Q.50. Describe the T.S. ofleaf in relation to transpiration.

Ans: i. T.S. of leaf shows an upper epidermis and lower epidermis.

ii. The mesophyll tissue is present between upper and lower epidermis which is differentiated into palisade and spongy tissue.

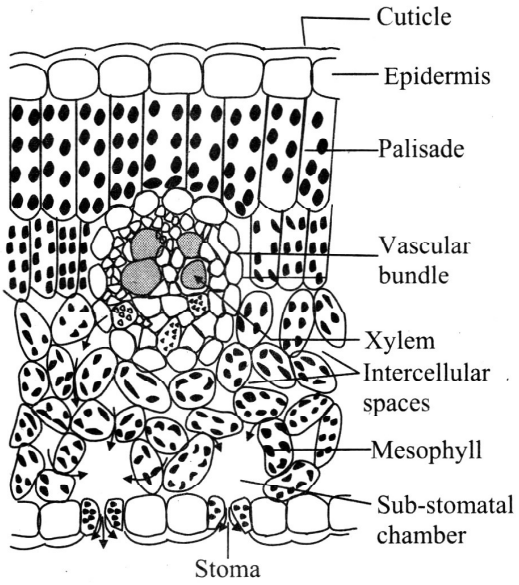
iii. The palisade tissue is present below the upper epidermis and made up of closely- arranged elongated cells with chloroplasts. While the spongy tissue is present above the lower epidermis and made up of loosely arranged parenchymatous cells with few chloroplasts.

iv. Many small openings called stomata are present in lower epidermis.

v. These stomata connect the intercellular spaces between the spongy tissue to the atmosphere.

vi. Number of vascular bundles are present in mesophyll tissue. Each vascular bundle contains xylem and phloem.

vii. The xylem conducts water absorbed by roots to the leaves.



Internal structure of leaf in relation to transpiration

viii. From xylem, the water enters mesophyll cells.

ix. Water gets evaporated from thin cell walls of turgid mesophyll cells and this water vapour gets collected in the intercellular spaces and sub-stomatal chambers.

x. Through stomata, water vapours diffuse into the atmosphere.

Q.51. With a neat and labelled diagram describe the structure of stomata.

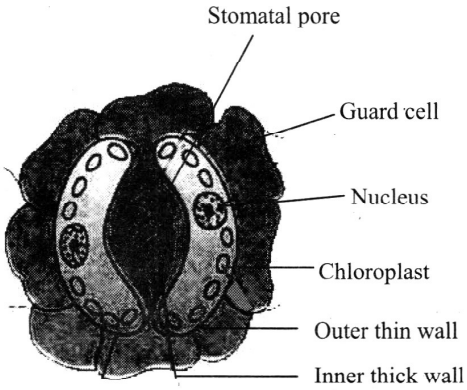
Ans: Structure of stomata:

i. A typical stoma consists of an elliptical aperture surrounded by a pair of specialized epidermal parenchyma cells, called guard cells.

ii. Guard, cells are modified epidermal cells which are kidney-shaped in dicotyledonous plants and dumbbell shaped in monocotyledonous plants.

iii. The inner wall of guard cells surrounding the pore is thick and inelastic due to presence of secondary wall layer and the outer walls are thin, elastic and permeable.

iv. Guard cells are living, uninucleate cells having central vacuole, peripheral granular cytoplasm and a central vacuole.



Stoma

v. Cytoplasm contains nucleus and many chloroplasts.

vi. In some plants, epidermal cells surrounding guard cells are specialized. These are called subsidiary cells or accessory cells.

vii. They help the guard cells in opening and closing of stoma.

Q.52. Explain the role of Ie ions in opening and closing of stomata.

OR

How does opening and closing of stomata take place?

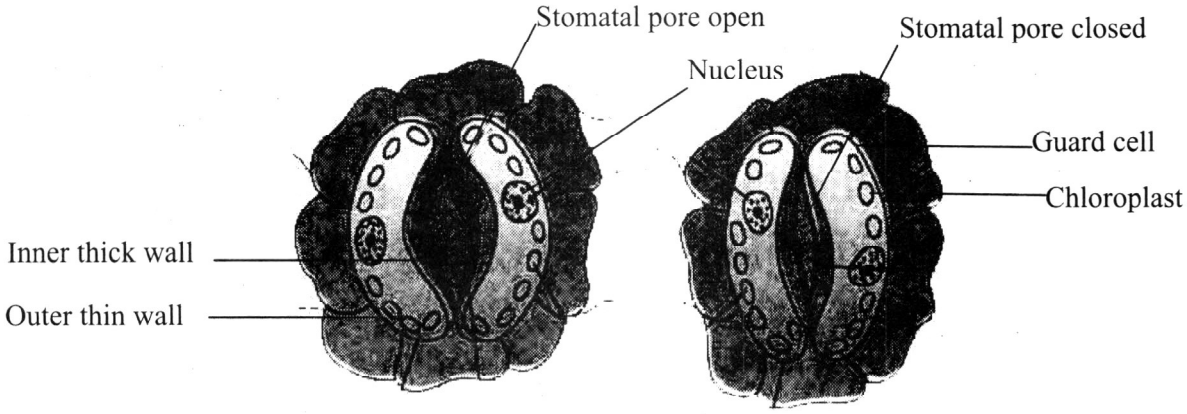
OR

What causes the opening and closing of guard cells of stomata during transpiration?

