

Chapter 12

Plant Anatomy and Plant Physiology

I. Choose the correct Answer:

Question 1.

Casparian strips are present in of the root.

- (a) cortex
- (b) pith
- (c) pericycle
- (d) endodermis

Answer:

- (d) endodermis

Question 2.

The endarch condition is the characteristic feature of ____.

- (a) root
- (b) stem
- (c) leaves
- (d) flower.

Answer:

- (b) stem

Question 3.

The xylem and phloem arranged side by side on same radius is called:

- (a) radial
- (b) amphivasal
- (c) conjoint
- (d) None of these

Answer:

- (c) conjoint

Question 4.

Which is formed during anaerobic respiration:

- (a) Carbohydrate
- (b) Ethyl alcohol
- (c) Acetyl CoA
- (d) Pyruvate

Answer:

- (b) Ethyl alcohol

Question 5.

Kreb's cycle takes place in ____.

- (a) chloroplast
- (b) mitochondrial matrix
- (c) stomata
- (d) inner mitochondrial membrane.

Answer:

- (b) mitochondrial matrix

Question 6.

Oxygen is produced at what point during photosynthesis?

- (a) when ATP is converted to ADP
- (b) when CO₂ is fixed
- (c) when H₂O is splitted
- (d) All of these

Answer:

- (d) All of these

II. Fill in the blanks:

1. Cortex lies between
2. Xylem and phloem occur on the same radius constitute a vascular bundle called
3. Glycolysis takes place in
4. The source of O₂ liberated in photosynthesis is
5. is the ATP factory of the cells.

Answer:

1. epidermis and Pericycle
2. conjoint bundles
3. cytoplasm
4. splitting of Water molecules
5. Mitochondria

III. State whether the statements are true or false. Correct the false statement.

1. Phloem tissue is involved in the transport of water in plants.
2. The waxy protective covering of a plant is called as the cuticle.
3. In monocot, stem cambium is present in between xylem and phloem.
4. Palisade parenchyma cells occur below the upper epidermis in the dicot root.
5. Mesophyll contains chlorophyll.
6. Anaerobic respiration produces more ATP than aerobic respiration.

Answer:

1. False – Phloem tissue is involved in the transport of food in plants.
2. True
3. False – In monocot stem cambium is absent.
4. True
5. True
6. False – Aerobic respiration produces more ATP than anaerobic respiration.

IV. Match the following:

Column I		Column II	
A	Amphicribal	(i)	<i>Dracaena</i>
B	Cambium	(ii)	Translocation of food
C	Amphivasal	(iii)	Fern
D	Xylem	(iv)	Secondary growth
E	Phloem	(v)	Conduction of water

Answer:

- A. (iii)
 B. (iv)
 C. (i)
 D. (v)
 E. (ii)

V. Answer in a sentence:

Question 1.

What is the collateral vascular bundle?

Answer:

If xylem and phloem in a vascular bundle are arranged along the same radius with phloem towards the outside, such vascular bundle is called a collateral vascular bundle.

Question 2.

Where does the carbon that is used in photosynthesis come from?

Answer:

The carbon that is used in photosynthesis comes from CO₂ from the air.

Question 3.

What is the common step in aerobic and anaerobic pathway?

Answer:

Glycolysis is the common step in aerobic and anaerobic respiration.

Question 4.

Name the phenomenon by which carbohydrates are oxidized to release ethyl alcohol.

Answer:

Alcohol fermentation.

VI. Short Answer Questions:

Question 1.

Give an account on vascular bundle of dicot stem.

Answer:

Vascular bundles of dicot stem are conjoint (xylem and phloem lies in the same radius) collateral (xylem is the centre and phloem lies towards periphery) endarch (proto xylem in the centre, Meta xylem lies in the periphery) and open (cambium present in between xylem and phloem: They are arranged in the form of ring around the pith.

Question 2.

Write a short note on mesophyll.

Answer:

In Dicot leaf, the tissue present between the upper and lower epidermis is called mesophyll. It is differentiated into

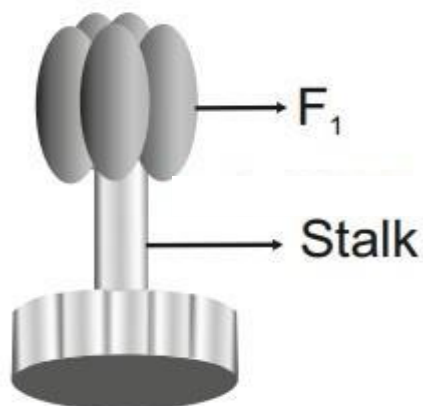
1. Palisade Parenchyma: They are found below the epidermis and are elongated. They have a number of chloroplasts and can take part in photosynthesis. The cells do not have intercellular spaces.
2. Spongy Parenchyma: They are found below the palisade parenchyma tissue. Cells are spherical or oval and are irregularly arranged. Cells have intercellular spaces and help in gaseous exchange.

In monocot leaves, mesophyll is present between both upper and lower epidermal layer. The cells are irregularly arranged with intercellular spaces. Mesophyll cells contain chloroplasts, to take part in photosynthesis.

Question 3.

Draw and label the structure of oxysomes.

Answer:



Structure of Oxysomes

Question 4.

Name the three basic – tissues systems in flowering plants.

Answer:

The three basic tissue system in flowering plants are:

- Dermal or epidermal tissue system.
- Ground tissue system.
- Vascular tissue system.

Question 5.

What is photosynthesis and where in a cell does it occur?

