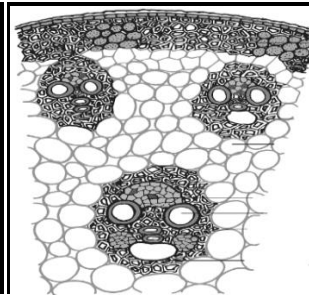


UNIT - 12

PLANT ANATOMY AND PLANT PHYSIOLOGY



I. Choose the correct answer

- Casparian strips are present in the _____ of the root. [MDL – 19]
 a) Cortex b) Pith c) Pericycle d) endodermis
- The endarch condition is the characteristic feature of [AUG – 2022, MAY - 2022]
 a) root b) stem c) leaves d) flower
- The xylem and phloem arranged side-by-side on same radius is called
 a) radial b) amphivasal c) conjoint d) None of these
- Which is formed during anaerobic respiration [SEP – 2020, MDL – 19]
 a) Carbohydrate b) Ethyl alcohol c) Acetyl CoA d) Pyruvate
- Krebs cycle takes place in [PTA – 3]
 a) chloroplast b) mitochondrial matrix c) stomata d) inner mitochondrial membrane
- Oxygen is produced at what point during photosynthesis (or) During photosynthesis at which of the following state, oxygen is produced. [PTA – 4]
 a) when ATP is converted to ADP b) when CO₂ is fixed
 c) when H₂O is splitted d) all of these

II. Fill in the blanks

- The innermost layer of cortex in root is called endodermis.
- Xylem and phloem are arranged in an alternate radii constitute a vascular bundle called radial bundles.
- Glycolysis takes place in cytoplasm.
- The source of O₂ liberated in photosynthesis is water.
- Mitochondria is ATP factory of the cells.

III. True or false. Correct the statement if it is false.

- Phloem tissue is involved in the transport of water in plant. [False]
 * Xylem tissue is involved in the transport of water in plant.
- The waxy protective covering of a plant is called as cuticle. [True]
- In monocot stem, cambium is present in between xylem and phloem. [False]
 * In dicot stem, cambium is present in between xylem and phloem.
- Palisade parenchyma cells occur below upper epidermis in dicot root. [False]
 * Palisade parenchyma cells occur below upper epidermis in dicot leaf.
- Mesophyll contains chlorophyll. [True]
- Anaerobic respiration produces more ATP than aerobic respiration. [False]
 * Anaerobic respiration produces less ATP than aerobic respiration.

IV. Match the following

Column I	Column II	Answer
1. Amphoteric	<i>Dracaena</i>	1. Fern
2. Cambium	Translocation of food	2. Secondary growth
3. Amphivasal	Fern	3. <i>Dracaena</i>
4. Xylem	Secondary growth	4. Conduction of water
5. Phloem	Conduction of water	5. Translocation of food

V. Answer in a sentence

1. What is collateral vascular bundle?

In collateral vascular bundle, xylem lies towards centre, phloem lies towards periphery.

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

Carbon come from atmosphere in the form of CO₂.

3. What is the common step in aerobic and anaerobic pathway and where is it occur in a cell?

Common Step - Glycolysis. It takes place in cytoplasm of the cell. [PTA – 5]

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

Fermentation (Anaerobic respiration).

VI. Short answer Questions

1. Give an account on vascular bundle of dicot stem.

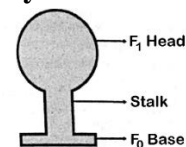
- ❖ Vascular bundles of dicot stem are conjoint collateral, endarch and open.
- ❖ They are arranged as ring around the pith.

2. Write a short note on mesophyll.

Tissue between upper and lower epidermis of leaf is called mesophyll.

- ❖ Palisade parenchyma: Elongated cells with more chloroplasts.
Helps in photosynthesis.
- ❖ Spongy parenchyma: Spherical cells with intercellular spaces.
Helps in gaseous exchange.

3. Draw and label the structure of oxysomes.



4. Name the three basic tissue system in flowering plants.

- * Dermal/Epidermal tissue system
- * Ground tissue system
- * Vascular tissue system

5. What is photosynthesis and where in a cell does it occur? [SEP – 2021, PTA – 3]

It is a process by which organisms utilize energy from sunlight to synthesize their own food.



- ❖ It occurs in the chloroplast.

6. What is Respiratory quotient?

[AUG – 2022, MAY - 2022, SEP – 2021, PTA – 1]

Respiratory Quotient (R.Q.) is the ratio of volume of carbon dioxide liberated and volume of oxygen consumed during respiration.

