

Hydroponics :

- The absorption, distribution and metabolism of various mineral elements by plants is called **mineral nutrition**.

Importance :

- Important for physical activity of plants.
- Plants derive their inorganic nutrients from soil, water and atmosphere.
- Plants require various essential elements for their survival, growth, proper development and reproduction. These mineral elements occur mainly in their inorganic ionic forms in the soil. Plants absorb them from the soil through their root system.
- If the minerals are not available to plants, specific symptoms appear due to the deficiency of a particular element.

Methods of study :

- Methods to study the requirement of mineral in plants is as under :

Hydroponics :

- To understand the role of an individual mineral element and to understand the effects of its deficiency or absence, 'Hydroponic' method of growing plants is employed.
- The technique of growing plants only in a nutrient medium and in complete absence of soil is known as Hydroponics.
- Demonstrated By : A German Botanist Julius Von Sachs (1880)
- Hydroponics is soil less cultivation of plants. It is a method of growing plants using mineral nutrient solution instead of soil.
- Essential nutrients are introduced to the growth of plants artificially in a water medium.
- A large amount of such 'nutrient solution' is utilized.
- Essential mineral elements are dissolved in their determined amounts.
- Their concentrations and the pH of the medium are periodically checked and maintained at their proper levels.

Types of Hydroponics :

- There are two types of Hydroponic :

(a) Solution culture :

- In solution culture of hydroponics, just the nutrient solution of essential plant nutrients is used for raising plants.
- There are three types of solution culture.

(I) Static solution culture :

- This is a method of hydroponics, used for raising plants and seedlings in solution filled containers such as glass jars, buckets, tub and water tanks.

(II) Continuous flow solution culture :

- This is a method of hydroponics where continuous flow of nutrient filled solution is automated by using a nutrient film technique-NFT.

(III) Aeroponics :

- This is a method of hydroponics where plants or seedlings are raised in an environment saturated with fine drops (aerosol) of nutrient solution.

Advantages of Hydroponics

- Less use of plant nutrients
- Less use of water
- Less utilization of energy and space
- Elimination of soil-borne diseases
- Complete elimination of weeds
- Balanced plant nutrition

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- (1) Why is there a need to add oxygen gas continuously in Hydroponic method ?
(A) Because it is an essential mineral elements (B) Because it is an inessential mineral elements
(C) For the growth of roots of plants (D) For the growth and development
- (2) Which scientist coined the term 'essential mineral' ?
(A) Arnon and Stout (B) Khurana and Mathai (C) Schleiden and Schwan (D) Dixon and Jolly
- (3) Continuous flow solution culture : :: Aeroponics : use nutrient solution fine drops (aerosol)
(A) NET (B) NFT (C) NCT (D) NEFT
- (4) Hydroponic method means growing plants in
(A) Water (B) Soil
(C) Mineral nutrient solution (D) in the medium of Tissue culture
- (5) Characteristic of essential mineral elements
(A) in the ash of vegetation (B) Minerals are present in soil
(C) it is essential for growth and development (D) improves the growth of vegetation
- (6) Where are the elements, absorbed by the roots present in
(A) Xylem (B) Phloem (C) Sieve tubes (D) Cambium
- (7) Hydroponic plant growing method means
(A) growth of plant in water (B) growth as floating aquatic plants
(C) growth as an aquatic plants (D) growth of plant without soil
- (8) From the given options which of the following is not present as nutrition in plants ?
(A) Water (B) Minerals (C) CO₂ (D) N₂
- (9) Which minerals are mostly present in the dry mass of plants ...
(A) N, P, K (B) Ca, Mg, S (C) C, N, H (D) C, H, O
- (10) What is Hydroponic solvent ?
(A) Liquid (B) Water
(C) Soil culture (D) Saturated solution with contained minerals
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- (11) Which scientist observed Hydroponic method and in which year ?
 (A) Arnon and stout, 1939 (B) Julious wan sach, 1980
 (C) Arnon and stout, 1950 (D) Julious wan rech, 1939
- (12) What should be added continuously in Hydroponic method ?
 (A) O₂ (B) Minerals (C) pH (D) A, B, C
- (13) Full form of NFT ...
 (A) Nutrient Fine Technique (B) Nutrient Film Technology
 (C) Nutrient Film Technique (D) Nutrient Fine Technology
- (14) What is used in Medium culture ?
 (A) Water tank (B) NFT
 (C) agar agar (D) Fine drops of nutrient solution
- (15) Without what plants can not complete their life cycle ?
 (A) essential land (B) essential solution (C) essential minerals (D) essential gasses

Answers : (1-D), (2-A), (3-B), (4-C), (5-C), (6-A), (7-D), (8-C), (9-A), (10-D), (11-B), (12-A), (13-C), (14-C), (15-C)

Criteria for essentiality of elements :

- Botanist Arnon and Stout (1939) represented criteria for these.
- A plant must be unable to complete its life cycle in the absence of the mineral element.
- The function of the element must not be replaceable by another mineral element.
- The element must be directly involved in plant metabolism.
- The mineral nutrients are divided into two groups.