Answer:

Photosynthesis is a process by which autotrophic organisms (green plants, algae and chlorophyll containing bacteria) utilize the energy from sunlight to synthesize their own food. It occur in the chloroplast of the cell.

Question 6.

What is respiratory quotient?

Answer:

Respiratory quotient is the ratio of volume of carbon dioxide liberated and the volume of oxygen consumed during respiration. It is expressed as

$$RQ = \frac{\text{Volume of CO}_2 \text{ liberated}}{\text{Volume of O}_2 \text{ consumed}}$$

Question 7.

Why should the light – dependent reaction occur before the light-independent reaction?

Answer:

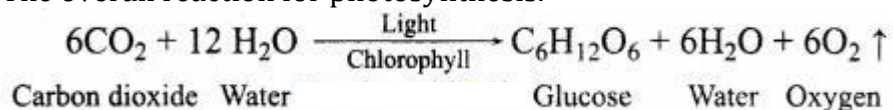
In light – dependent photosynthesis, the photosynthetic pigment absorbs the light energy and convert it into chemical energy, ATP and NADPH₂. These products move out from grana to the stroma of the chloroplast for the light-independent reactions (Dark reaction or Biosynthetic pathway). During this reaction, CO₂ is reduced in the carbohydrates with the help of light generated ATP and NADPH₂. So the light-dependent reaction should occur before the light-independent reaction.

Question 8.

Write the reaction for photosynthesis.

Answer:

The overall reaction for photosynthesis.



VII. Long Answer Questions:

Question 1.

Differentiate the following:

(a) Monocot root and Dicot root

Answer:

Monocot Root	Dicot Root
Xylem is poly arch.	Xylem is usually tetrarch.
Pith is usually large at the centre.	Pith is usually absent.
Conjunctive tissue is made up of sclerenchyma.	Conjunctive tissue is made up of parenchyma.
There is no secondary growth.	Secondary growth is generally present.

(b) Aerobic and Anaerobic respiration

Answer:

Aerobic Respiration	Anaerobic Respiration
It occurs in all living cells of higher organisms.	It occurs in yeast and some bacteria.
It requires oxygen for breaking the respiratory substrate.	oxygen is not required for breaking the respiratory substrate.
The end products are CO ₂ and H ₂ O.	The end products are alcohol and CO ₂ .
Glucose molecules are completely oxidised.	Glucose molecules are partially broken down.

Question 2.

Describe and name three stages of cellular respiration that aerobic organisms use to obtain energy from glucose.

Answer:

The name and the three stages of cellular respiration.

- **Glycolysis: (Glucose splitting):** Glycolysis is the break down of one molecule of Glucose (6 Carbon) into two molecules of Pyruvic acid (3 Carbon). It takes place in the cytoplasm of the cell.
- **Kreb's cycle:** This cycle occurs in the mitochondria matrix. At the end of Glycolysis, 2 molecules of pyruvic acid enter into mitochondria. The oxidation of pyruvic acid into CO₂ and H₂O takes place through this cycle. It is also called as Tricarboxylic Acid Cycle. (TCA)

- **Electron transport chain:** It is a system of Electron Transport Chain (ETC) located on the inner membrane of the mitochondria. NADH_2 and FADH_2 molecules formed during Glycolysis and Krebs cycle are oxidised to NAD^+ and FAD^+ to release the energy via electrons.

The electrons, as they move through the system, release energy which is trapped by ADP to synthesize ATP. This is called Oxidative Phosphorylation. During this process, oxygen which is the acceptor of electrons gets reduced to water.

Question 3.

How does the light dependent reaction differ from the light independent reaction? What are the end product and reactants in each? Where does each reaction occur within the chloroplast?

Answer:

Light dependent reaction	Light independent reaction
The reaction involving pigments, solar energy and water that produce ATP and NADPH_2 are called light dependent reaction.	The photosynthetic reaction in which CO_2 is reduced to carbohydrates making use of ATP and NADPH_2 generated by light dependent reaction.
The end product is ATP and NADPH_2 .	The end product is carbohydrates.
This reaction takes place in Thylakoid membranes (grana) of the chloroplast.	It occurs in the stroma of the chloroplast.

VIII. Higher Order Thinking Skills(HOTS):

Question 1.

The reactions of photosynthesis make up a biochemical pathway.

(a) What are the reactants and products for both light and dark reactions.

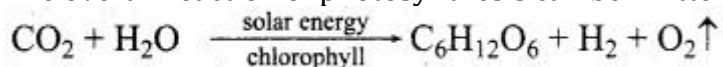
Answer:

The reaction of photosynthesis can be grouped into two: Light and Dark reaction.

The reaction involving pigments, solar energy and water that produce ATP and NADPH_2 are called light reaction.

The photosynthetic reactions in which CO_2 is reduced to carbohydrates making use of ATP and NADPH_2 generated by light reaction are called dark reaction.

The overall reaction of photosynthesis can be written as follows:



(b) Explain how the biochemical pathway of photosynthesis recycles many of its own reactions and identify the recycled reactants.

Answer:

Light reaction use light to synthesize ATP and NADPH₂. The calvin cycle uses these reactants to produce sugar from CO₂ molecule.

This cycle then produce NAP + ADP + Pi which is used in light reaction with H₂O molecules to produce ATP and NADPH₂ again.

Question 2.

Where do the light-dependent reaction and the Calvin cycle occur in the chloroplast?

Answer:

The Light-dependent reaction occurs in the Thylakoid membranes (Grana) of the chloroplast. The Light independent reaction occurs in the stroma of the chloroplast.