Ans: i. Stomatal transpiration takes place when the stomata are open (i.e daytime) and the process stops when stomata get closed (i.e night time)

ii. According to Levitt's proton transport concept, opening and closing of the stomata takes place as a result of an active transport of potassium ions into the guard cells and out of them.

iii. The adjacent epidermal cells act as ion storage cells for guard cells.



Open and Closed stoma

a. Opening of stomata:

i. During day, starch is converted into malic acid in the cytoplasm of guard cells.

ii. Malic acid dissociates into hydrogen (W) ions and malate ions.

iii. H^+ ions move out of guard cells and K^+ ions from subsidiary cells enter into the guard cells.

iv. The intake of K^+ ions is balanced by intake of Cl^- ions.

v. This leads to increase in osmotic potential of the guard cells.

iv. Water from surrounding cell enters the guard cell by the process of endosmosis, as a result guard cells become turgid.

vii. The outer thin wall is stretched and inner thick wall is pulled apart. As a result, stoma opens.

b. Closing of Stomata:

i. Photosynthesis does not take place during night.

ii. As a result, CO_2 concentration in guard cells increases and pH becomes acidic.

iii. In presence of CO_2, an inhibitor hormone abscissic acid (ABA) functions and inhibits uptake of K^+ ions and Cl^- ions by changing the diffusion and permeability of guard cells.

iv. The K^+ ions and Cl^- ions move out of the subsidiary cells, as a result, osmotic concentration of guard cell decreases.

v. Exosmosis occurs due to which guard cells become flaccid.

vi. Inner walls of guard cells come in contact with each other and stoma closes.

Q.53. What is theshape of guard cells in monocots?

Ans: In monocots, the guard cells are dumb-bell shaped.

Q.54. Which type of transpiration is maximum in plants?

Ans: Stomatal transpiration is maximum in plants.

Q.55. What is transpiration? Give its significance.

OR

What are the beneficial and harmful effects of transpiration?

Ans: The loss of water in the form of vapours from the aerial parts ofthe plant is called transpiration.

Significance of transpiration (beneficial effects):

i. Translocation of water:

Transpiration plays an important role in translocation of water. The water absorbed is translocated from roots to leaves through the xylem vessels. The upward water translocation is greatly influenced

by transpiration pull. Hence, under high transpiration, the rate of water translocation through xylem vessels is more.

ii. Absorption and conduction of minerals:

Minerals dissolved in water are passively absorbed and translocated due to transpiration. Minerals are actively absorbed and translocated to the top of the plant due to transpiration pull.

iii. Cooling effect:

Transpiration plays an important role in reducing the temperature of the leaf, thereby avoiding the overheating of the plant.

iv. Optimum turgidity:

Transpiration helps in maintaining the optimum turgidity in plant cells for their efficient functioning. Under favourable conditions, plants absorb excess amount of water which is lost by transpiration to maintain optimum turgidity. It is necessary for better growth and development of plants.

Disadvantage of transpiration (Harmful effects):

i. A large amount of water is lost due to transpiration.
ii. It causes water deficit in plants.
iii. Plants can suffer from injury due to desiccation.
iv. Plants waste energy to develop modifications like scale leaves, thoms, prickles to cut down the rate of transpiration.

Q.56. "Transpiration is a necessary evil". Comment.

Ans: i. Transpiration is regarded as a necessary evil by Curtis (1926).
ii. Transpiration is a necessary evil because of leaf anatomy.
iii. Mesophyll tissue is made up of thin walled cells with intercellular spaces.
iv. Stomatal transpiration always occurs whenever stomata are open, thus due to such leaf anatomy transpiration cannot be avoided.
v. It is regarded as evil, because water which is important for the plant is lost unnecessarily.
vi. Stomata opens for exchange of gases required for photosynthesis and respiration and thus the loss of water through them cannot be avoided.
vii. Though transpiration is an energy sapping process, transpiration helps in absorption and translocation process.
viii. Hence, transpiration is regarded as a necessary evil.

Q.57. Why is transpiration called as energy sapping process?

Ans: Transpiration is called as energy sapping process because large amount of water absorbed is lost.

Q.58. Distinguish between

i. Evaporation and Transpiration.
ii. Guttation and Transpiration

Ans: i. Evaporation and Transpiration.

No.	Evaporation	Transpiration
i.	Occurs in any free surface.	Takes place in plants.
ii.	It is a physical process.	It is a physiological process.
iii.	It is comparatively faster process.	It is comparatively slower process.
iv.	Both living and non-living cells are involved.	Only living cells are involved.

ii. Guttation and Transpiration :

No.	Guttation	Transpiration
i.	It is water loss in the form of liquid.	It is water loss in the form of water vapours.
ii.	Water lost contains sugar, amino acids and salts.	Water lost is pure.
iii.	It occurs when atmosphere is humid.	It occurs in presence of light and when temperature is high.
iv.	It occurs through hydathodes.	It occurs through cuticle, stomata and lenticels.
v.	Water lost is impure.	Water lost is pure.
vi.	It occurs in herbaceous plants only.	It occurs in all plants.

6.5 : Role of water :

Q.59. "Water is absolutely essential for life". Explain.

Ans: i. Water is the chief and major constituent of protoplasm, thus it is necessary for normal functioning, growth and development.

ii. It serves as aqueous medium for various metabolic reactions.

iii. Water has high specific heat, high heat of fusion and high heat of vapourization, due to which it serves as a temperature stabilizer, also it maintains stable metabolic rate.

iv. In plants, water is an essential raw material for photosynthesis.

v. It helps to maintain turgidity of cells and plant organs.

vi. Carbohydrates, proteins, nucleic acid, enzymes and pigments may lose their function in the absence of water.

vii. Water is an excellent solvent for various organic materials of cells.

viii. Water plays a significant role in many activities such as translocation of organic and inorganic solutes, movement of gametes, opening and closing of stomata, dehiscence of fruits, germination of seeds, etc.