(A) Macronutrients : Source, importance and Deficiency Symptoms

- The concentration of macronutrients in the dry mass of plants is about 1 to 10 mg per 1 gram.
- **Primary Macronutrients** : Phosphorus (P), Nitrogen (N), Potassium (K)
- **Secondary Macronutrients** : Calcium (Ca), Magnesium (Mg), Sulphur (S)
- **Non mineral Macronutrients** : Carbon (C), Oxygen (O), Hydrogen (H)

(B) Micronutrients : Source, important and Deficiency symptoms

- The concentration of micronutrients is 0.1 mg or less than that micronutrients are also called - Trace elements.
- Micronutrients are those elements which are needed in very small (micro) quantities for plant growth.
- Example : Manganese (Mn), Nickel (Ni), Sodium (Na), Cobalt (Co), Silicon (Si), Vanadium (V), Boron (B), Copper (Cu), Iron (Fe), Chlorine (Cl), Molybdenum (Mo), Zinc (Zn).

Essential plant nutrients : their source, relative amounts, functions and classification :

Element	Chemical Symbol	Source	Absorbed Form	Major functions	Relative % in plant
Macronutrients					
Non mineral elements					
Carbon	(C)	Atmosphere	CO ₂	In all organic molecules	—
Oxygen	(O)	Atmosphere	O ₂	In most of organic molecules	—
Hydrogen	(H)	Soil	H ₂ O	In most of organic molecules	—
Nitrogen	(N)	Soil	NH ₄ ⁺ , NO ₂ ⁻ and NO ₃ ⁻	In protens, nucleic acids etc.	100
Mineral Nutrients					
Phosphorus	(P)	Soil	H ₂ PO ₄ ⁻	In nucleic acids, ATP, Phospholipids etc.	6
Potassium	(K)	Soil	K ⁺	Enzyme, activation, water balance, ion balance	25
Sulphur	(S)	Soil	SO ₄ ²⁻	In structure of coenzymes ionic balances	3
Calcium	(Ca)	Soil	Ca ²⁺	Affects the cytoskeleton, membranes and many enzymes, second messenger	12.5
Magnesium	(Mg)	Soil	Mg ²⁺	In structure of chlorophyll and many enzymes, stabilizes ribosomes	8
Micronutrients					
Iron	(Fe)	Soil	Fe ³⁺	In active site of many redox enzymes and electron carriers, In chlorophyll synthesis	0.2
Chlorine	(Cl)	Soil	Cl ⁻	In photosynthesis, ionbalance	0.3
Manganese	(Mn)	Soil	Mn ²⁺	Activation of many enzymes	0.1
Boron	(B)	Soil	H ₂ BO ₃ ⁻ , H ₂ BO ₃ ⁻²	Carbohydrate transport, Cell wall component	0.2
Zinc	(Zn)	Soil	Zn ²⁺	Enzyme activation, auxin synthesis	0.03
Copper	(Cu)	Soil	Cu ²⁺	In active site of many redox enzyme and electron carriers	0.01
Molybdenum	(Mo)	Soil	MoO ₄ ³⁻	Various process of nitrogen fixation	0.0001
Nickel	(Ni)	Soil	Ni ²⁺	Required for iron absorption	
Sodium	(Na)	Soil	Na ⁺	Involved in osmotic (water movement) and ionic balance in plants	
Cobalt	(Co)	Soil	CO ²⁺	Required for nitrogen fixation in xeguminous plants	
Silicon	(Si)	Soil	Si ⁴⁺	As a component of cell walls	
Vanadium	(V)	Soil	V ^{3+,4+,5+}	Necessary for the activation of nitrogenase in the nitrogen fixing bacteria	