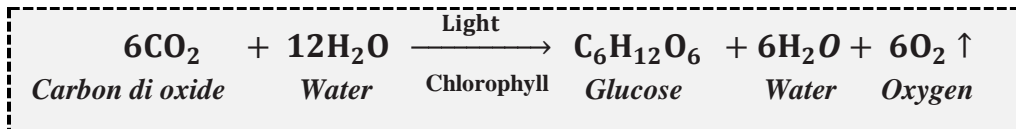
$$\text{R. Q} = \frac{\text{volume of CO}_2 \text{ liberated}}{\text{volume of O}_2 \text{ consumed}}$$

7. Why should the light dependent reaction occur before the light independent reaction?

- ❖ During light independent reactions, CO₂ is reduced into carbohydrates with the help of ATP and NADPH₂ which is generated during light dependent reaction.
- ❖ So, light dependent reaction should occur before the light independent reaction.

8. Write the reaction for photosynthesis.

[MAY - 2022]



VII. Long Answer Questions

1. Differentiate the following.

[MDL – 19]

a) Monocot root and Dicot root:

[SEP – 2020]

S.No	Tissues	Dicot Root (Bean)	Monocot Root (Maize)
1.	Number of xylem	Tetrarch	Polyarch
2.	Cambium	Present	Absent
3.	Secondary growth	Present	Absent
4.	Pith	Absent	Present
5.	Conjunctive tissue	Parenchyma	Sclerenchyma

b) Aerobic and Anaerobic respiration:

[AUG – 2022, SEP – 2021]

Aerobic respiration	Anaerobic respiration
1) Takes place in presence of oxygen.	1) Takes place in absence of oxygen.
2) Occurs in most plants and animals	2) Occurs in some bacteria.
3) Carbohydrate is completely oxidized into carbon dioxide, water and energy.	3) Glucose is converted into ethanol (in plants) or lactate (in bacteria).
4) $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{ATP}$	4) $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{CO}_2 + 2\text{C}_2\text{H}_5\text{OH} + \text{Energy (ATP)}$

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

Cellular Respiration : It is a cell process where the food is oxidized to obtain energy.

Stages of Aerobic Cellular Respiration :

Glycolysis:

- ❖ One glucose molecule breakdown into two molecules of pyruvic acid in cytoplasm.

Krebs cycle (or) Tricarboxylic Acid cycle (TCA):

- ❖ After glycolysis, pyruvic acid is oxidized to CO₂ and water in mitochondrial matrix.

Electron Transport chain (ETC):

- ❖ It occurs through electron carrier complex in the inner membrane of mitochondria.
- ❖ NADH₂ & FADH₂ are oxidized to NAD⁺ & FAD⁺ to release energy via electrons.
- ❖ The electrons release energy, which is trapped by ADP to synthesize ATP.
- ❖ This is called oxidative phosphorylation. Here O₂ is reduced to water.

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

Light dependent (Light) Reaction	Light independent (Dark) Reaction
Takes place in the presence of light energy	Takes place in the absence of light.
Photosynthetic pigments absorb light energy and convert it into ATP & NADPH ₂	CO ₂ is reduced into carbohydrates with the help of ATP & NADPH ₂
Occurs in <i>thylakoid membrane</i> of chloroplast.	Occurs in <i>Stroma</i> of chloroplast.

VIII. Higher Order Thinking Skills (HOTS)

1. The reactions of photosynthesis make up a biochemical pathway.

A) What are the reactants and end products of light & dark reaction of photosynthesis? [PTA-5]

	Light Reaction	Dark Reaction
Reactants	sunlight, H ₂ O, NADP ⁺ , ADP	ATP and NADPH ₂
Products	ATP, NADPH ₂ and O ₂	Carbohydrate

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

- ❖ Steps of photosynthesis - Light reactions and Dark reactions (or) Calvin cycle.
- ❖ ATP and NADPH₂ are formed by light reactions using sunlight.
They are used by Calvin cycle to produce glucose.
- ❖ Calvin cycle oxidizes NADPH₂ and ADP to NADP⁺ and ATP. These are used again by light reaction and reduced to NADPH₂ and ATP with the help of a water molecule.
- ❖ In this way, photosynthesis recycles its own reaction in a series.

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

- ❖ Light dependent reaction takes place in *thylakoid membrane* of chloroplast.
- ❖ Calvin cycle takes place in stroma of chloroplast.