6.6 : Translocation of food: Through phloem :

Q.60. What is translocation of organic solutes?

Ans: The transport of organic substances from supply point to consumption point in higher plants is known as translocation of organic solutes.

Q.61. Name the special conducting tissue to translocate food in plants.

Ans: Phloem is the special conducting tissue to trans locate food in plants.

Q.62. Which part of plant is referred as the supply end and sink end?

Ans: Storage organs and leaves are referred as supply end, while growing regions are considered as sink end.

Q.63. Describe the course of translocation of organic sap and its mechanism.

Ans: Translocation of organic sap:

In plants, transport phenomenon is very significant because various substances, either inorganic or organic are transported from one place to another from the site of synthesis to the site of consumption.

During the process of photosynthesis, sugars are manufactured in the leaves of the plants. This sugar is carried to all organs of plants or to the storage sites through phloem. This translocation is described as phloem translocation.

The storage organs and leaves are considered as supply points or supply end, while the growing regions are considered as consumption points or sink end.

The transport of organic substances from supply point to consumption point in higher plants is known as translocation of organic solutes.

The direction of translocation is upward, downward and lateral. Generally, the translocation of sugars is

downward from green leaves to non-green parts of the plant. Upward translocation occurs in germinating seeds and apices of stems which lie above the leaves. Food migrates in upward or lateral direction during growth and development of flower and fruits. Radial translocation of organic solutes occurs within the stem. e.g. cells of pith to cortex.

Hence, food translocates from the parts where it is in plenty (supply end) to those' where it is required for consumption (sink end).

Q.64. Explain Munch hypothesis theory of translocation of organic food.

OR

Explain the pressure flow hypothesis of translocation of sugar in plants.

Ans: Munch hypothesis is the theory to explain the mechanism of translocation of organic food. According to this theory, a turgor pressure gradient exists between the supply end and consumption end. Organic solutes are carried passively in the positive direction of the gradient and translocation of organic solutes takes place through phloem from region of higher concentration of solutes, i.e. supply end to the region of lower concentration, i.e. consumption end.

Q.65. Explain why xylem transport is unidirectional and phloem transport bidirectional?

Ans: Xylem transport: Xylem conducts water absorbed by roots to the leaves. It is always unidirectional, i.e. only upwards.

Phloem transport: It is called flow from source to the sink. Downward translocation of organic solutes occurs from leaves to other parts of the plant. Upward translocation takes place from storage organ to new buds, developing fruits, etc. Source-sink relationship is variable. It is bidirectional" i.e. upward and downward.

6.7 : Mineral Nutrition :

Q.66. Define inorganic nutrients.

Ans: Various types of inorganic elements which are required by the green plants for their nutrition are known as inorganic nutrients.

Q.67. What are non-mineral elements and mineral nutrients?

Ans: i. Non-mineral elements:

Carbon, hydrogen and oxygen which are obtained by plants from air or water are called non-mineral elements.

ii. Mineral nutrients:

The other nutrients which are mainly obtained by the plants from soil are called mineral nutrients.

Q.68. Define:

i. Essential elements
ii. Non-essential elements
iii. Mineral nutrition

Ans: i. Essential elements:

The elements which are required for the normal growth and development of the plant body are called essential elements.

ii. Non-essential elements:

The elements which are not required for the growth and development of the plant body are called non-essential elements.

iii. Mineral nutrition:

The utilization of various kinds of absorbed minerals by a plant for growth and development is called mineral nutrition.

Q.69. Enlist essential elements.

OR

Name the various essential elements for the growth of plants.

Ans: There are 16 essential elements present for the growth of plants. These are as: Carbon (C), Hydrogen (H), Oxygen (0), Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca), Sulphur (S), Magnesium (Mg), Iron (Fe), Manganese (Mn), Zinc (Zn), Boron (B), Copper (Cu), Molybdenum (Mo) and Chlorine (Cl).

Q.70. Which elements are referred to as critical elements?

Ans: NPK (Nitrogen, Phosphorus, Potassium) elements are referred to as critical elements with reference to agricultural crops.

Q.71. What are the various criteria for essentiality of elements?

Ans: Criteria for essentiality of elements:

i. Essential elements are indispensible for healthy growth of a plant.
ii. The essential elements are specific in their function. Thus, they cannot be replaced by other elements.
iii. The deficiency of essential elements develop some symptoms which can be corrected by supplying that specific element.

Q.72. Why micronutrients or trace elements are required in very small amount?

Ans: Most of the micronutrients act as activators or co-factors for various enzymes, excess quantity suppresses enzyme activity Hence, micro nutrients are required in very small amount.

Q.73. All elements that are present in the plant need not be essential to its survival",Comment.

Ans: The elements like Zn, Mo, B, etc are micronutrients (required in very less amount) and are essential, as they take part in some metabolic reactions, but are not essential for survival of the plant. Approximately 30 elements are universally present in all plants. However, only 16 of them are essential for plant growth and development.

Q.74. Explain the role of macro nutrients and their deficiency symptoms.