- (16) Cause yellowing of leaves means
 (A) Tylosis (B) Nephrosis (C) Florosis (D) Chlorosis
- (17) Deficiency kills terminal buds leaving a rosette effect on the plant ...
 (A) Cobalt (B) Boron (C) Calcium (D) Phosphorous
- (18) Which of the following group is secondary nutrient ?
 (A) N, P, K (B) Ca, Mg, S (C) N, P, Ca (D) B, Cu, Fe, Cl
- (19) Which mineral is necessary in meristematic tissues and in differentiating tissues ?
 (A) P (B) K (C) Ca (D) S
- (20) Which mineral is essential for the activity of enzymes involved in photosynthesis and respiration ?
 (A) Mg (B) N (C) Cu (D) A and B both
- (21) Which substance (minerals) is necessary for process of $H_2O \rightarrow H^+$ and OH^- ?
 (A) Fe (B) Mn
 (C) Zn (D) None above
- (22) Which mineral is essential for synthesis of growth hormone ?
 (A) Fe (B) Mn (C) Zn (D) B
- (23) Which mineral is essential for thick brown spotted fruits ?
 (A) Cu (B) B (C) Ca (D) Mo
- (24) What is the quantity of magnesium present per gram in by mass of plant for the deficiency symptoms observe ?
 (A) 10 mg (B) 10^{-1} g (C) 1 g (D) 10^{-4} g
- (25) Due to deficiency of which mineral there is a reduction in fruit-size ?
 (A) Chlorine (B) Boron (C) Molybdenum (D) Sulphur
- (26) Which mineral is not absorbed by the plant in the form of soil solution ?
 (A) Mn (B) C (C) Zn (D) Cl
- (27) Which process is important for Zinc ?
 (A) activity of carboxylase type of enzymes (B) Translocation of sugars
 (C) Cell differentiating (D) maintenance of ribosomal constitution
- (28) Which mineral is necessary for the activity of carboxylase type of enzymes and synthesis of auxin ?
 (A) Manganese (B) Zinc (C) Boron (D) Molybdenum
- (29) Which mineral deficiency is removal of dominance of apical buds as a result lateral buds develop ?
 (A) Phosphorous (B) Sulphur (C) Copper (D) Potassium
- (30) Which mineral is present in constitution of vitamin Thiamine ?
 (A) Iron (B) Zinc (C) Manganese (D) Sulphur
- (31) Which mineral is required for absorption and utilization of calcium ?
 (A) Cu (B) S (C) B (D) Fe
- (32) Which of the following reaction occurs in presence of phosphorous ?
 (A) Cellular differentiation (B) Photosynthesis
 (C) Regulation of stomatal pore size (D) Phosphorylation
- (33) Which minerals is necessary for constitution and synthesis of nucleic acid ?
 (A) Magnesium, Phosphorous (B) Manganese, Phosphorous
 (C) Phosphorous, Magnesium (D) Manganese
- (34) Which mineral is responsible for bark of tree become rough and get split ?
 (A) Copper (B) Zinc (C) Manganese (D) Chlorine

- (35) Show the importance of iron element ?
 (A) induce photolysis of water during photosynthesis
 (B) in the constitution of cytochromes and ferredoxin
 (C) essential for germination of pollen grain (D) Synthesis of O_2
- (36) The transportation of minerals through Xylem happens with water.
 (A) Transpiration (B) Evaporation (C) Guttation (D) Ascent of sap
- (37) Which of the following is important of sulphur ?
 (A) for cambial activity (B) for synthesis of O_2
 (C) for constitution of Vitamin B_1 (D) for subcellular skeleton
- (38) Which mineral deficiency is responsible for the red and purple spot on leaves ?
 (A) Phosphorous, Magnesium (B) Phosphorous, Manganese
 (C) Sulphur, Magnesium (D) Sulphur, Manganese
- (39) In which form the Molybdenum is absorbed ?
 (A) MoO_3^{-3} (B) MoO_3^{-4} (C) MoO_4^{-3} (D) MoO_4^{-4}
- (40) In which form the Boron is absorbed from the soil ?
 (A) $H_2B_2O_3^-$ (B) $H_2BO_3^+$ (C) $H_2BO_3^{-2}$ (D) HBO_3^{-2}
- (41) Which of the following substituent mineral is present in constitution and element of cell wall ?
 (A) Boron, Silicon (B) Silicon, Boron (C) Calcium, Boron (D) Silicon, Calcium
- (42) Which mineral deficiency is responsible for shortening of internodes and reduction in cambial activity ?
 (A) N (B) Cu (C) K (D) Fe
- (43) Which group is the micronutrients ?
 (A) B, Cu, Fe, Cl, Mn (B) B, Cu, S, Ca, Mn (C) Mn, Cu, Ca, Zn (D) Zn, Cu, B, N, P
- (44) Function of potassium
 (A) Photosynthesis
 (B) increase enzyme activity which helps function of vegetation (plants)
 (C) impart red pigment in fruits
 (D) produce cambium in vascular bundle
- (45) Essential characteristic of macronutrients ?
 (A) made during photosynthesis (B) used by growth regulators
 (C) absorbed from the soil (D) produced by enzyme
- (46) Macronutrient which is essential for synthesis of organic substance but not obtain from soil.
 (A) Nitrogen (B) Phosphorus (C) Manganese (D) Carbon
- (47) What should be added for premature yellowness of leaves ?
 (A) Fe and Mg
 (B) give water to crop
 (C) Cytokinin and little Nitrogen base fertilizer
 (D) Spray 2, 4, 5 - T = (2, 4, 5 - Trichlorophenoxy acetic acid) on green leaves
- (48) Between whom the continuous ion exchange take place ?
 (A) Root and between the soil particles (B) Root and soil solution
 (C) Cell and Cortex (D) Given all

