other compounds.

15. Dark reaction of photosynthesis occurs in-

Correct Answer: (B) Stroma

Explanation: The dark reactions (Calvin cycle) occur in the stroma of the chloroplast, where CO2 is fixed into glucose using ATP and NADPH produced in the light reactions.

16. Photosynthesis proceeds in sequence of-

Correct Answer: (C) Light phase and dark phase

Explanation: Photosynthesis occurs in two stages: the light-dependent reactions (light phase) in the thylakoids, followed by the light-independent reactions (dark phase or Calvin cycle) in the stroma.

17. In bacterial photosynthesis, the hydrogen donor is-

Correct Answer: (D) H2S

Explanation: In bacterial photosynthesis (e.g., in purple sulfur bacteria), hydrogen sulfide (H2S) is often used as the hydrogen donor instead of water, unlike in plants.

18. Light waves where photosynthesis is maximum are-

Correct Answer: (D) Violet-Blue and Red

Explanation: Photosynthesis is most efficient in the violet-blue (400–500 nm) and red (600–700 nm) wavelengths, as chlorophyll absorbs these wavelengths most effectively.

19. The carbohydrate reserve of plants is-

Correct Answer: (A) Starch

Explanation: Plants store excess glucose produced during photosynthesis as starch, which serves as an energy reserve.

20. Choose the event that does not occur in photosynthesis-

Correct Answer: (C) Oxidation of carbon to carbon dioxide

Explanation: Photosynthesis involves the reduction of CO_2 to carbohydrates, not the oxidation of carbon to CO_2, which occurs in respiration.

21. Chlorophyll in chloroplasts is located in-

Correct Answer: (A) grana

Explanation: Chlorophyll is found in the thylakoid membranes of the grana, where light-dependent reactions occur.

22. Which of the following is the best equation representing photosynthesis?

Correct Answer: (C) energy + 6 CO_2 + 12 H_2O → $C_6H_{12}O_6$ + 6H_2O + 6 O_2

Explanation: This equation accurately represents photosynthesis, showing the correct stoichiometry and inclusion of chlorophyll and light as catalysts.

23. In which part of chloroplast does the light reaction of photosynthesis occur?

Correct Answer: (A) Grana

Explanation: The light-dependent reactions occur in the thylakoid membranes of the grana, where chlorophyll captures light energy.

24. The raw materials for photosynthesis are-

Correct Answer: (D) CO_2 and water

Explanation: The raw materials for photosynthesis are carbon dioxide (CO_2) and water (H_2O), which are converted into glucose and oxygen.

25. Plants are green in colour because-

Correct Answer: (B) they reflect green light

Explanation: Plants appear green because chlorophyll reflects green light while absorbing red and blue light for photosynthesis.