Ans:

No.	Minerals	Symbol of minerals	Role	Deficiency symptoms
i.	Carbon, hydrogen, oxygen	C, H, O	Carbon, hydrogen and oxygen are essential for the synthesis of carbohydrates, proteins and fats.	If they are not available in sufficient quantity, then the growth of the plant will be poor.
ii.	Nitrogen	N	It is the constituent of nucleic acids, proteins, vitamins, coenzymes, alkaloids and porphyrins. It is essential for the synthesis of proteins, as it is the constituent of all amino acids. Porphyrin is present in the structure of chlorophyll and cytochrome enzymes. These two compounds play an important role in photosynthesis and respiration.	Chlorosis or yellowing will be observed in leaves. Petioles and veins of leaves turn purple due to the production of purple pigment anthocyanin. Shoot growth will be suppressed. Flowering is delayed or is completely suppressed.
iii.	Sulphur	S	It is the important constituent of some amino acids (methionine, cystine) and therefore is required for protein synthesis.	Chlorosis followed by the production of anthocyanin pigments in some species. Inward rolling of leaf margins and tips.

			It is also essential for the synthesis of sulphur containing vitamins like biotin, thiamin and coenzyme A. Disulphide bridge (–S–S–) plays an important role in determining protein structure and sulphahydril groups (–SH) are necessary for the activity of enzymes.	Development of sclerenchymatous tissue in stem due to which it becomes hard.
iv.	Phosphorus	P	It is an important constituent of phospholipid. It is present in nucleic acids. It is the component of co-enzymes like NAD, NADP and ATP. It is the structural component of DNA, RNA, ATP. Co-enzymes NADP and NAD are required for oxidation-reduction reactions of photosynthesis, respiration and fat metabolism.	Premature leaf fall, decrease in the rate of protein synthesis, delay in flowering, leaves become dark blue in colour, stunted growth, formation of dead necrotic spots.
v.	Calcium	Ca	It is the constituent of middle lamella. In middle lamella, it is present in the form of calcium pectate. It helps to stabilize the structure of chromosomes.	Growth of root, stem and leaf will stop due to deficiency of calcium and malformation of leaves occurs. Chlorosis along the margin of younger leaves. . Plant will show stunted growth. Cell wall becomes brittle due to lack of calcium.
vi.	Potassium	K	It is an activator of enzymes concerned in the synthesis of polypeptides from amino acids and is also essential for photosynthesis and respiration.	Inhibits protein synthesis. Leaves exhibit curling, marginal chlorosis. Shortening of internodes also occurs, resulting in stunted growth.
vii.	Magnesium	Mg	Major constituent of the chlorophyll molecule. Acts as an activator for many enzymes in phosphate transfer reactions, particularly in carbohydrate metabolism and nucleic acid synthesis. It is an important binding agent in ribosome, where protein synthesis takes place.	Magnesium deficiency results in extensive chlorosis of leaves. The older leaves are affected first, ultimately leaves develop necrotic spots.

viii.	Iron	Fe	Helps in chlorophyll synthesis. It is an important constituent of ferredoxin, flavoprotein, iron-porphyrin, catalase, peroxidase and cytochrome. Iron is concerned in the formation of chloroplast protein in the leaves.	Pronounced chlorosis.

Q.75. Explain the role of Micronutrients and their deficiency symptoms.
Ans:

No.	Minerals	Symbol of minerals	Role	Deficiency symptoms
i.	Manganese	Mn	It is an activator of many respiratory enzymes. It is required during non-cyclic photophosphorylation. Manganese is also related to the evolution of O_2 in photosynthesis.	Chlorosis. Formation of necrotic spots in the leaves.
ii.	Boron	B	It facilitates the translocation of sugars.	Death of shoot tips and root tips, which results in stunted growth. Flowers are not formed due to lack of boron.
iii.	Copper	Cu	Catalyzes oxidation-reduction reactions.	Dieback of citrus. Reclamation disease of cereals and leguminous plants.
iv.	Zinc	Zn	It is an activator of certain enzymes like carbonic anhydrase, alcohol dehydrogenase, etc. It is involved in synthesis of growth hormones (Auxin, I.A.A.)	Chlorosis of older leaves starting from tips and margins, mottle leaf disease of apple, citrus and other trees.
v.	Molybdenum	Mo	It acts as an activator for the enzyme nitrate reductase involved in nitrogen metabolism.	Whiptail disease in cauliflower and flower formation is inhibited.
vi.	Chlorine	Cl	It is involved in the transfer of electron to photosystem II during non-cyclic photophosphorylation.	Overall poor growth of the plants.

Q.76. What is hydroponics?
Ans: The technique of growing plants in a nutrient solution is called hydroponics.
It is a soilless culture, i.e. growing plants without soil.

Q.77. How plants are grown by the technique of hydroponics?
Ans: i. In hydroponics, plants are grown in nutrient solution.
ii. Roots are immersed in an adequately aerated, dilute and defined solution of nutrients.
iii. Purified water and mineral salts are used in nutrient medium.
iv. Concentration of a particular mineral in a solution of nutrients in which roots are immersed can be increased or decreased, according to the need of the plant.
v. Thus by hydroponics technique, plants can be grown well in absence of soil.

Q.78. Give the advantages of hydroponics.

Ans: i. Hydroponics is used for commercial production of vegetables such as tomato, cucumber, lettuce, spinach, etc.

ii. Hydroponics technique can be practiced in terrace or balcony.

iii. As it is a soilless culture, making beds, de-weeding, watering, etc is not needed, wastage of water is avoided.

iv. Off season production is possible.

v. It gives clean working environment, there is no harm from soil borne diseases or nematode damage.

vi. Well grown plants can be exported with root cuttings free from soil particles.

Q.79. Write a short note on mineral toxicity.