- (49) Less quantity of micronutrient is important because
 (A) it is poisonous for vegetation
 (B) it is removed by root in plant
 (C) physiologist could not find it in plant
 (D) it absorb less as directed
- (50) In which form the inorganic elements are seen in plants ?
 (A) make very dilute solution (B) concentrated solution
 (C) very high concentrated solution (D) make dilute solution
- (51) What is Trace elements ?
 (A) Isotops by Gayger counting method
 (B) it is needed in very less quantity
 (C) elements which are not present in protoplasm
 (D) which is found first in protoplasm
- (52) Identify the common defficiency effect of P, K, Ca and Mg in plant ?
 (A) proportion of anthocyanine (B) feel curve of leaf tip
 (C) week development of vascularbundle (D) few dead zone of sight zone
- (53) Which elements is present in the middle lamella of plant cell ?
 (A) Mg (B) Ca (C) K (D) Fe
- (54) Which mineral defficiency is responsible for death of stem tip and root tip ?
 (A) Calcium (B) Nitrogen (C) Carbon (D) Phosphorous
- (55) What is seen in plant tissue by the defficiency of Mg ?
 (A) Hydrolysis (B) Nephrosis (C) Chlorosis (D) Stuntation
- (56) Which mineral is present in the constitution of chlorophyll ?
 (A) Mg (B) K (C) Mn (D) Fe
- (57) Which mineral is removed during the combustion of chlorophyll ?
 (A) Na (B) Mg (C) Mn (D) Fe
- (58) What will happen by the iron defficiency ?
 (A) Decrease protein synthesis
 (B) Intervein of young leaf first feel chlorosis
 (C) Indicates stemtip curve
 (D) Process of less leaf and stunt growth
- (59) Which two metallic element is needed for the synthesis of chlorophyll ?
 (A) Fe and Mg (B) Cu and Ca
 (C) Cu and K (D) Mg and Ca
- (60) Which independant mineral is necessary for energy in metabolic reaction ?
 (A) P (B) S (C) Ca (D) Na
- (61) From the given mineral below which is not the constituent of any enzyme but is necessary for the activeness of enzyme ?
 (A) Zn (B) Mg (C) K (D) Mn

- (62) Main function of potassium
 (A) it controls many reaction of plant
 (B) useful to produce the red pigment in fruit
 (C) it helps in photosynthesis
 (D) it activates enzyme and therefore plant indicate reaction
- (63) Which of the following trace element is useful in plant growth and its radio isotopes which useful in the treatment of cancer ?
 (A) Cobalt (B) Calcium (C) Sodium (D) Iron
- (64) What happens by the defficiency of Molybdenum ?
 (A) it causes leaftip curve. (B) chlorosis in leaves
 (C) drying and wilting of leaves (D) weak development of vascular tissue system
- (65) Which of the following mineral is responsible for translocation of sugar in plant ?
 (A) Boron (B) Molybdenum (C) Manganese (D) Iron
- (66) Which micro nutrient is absorbed by foliaceous stipule ?
 (A) Zinc (B) Iron (C) Phosphorous (D) None above
- (67) Which mineral is usefull for synthesis of IAA ?
 (A) Iron (B) Zinc (C) Calcium (D) Nitrogen
- (68) Which mineral defficiency causes grayish spot on malt ?
 (A) Cu (B) Zn (C) Mn (D) Fe
- (69) How many minerals are necessary for healthy growth and development of plant ?
 (A) 20 (B) 10 (C) 26 (D) 50
- (70) Which mineral is present in sea weed ?
 (A) Iodine (B) Iron (C) Chlorine (D) Boron
- (71) Which mineral is responsible for death of apical bud and poor growth of plant ?
 (A) Mg (B) Mo (C) Zn (D) B
- (72) For which process the Manganese is useful in plants ?
 (A) Photolysis in Photosynthesis (B) Synthesis of chlorophyl
 (C) Synthesis of Nucleolus (D) Production of plant cell wall

Answers : (16-D), (17-B), (18-B), (19-C), (20-A), (21-B), (22-C), (23-B), (24-D), (25-B), (26-B), (27-A), (28-B), (29-D), (30-D), (31-C), (32-D), (33-C), (34-A), (35-B), (36-D), (37-C), (38-A), (39-C), (40-C), (41-C), (42-C), (43-A), (44-B), (45-C), (46-D), (47-A), (48-A), (49-A), (50-A), (51-B), (52-D), (53-B), (54-A), (55-C), (56-A), (57-B), (58-B), (59-A), (60-A), (61-C), (62-D), (63-A), (64-C), (65-A), (66-B), (67-B), (68-C), (69-A), (70-A), (71-D), (72-A)

Absorption of Mineral Nutrients :

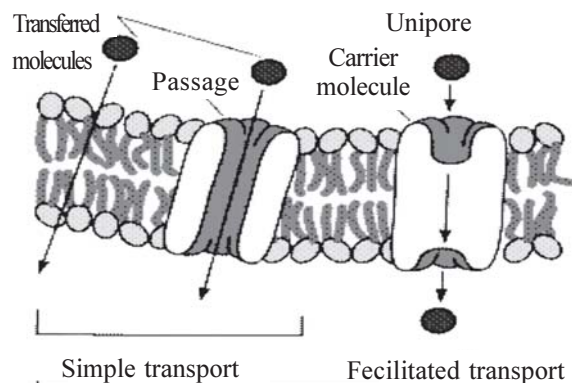
- The process of absorption of mineral nutrients from the soil.
- The nutrients enter the cell walls of root on the outer side of plasma membrane and they also move into the intercellular spaces.
- This process is relatively more rapid and no energy (ATP) is expended in it.
- Then from this extra cellular region, the mineral nutrients enter the cellular region. The cellular region means within the plasma membrane and the region within the vacuole. Plant absorb a large number of minerals from soil.

(A) Simple Absorption : (Passive Absorption)

- Absorption is the initial and rapid phase.
- This type of absorption does not require use of energy (ATP).
- Absorption occurs according to normal physical principles.

(I) Diffusion :

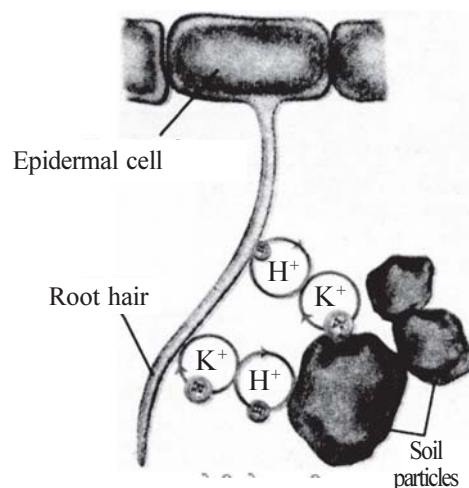
- A substance moves from where it is in a higher concentration to where it is in a lower concentration.
- Thus, ions are absorbed following their concentration gradient.
- For ionic absorption various 'ionic-channels' are located in the plasma membrane.
- Special kinds of proteins which extend along the thickness of the plasma membrane provide pores which act as such 'ion-channels'.



Passive transport

(II) Ion Exchange :

- Both, anions and cations are located on the surface of the cell wall through their absorption.
- The soil solution also contains ions. An ion exchange occurs between them.
- Such an ionic-exchange occurs even against their concentration - gradient.



Ion Exchange

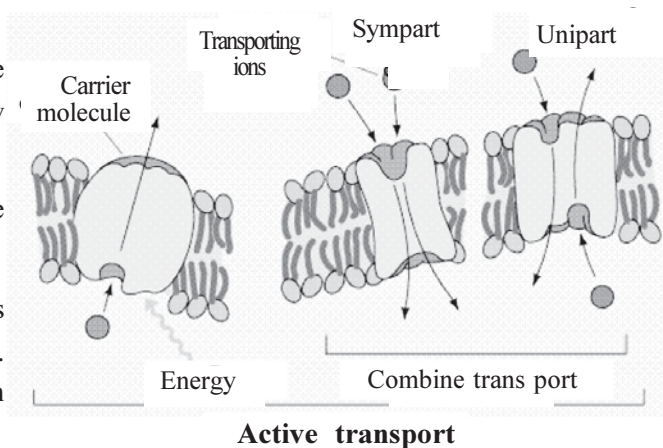
(III) Donnan Equilibrium :

$$[Co^+] [Ao^-] = [Ci^+] [Ai^-] \text{ जहाँ, } Co^+ = \text{Outer cations}$$
$$Ao^- = \text{Outer anions}$$
$$Ci^+ = \text{Inner cations}$$
$$Ai^- = \text{Inner anions}$$

- Certain ions are incapable of diffusion against their concentration-gradient.
- The accumulation of such stable and non diffusible ions is explained through this principle.
- It occurs against concentration-gradient.
- Plasma membrane possesses selective permeability it permits exchange of some ions and does not permit that of some others.
- As a result, there occurs an increase in the concentration of positive ions on the inner surface of plasma membrane.
- Due to this the negatively charged ions in the soil solution, become accumulated on the outer surface of Plasma membrane.

(B) Active Absorption :

- This type of absorption needs the expenditure of metabolic energy from the cell in the form of ATP.
- The ions are taken in slowly into the 'inner space'.
- Such absorption of ions occurs against their concentration ingradient. Energy is consumed in it. Based on a variety of evidences.



- It seems that specials 'carrier molecules' are involved in this process.
- This carrier molecules are special kind of proteins.
- They combine with ions on the outer side of plasma membrane and form 'ion-carrier complex'.
- This complex migrates across the membrane towards the inside, where the complex releases the ion.