Ans: i. Micronutrients are always required in traces. However, their moderate decrease causes deficiency symptoms and a moderate increase causes toxicity.

ii. Toxicity is nothing but the reduction in dry weight of tissues by about 10% by any mineral.

iii. Many times excess of an element inhibits the uptake of another element and deficiency symptoms of that element are observed.

e.g. symptom of manganese toxicity is brown spots surrounded by chlorotic veins. In fact, manganese competes with iron and magnesium for uptake and also inhibits calcium translocation in shoot apex. Thus, what appears as symptoms of Mn toxicity may be the deficiency symptoms of Fe, Mg and Ca.

Q.80. Why is purification of water and nutrient salts so important in studies involving mineral nutrition using hydroponics?

Ans: Micronutrients are required in very small quantity. Presence in small quantity of such minerals may affect the nutrition in hydroponics. Due to this reason, purification of water and mineral' salts are required for growing plants in nutrient solution (hydroponics). It is important for the studies of physiological role and deficiency symptoms of specific element involving hydroponics. Impure water contains large number of soluble minerals dissolved in it. Salts also contain impurities.

Q.81. If a plant shows a symptom which could develop due to deficiency of more than one nutrient, how would you find out experimentally the real deficient mineral element?

Ans: For this, technique of hydroponics can be used. Plants are grown in pure nutrient media with only required elements. Similarly in other glass containers, plant is allowed to grow artificially with same nutritive culture, which contains all essential elements except one, whose deficiency symptom is to be judged. If deficiency symptom appears, it is due to deficiency of that particular nutrient. .

Q.82. Define mineral absorption.

Ans: Mineral absorption: The movement of minerals across the cell wall and plasma membrane is called mineral absorption.

Q.83. In which form the minerals are absorbed?

Ans: Minerals are absorbed in the form of positively charged ions (cations) or negatively charged ions (anions).

Q.84. Explain the various methods of absorption of mineral ions by root cells.

Ans: The mineral ions are absorbed by the root cells through two methods viz:

i. Passive absorption:

Passive absorption of minerals is a physical process. In soil solution, mineral ions are present in higher concentration, they move from the soil into the root along the concentration gradient.

The movement of mineral ions from the soil into the root generally takes place by diffusion.

During passive absorption, there is no expenditure of metabolic energy.

ii. Active absorption:

Passive absorption of minerals by diffusion stops, when the equilibrium is established.

This absorption of minerals against the concentration gradient requires the expenditure of metabolic energy and is described as active absorption.

Ion accumulation inside the plant against the concentration gradient proves that the minerals are absorbed by the plants actively.

Q.85. 'Mineral absorption is mainly an active process'. Justify.

Ans: i. Active absorption is the absorption of minerals against the concentration gradient.
ii. This process requires the expenditure of metabolic energy.
iii. Higher rate of respiration increases salt accumulation inside the cell.
iv. Respiratory inhibitors. reduce the rate of mineral absorption.
v. If oxygen content in the medium is less, then the rate of mineral absorption decreases.
vi. This explains that mineral absorption is mainly an active process.

Q.86. Define biological nitrogen fixation.

Ans: Reduction of molecular nitrogen to ammonia by a living cell in the presence of enzyme nitrogenase is called biological nitrogen fixation.

Q.87. Name the free living and symbiotic N_2 fixing organisms.

Ans: Free living N_2 fixing bacteria: Clostridium, Azotobacter, etc
Symbiotic N_2 fixing bacteria: Rhizobia
Free living N_2 fixing cyanobacteria: Nostoc, Aulosira, etc
Symbiotic N_2 fixing cyariobacteria: Anabaena, Azollae

Q.88. Explain the role of Rhizobia in biological nitrogen fixation.

Ans: i. Rhizobia are free-living soil bacteria and can fix nitrogen only after infecting roots of leguminous plants and formation of nodules.
ii. Biological nitrogen,fixation takes place only in absence of .oxygen. Enzyme nitrogenase catalyze this process.
iii. Rhizobia are aerobic bacteria, and to carry out nitrogen fixation, it is necessary to maintain anaerobic condition.
iv. For this, Leghaemoglobin is synthesized by genes from leguminous plant and Rhizobia.
v. Leghaemoglobin acts .as oxygen carrier and it does not allow free oxygen to accumulate inside nodule. Thus, nitrogen fixation occurs inside the nodule.

Q.89. What is heterocyst?

Ans: Heterocyst is the site for nitrogen fixation, It contains the enzyme nitrogenase. Heterocysts are present in filaments of cyanobacteria and appear as thick walled, colourless and slightly enlarged cells.

Q.90. In which chemical forms is nitrogen available to plants and animals?

Ans: Nitrogen is available to plants and animals in forms such as ammonium (NH/), nitrate (N03-) or organic nitrogen, e.g. Urea $(NH_2)_2$ CO.

Q.91. Why we cannot use nitrogen present in air directly?

Ans: We cannot use nitrogen present in air directly because the strong triple bond between the N atoms in N_2 molecules makes it relatively inert.