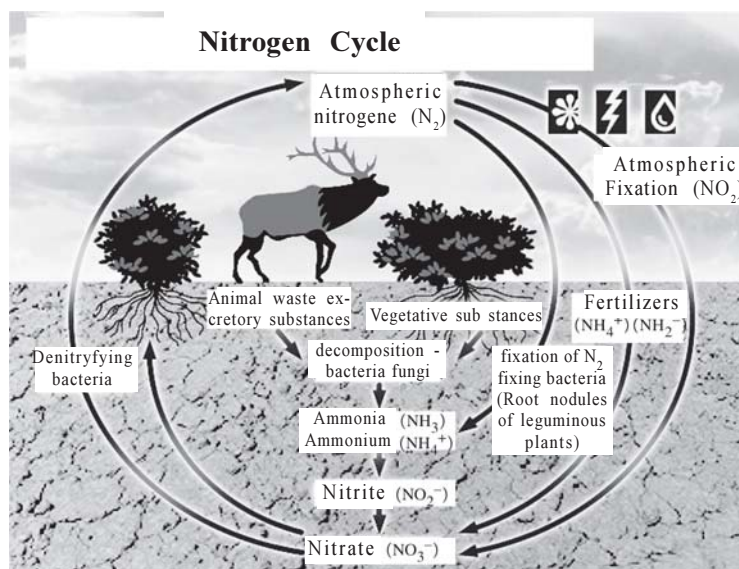
- (73) Following which way is correct for absorption and transportation or minerals ?
- (A) Epiblema → Cortex → Endodermis → Pericycle → Protoxylem → Metaxylem
(B) Epiblema → Endodermis → Cortex → Pericycle → Metaxylem
(C) Epiblema → Cortex → Pericycle → Endodermis → Protoxylem → Metaxylem
(D) Epiblema → Cortex → Endodermis → Pericycle → Metaxylem → Protoxylem
- (74) Ionchannels are seen in which types of transportation ?
- (A) Diffusion (B) Ion exchange
(C) Donnan equilibrium (D) Principle of mass flow
- (75) By which principle the accumulation of such stable and non diffusible ions can be explained ?
- (A) Diffusion (B) Ion exchange
(C) Donnan equilibrium (D) Principle of mass flow
- (76) If inner surface of plasmamembrane becomes negatively, charged which element is absorbed by the soil solution ?
- (A) Cl^- (B) H_2PO_4^- (C) MoO_4^- (D) K^+
- (77) Donnan equilibrium happens on which surface ?
- (A) Cell wall (B) Nuclear membrane (C) Plasma membrane (D) Tonoplast
- (78) Simple absorption of elements happens by which process ?
- (A) Diffusion (B) Mass flow (C) Donnan equilibrium (D) All above
- (79) Ion channels are made up of which element ?
- (A) Carbohydrate (B) Lipid (C) Protein (D) Nucleic acid
- (80) What is the true equation of Donnan equilibrium ?
- (A) $[\text{Ci}^+][\text{Ai}^-] = [\text{Co}^+][\text{Ao}^-]$ (B) $[\text{Ci}^+][\text{Ai}^+] = [\text{Co}^+][\text{Ao}^+]$
(C) $[\text{Ci}^+][\text{Ai}^-] = [\text{Co}^-][\text{Ao}^-]$ (D) $[\text{Co}^+][\text{Ci}^-] = [\text{Ao}^+][\text{Ai}^-]$

- (81) More suction pressure as
 (A) Less water absorption and more ion absorption (B) More water absorption and less ion absorption
 (C) More water absorption and more ion absorption (D) More water absorption and no absorption of ion
- (82) Write the correct sentence for ion exchange.
 (A) Both the ions are located on the surface of cell wall through their absorption.
 (B) Absorption of ion happens towards their concentration gradient
 (C) Ions are absorbed along with the absorption of water in large amount.
 (D) This type of absorption needs the expenditure of metabolic energy.
- (83) Through which minerals absorb by the root transport to the leaves ?
 (A) Xylem (B) Phloem (C) Sieve tube (D) Companion cell
- (84) Transportation of minerals in plant root by diffusion is called ...
 (A) Exosmosis (B) Osmosis (C) Active absorption (D) Passive absorption
- (85) What is indicated in plant ash ?
 (A) Minerals which of absorbed by plants.
 (B) It shows the organic compounds of the plants.
 (C) It shows the organic and inorganic compounds of the plants.
 (D) None above.
- (87) How does the passive absorption of minerals takes place ?
 (A) Diffusion and ionexchange (B) Osmosis
 (C) Transpiration (D) From the following

Answers : (73-A), (74-A), (75-C), (76-D), (77-C), (78-D), (79-C), (80-A), (81-C), (82-A), (83-A), (84-D), (85-C), (87-A),

Nitrogen Metabolism :

- C, H, O and N are amongst the most important essential elements.
- In living organisms except C, H, and O, N occurs in the largest amount.
- It occurs in the constitution of important protoplasmic substances like amino acids, proteins, nucleotides, vitamins and hormones.
- We also know that the atmosphere contains large amount of N_2 and that it cannot be directly utilized by any organism.
- Plants absorb salts of nitrogen like NH_4^+ , NO_2^- and NO_3^- from the soil and incorporate them into their organic constituents.
- Animals obtain these constituents when they consume these plants as food.
- When plants and animals die, their dead bodies are decomposed.
- During such decomposition which is caused by bacteria, NH_3 is released.
- This process is called ammonification.
- This NH_3 is immediately converted to NO_2^- and NO_3^- by a process called – nitrification.
- Specific bacteria are responsible for this. This salts can be absorbed by plants.
- Some bacteria release N_2 into atmosphere by decomposing nitrates.



The Nitrogen Cycle

Nitrogen Cycle :

- Nitrogen cycle is an example of gaseous type of biogeochemical cycle.
- Nitrogen is an essential element of protoplasm, proteins and genetically important nucleic acids such as DNA.
- It is also a major constituent (about 78 %) of the atmosphere.
- Most green plants need nitrogen in the form of nitrate ions (NO_3^-) and ammonium ions (NH_4^+).
- Special N_2 -fixing bacteria (Rhizobium) present in the roots of leguminous plants and certain blue green algae (Nostoc and Anabaena) are capable of fixing nitrogen and converting the same into nitrates (NO_3^-).
- Lightening also converts gaseous N_2 into nitrates.
- But the denitrifying bacteria in the soil are transfer the nitrates into gaseous nitrogen and release the same to the atmosphere.
- The processes involved in the cycle are fixation, ammonification, nitrification and denitrification.

Ammonification :

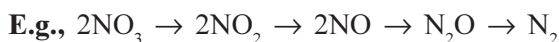
- Ammonification is the transforming process of complex organic matters into the inorganic matters.
- Dead animals and plant tissues and excretion matters give rise to nitrogenous wastes (complex organic matter).
- This nitrogenous wastes are converted into ammonia (NH_3) by heterotrophic bacteria, fungi and other decomposers in soil and water.
- Part of the ammonia is dissolved in water or taken up by plants. It is one way reaction.

Nitrification :

- Nitrification is a biological process in which ammonia (NH_3) is converted into nitrite (NO_2^-) and nitrate (NO_3^-).
- NH_3 is converted into NO_2^- by Nitrosomonas bacteria.
- NO_2^- is converted into NO_3^- by Nitrobacter.
- Thus, nitrification is a oxidation process in which nitrogen is increased.
- The NO_3^- which is thus formed is once again utilized by green plants for the synthesis of proteins.
- Gaseous N_2 is converted into NO_3^- by lightning N_2 - Fixing bacteria and blue green algae.
- Thus the N_2 cycle goes on continuously in nature again and again.

Denitrification :

- Some bacteria are capable of reducing nitrates to gaseous a process called denitrification.
- NO_3 is reconverted into gaseous N_2 by denitrifying bacteria. Agrobacterium and Pseudomonas.

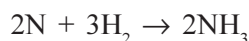


Nitrogen Fixation Process :

- Nitrogen fixation is the conversion process of atmosphere nitrogen to ammonia or nitrate.
- Ammonia is the product of biological fixation.
- In biological fixation molecular nitrogen (N_2) splits into two atoms of free nitrogen.



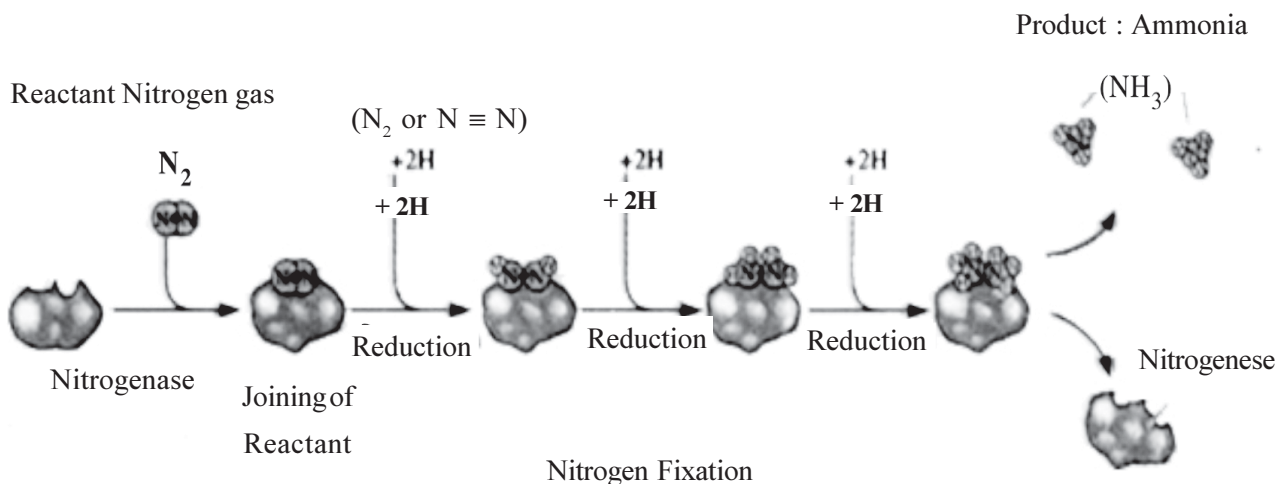
- The free nitrogen atoms can combine with hydrogen to form ammonia.