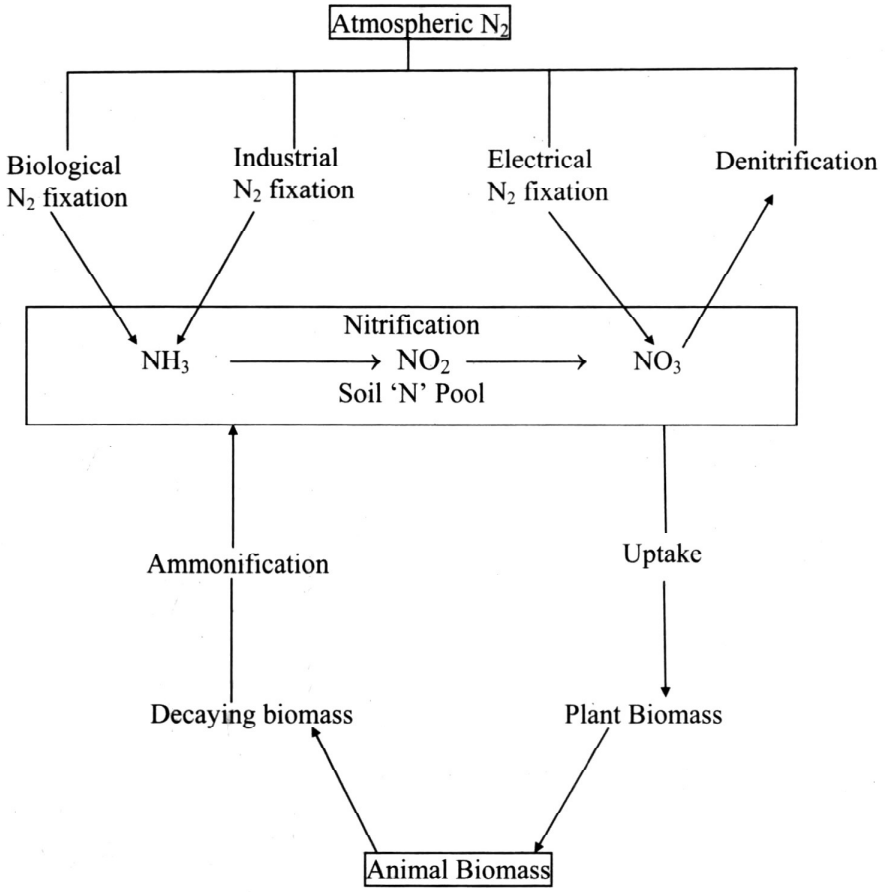
Q.92. Define nitrogen cycle.

Ans: The cyclic movement of nitrogen between the atmosphere, biosphere and geosphere in different forms is described as the nitrogen cycle.

Q.93. Give the five main processes that takes place during nitrogen cycle.

Ans: i. Nitrogen fixation
ii. Nitrogen uptake and formation of biomass.
iii. Ammonification
iv. Nitrification by nitrifying bacteria like Nitrosomonas; Nitrococcus,Nitrobacter.
v. Denitrification by Pseudomonas, Denitrificans.

Q.94. Give the diagrammatic representation of nitrogen cycle.
Ans:



Additional Theory Questions :

Q.1. Explain the role of imbibition and diffusion in absorption of water. Refer Q.5.

Q.2. What is endosmosis? Refer Q.12.(i)

Q.3. Explain active absorption of water. Refer Q.32.

Q4. Give an account of cohesion tension theory of Dixon. Refer Q.40,

Q.5. Describe transpiration pull model of water transport in plants. Refer Q.40.

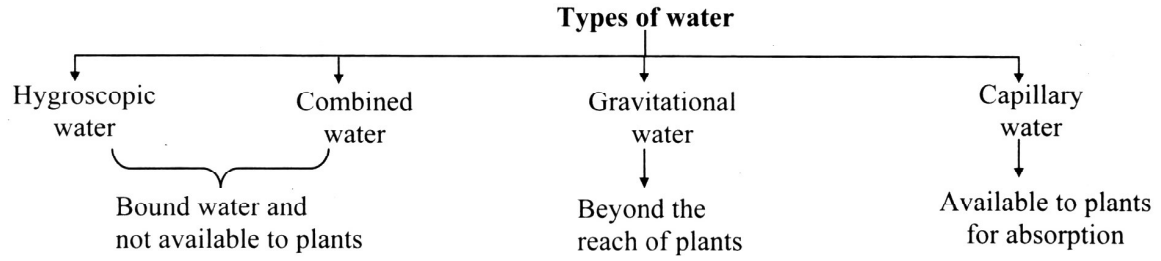
Q.6. Write a short note on transpiration pull. Refer Q.40.(iv)

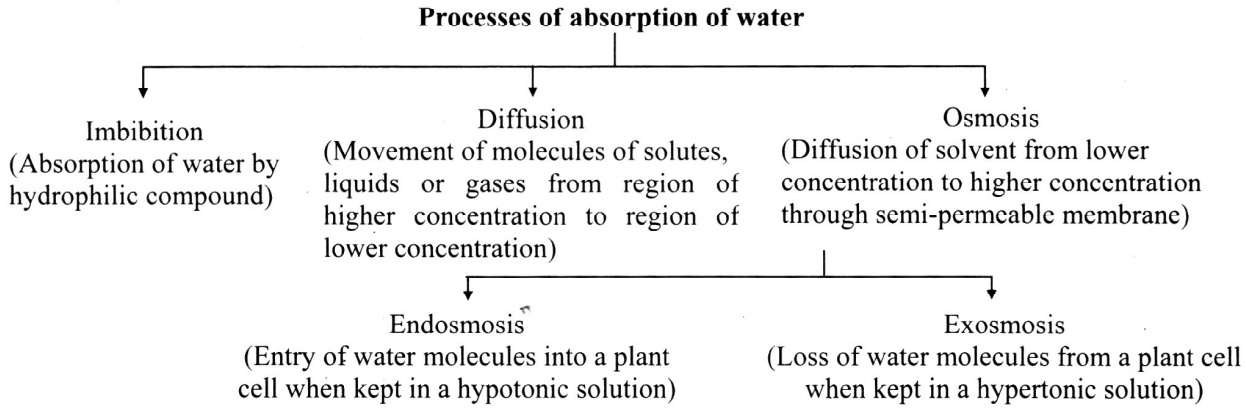
Q.7. Explain the role of any two macronutrients and any two micronutrients and their- deficiency symptoms. Refer Q. 74 and Q. 75.

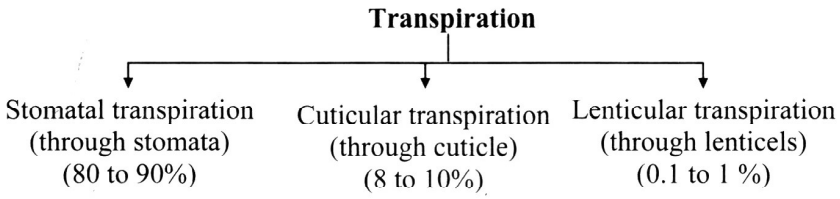
Q.8. Describe the role and deficiency symptoms of anyone macronutrient. Refer Q.74.

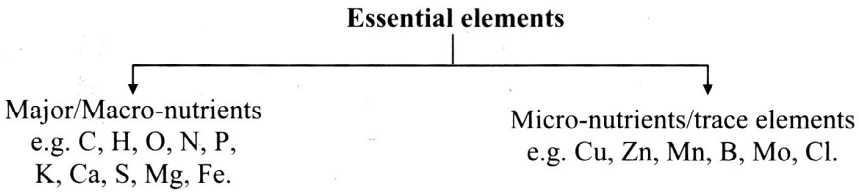
Q.9. Explain nitrogen cycle in brief. Refer Q.92, 93 and 94.

Quick Review :









- **Scientists and their discoveries :**

Sr No.	Scientists	Discoveries	Year
i.	Levitt	Put forward K^+ ion pump hypothesis for opening and closing of stomata.	1974
ii.	Curtis	Regarded transpiration as a necessary evil.	1926
iii.	Steward	Regarded transpiration as an unavoidable evil.	1959
iv.	Bergerstein	First to study guttation.	1887
v.	Schwendener	First to propose that stomatal movements are due to turgor changes in the guard cells.	1881
vi.	Stephen Hales	Coined the term root pressure.	–
vii.	Arnon and Stout	Proposed criteria for knowing the essentiality of an element.	1939
viii.	Dixon and Jolly	Put forward Cohesion Tension Theory (Transpiration pull theory).	1894
ix.	Munch	Put forward Mass flow hypothesis for translocation of organic nutrients through the phloem.	1927, 1930

Multipal Choice Question's

1. Which of the following is the major source of water for land plants?
   a) Gravitational water
   b) Hygroscopic water
   c) Capillary water
   d) Combined water
2. Which of the following is the first step in water absorption?
   a) Imbibition b) Active Absorption
   c) Passive absorption d) Osmosis
3. Wooden doors swell up and get stuck up during rainy season due to
   a) air b) exosmosis
   c) imbibition d) capillarity
4. The movement of molecules from a region of higher concentration to lower concentration is
   a) imbibition b) diffusion
   c) osmosis d) reverse osmOSIS
5. Transport of two types of molecules in the same direction is known as
   a) Symport b) Antiport
   c) Uniport d) Biport
6. Osmosis occurs through a membrane.
   a) permeable
   b) semipermeable
   c) impermeable
   d) differentially permeable
7. For osmosis which of the following is true?
   a) The solute moves from dilute to concentrated solution
   b) The solvent moves from dilute to concentrated solution
   c) Both dilute and concentrated solutions move in opposite direction
   d) Only concentrated solution moves to dilute solution
8. When a cell cannot absorb more water, the condition is called
   a) endosmosis b) plasmolysis
   c) turgidity d) exosmosis
9. Solution outside a cell has higher concentration than cell sap. Then, the solution is
   a) isotonic b) hypertonic
   c) hypotonic d) acidic
10. Plasmolysis occurs in plant cells when outer solution is
    a) isotonic b) hypertonic
    c) hypotonic d) mesotonic
11. Shrinkage of protoplasm is
    a) transpiration b) plasmolysis
    c) deplasmolysis d) diffusion
12. A potted plant has been supplied with water containing high quantity of common salt. As a result, the cells of the root will be found to be
    a) Plamolysed b) Deplasmolysed
    c) Turgid d) Swollen
13. A cell has OP of 10 bars and its TP is 6 bars, its DPD will be
    a) 16 bars b) – 4 bars
    c) 4 bars d) 12 bars
14. The water potential and osmotic potential of pure water are
    a) 100 and zero b) zero and zero
    c) 100 and 100 d) zero and 100
15. Entry of water into root hair cell from soil occurs because
    a) water potential of soil solution is more than root hair cell saril
    b) water potential of soil solution is less than root hair cell sap.
    c) water potential both outside and inside root hair is equal.
    d) water potential value in soil solution is negative.
16. The main constituent of cytoplasm is
    a) water b) carbohydrates
    c) proteins d) lipids
17. The main organ of water absorption is
    a) root b) stem
    c) leaf d) flower
18. The outer wall of root hair is made up of
    a) pectin b) cytokinin
    c) resin d) tannin
19. Root hair is derived from cell ____
    a) epidermal b) cortical
    c) endodermal d) pericycle
20. Root hair will absorb water when external solution is
    a) viscous b) isotonic
    c) hypertonic d) hypotonic
21. Absorption of water involving the activity of roots is called
    a) active absorption b) imbibition
    c) passive absorption d) diffusion
22. Uptake' of water at the expense of metabolic

energy is known as
a) endosmosis b) diffusion
c) active absorption d) passive absorption

23. Water in plants rises through
a) xylem b) phloem
c) pith d) cortex

24. Guttation takes place through special glands called
a) xylem b) chalk glands
c) hydathodes d) both b) and c)

25. Cohesive and adhesive forces cause
a) absolution of water .
b) continuity of water column
c) discontinuity of water column
d) plasmolysis

26. Cohesion theory of ascent of sap is based on
a) diameter of vessels
b) physical forces between water molecules
c) surface tension
d) pressure of water in roots.

27. Who first proposed the cohesion theory?
a) Dixon and Jolly b) Curtis
c) Bonner d) Gold Stone

28. Mutual attraction between H_2O molecules is called
a) cohesion b) adhesion
c) tension d) pressure

29. Lenticels are present on
a) herbaceous stems b) woody stems
c) leaves d) roots

30. "Transpiration Pull" is maximum when
a) stomata are open and atmosphere is dry
b) stomata are open and atmosphere is humid
c) stomata are open and soil is dry
d) stomata close due to high blowing winds

31. Maximum transpiration occurs through
a) stomata b) cuticle
c) lenticels d) bark

32. Stoma is surrounded by two modified epidermal parenchyma cells called
a) palisade b) lenticels
c) mesophyll cell d) guard cells

33. In monocot, guard cells are
a) kidney shaped b) dumb bell shaped
c) spherical shaped d) oval shaped

34. Guard cells are associated with
a) lenticels b) hydathodes
c) stomata d) epiblema

35. Opening and closing of stomata is due to the
a) hormonal change in guard cells
b) change in turgor pressure of guard cells
c) gaseous exchange
d) respiration

36. In fully opened stomata, guard cells are
a) plasmolysed b) shrunken
c) turgid d) flaccid

37. During night time, guard cells
a) swell
b) convert starch to sugar
c) become flaccid
d) increases turgor pressure

38. Importance of transpiration is
a) removal of excess water
b) occurrence of gaseous exchange
c) accelerate downward action of water
d) both a) and b)

39. Wilting in plants occurs due to increase in
a) photosynthesis b) photoperiodism
c) transpiration d) osmosis

40. Transpiration is 'unavoidable evil' is termed by
a) Curtis b) Steward
c) Boehm d) Stocking

41. The statement 'transpiration is a necessary evil' was made by
a) J. C. Bose b) Curtis
c) Levitt d) Wilmer

42. Movement of food material from leaves to other parts of the plant takes place through
a) xylem b) phloem
c) both a) and b) d) meristems

43. The elements which are required in large amount for the growth of plants are
a) macronutrients b) major elements
c) essential elements d) all of these

44. The minerals which are required in small amount for the growth of plants are called
a) micronutrients b) trace elements
c) minor elements d) all ofthese

45. The technique of growing plants in a nutrient solution is called
a) tissue culture b) propagation
c) hydroponics d) ascent of sap

46. Critical elements are
a) N, P, K b) Na, P and Ca
c) N, P, Mg d) Mn, Fe and Cu

47. Which of the following is a trace element?
a) Mg b) Nitrogen

c) Sulphur d) Mn

48. Which of the following is a macro nutrient?
a) Ca b) Mn
c) Zn d) Mo

49. Nitrogen is an important constituent of
a) carbohydrates b) lipids
c) proteins d) polyphosphates

50. The essential component of DNA and proteins is
a) Nitrogen b) Magnesium
c) Chlorine d) Oxygen

51. Purines and pyrimidines are
a) nitrogen bases b) phosphorus bases
c) iron bases d) calcium bases

52. Plants require sulphur for
a) protein synthesis
b) Co-enzyme A synthesis
c) biotin synthesis
d) all of these

53. Out of the following, which are essential for the synthesis of chlorophyll?
a) Mg b) Fe
c) K d) both a) and b)

54. Out of the following, which is the constituent of middle lamella?
a) Phosphorus b) Potassium
c) Calcium d) Nitrogen

55. Chlorosis results from the deficiency of
a) sodium b) boron
c) magnesium d) phosphorus

56. Zinc is essential for
a) synthesis of Auxin
b) stomatal opening
c) synthesis of chlorophyll
d) oxidation of carbohydrates

57. Biological nitrogen fixation is done by
a) Nostoc b) Anabaena
c) Rhizobia d) all of these

58. In cyanobacteria, is the site for nitrogen fixation.
a) heterocyst b) flagella
c) chloroplast d) cell wall

59. In nitrogen cycle, nitrification is done by
a) Nitrosomonas b) Nitrococcus
c) Nitrobacter d) all the above

60. Denitrification is done by
a) Rhizobia
b) Pseudomonas denitrificans
c) Azotobacter
d) Nos toe

Answer Keys

l. c)	2. a)	3. c)	4. b)	5. a)	6. b)	7. b)	8. c)	9. b)	10. b)
11. b)	12. a)	13. c)	14. b)	15. a)	16. a)	17. a)	18. a)	19. a)	20. d)
21. a)	22. c)	23. a)	24. d)	25. b)	26. b)	27. a)	28. a)	29. b)	30. a)
31. a)	32. d)	33. b)	34. c)	35. b)	36. c)	37. c)	38. d)	39. c)	40. b)
41. b)	42. b)	43. d)	44. d)	45. c)	46. a)	47. d)	48. a)	49. c)	50. a)
51. a)	52. d)	53. d)	54. c)	55. c)	56. a)	57. d)	58. a)	59. d)	60. b)