- This process is mainly carried out by living organisms. i.e. specific bacteria (symbiotic bacteria-Rhizobium), blue green algae (Nostoc and Anabena), Free-living soil bacteria (the aerobic Azotobacter species and the anaerobic clostridium species).

Important Components :

- Leghemoglobin = Red pigment haemeprotein.
- nif gene = nitrogen fixation gene.
- nif gene is responsible for synthesis of nitrogenase enzyme.
- This enzyme is extremely sensitive to the presence of oxygen.
- Leghemoglobin accepts oxygen and thus protects the enzyme from its side effects.
- This process of Biological fixation possess low energy requirement regulated by two enzymes which are nitrogenase (an iron containing protein) and hydrogenase (molybdenum containing protein).

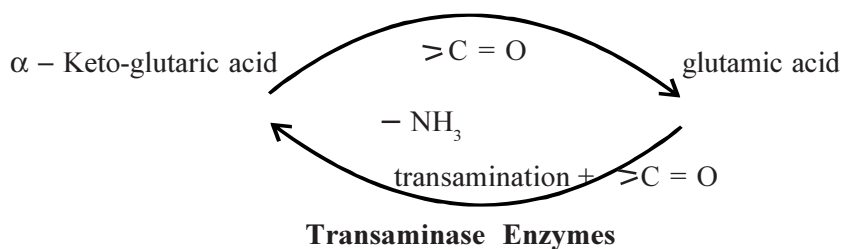


Protein synthesis :

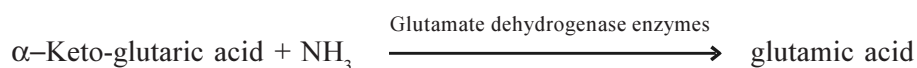
- NH_3 is initially utilized in the synthesis of amino acids.
- In the structure of an amino acid, there always occurs at least one ($-\text{NH}_2$) amino group and one (COOH) carboxyl group.
- There are two main methods of amino acid synthesis in plants.

Glutamate Dehydrogenase Enzymes

+ NH_3 [Reductive amination]



(A) Reductive Amination :



(B) Transamination :

- In this method, an amino group is separated from one amino acid and it is transferred to a keto group in another keto kind of acid.
- Glutamic acid acts as a main donor of amino group.
- Other 17 kinds of amino acids are synthesized in this way.
- The enzyme responsible for this are of transaminase types.

Synthesis of Proteins :

- Various kinds of amino acid units become joined with one another in various numbers and various sequences to form polypeptide chains through peptide bonds.
- There can be one or more polypeptide chains in the constitution of proteins.

(88) Which of the process take part in nitrogen cycle ?

- (A) Ammonification, Denitrification, Nitrification
- (B) Ammonification, Nitrification, Decarboxylation
- (C) Nitrification, Denitrification, Decarboxylation
- (D) Ammonification, Nitrification, Denitrification

(89) Which bacteria converts ammonia in to nitrate ion ?

- (A) Nitrobacter (B) Nitrosomonas (C) Pseudomonas (D) Agrobacterium
-

- (90) Which type of reaction is denitrification ?
 (A) Reduction (B) Oxidation (C) Carboxylation (D) Decarboxylation
- (91) $2\text{NO}_3 \rightarrow 2\text{NO}_2 \rightarrow 2\text{NO} \rightarrow \text{N}_2\text{O} \rightarrow \text{N}$ it shows which process ?
 (A) Nitrification (B) denitrification (C) Ammonification (D) Deammonification
- (92) Which of the following is nitrogen fixing anaerobic free living bacteria ?
 (A) Azotobacter (B) Clostridium (C) Both A and B (D) Rhizobium
- (93) Relation between Leguminous plant and Rhizobium bacteria ?
 (A) +, - (B) -, - (C) +, + (D) +, 0
- (94) Which protein contain molybdenum ?
 (A) Hydrolysis (B) Nitrogenase
 (C) Hydrogenase (D) None above
- (95) α Ketoglutaric acid + ammonia $\rightarrow$ glutamic acid which enzyme responsible for this process ?
 (A) Glutamate dehydrogenase (B) Transaminase (C) Glutamate dehydrogenase (D) Transfarase
- (96) Select a non similar option.
 (A) Rhizobium (B) Azotobacter (C) Clostridium (D) Cynobacteria
- (97) When animals and plants dies during such decomposition NH_3 is released this process is called ...
 (A) Ammonification (B) Nitrification (C) Biological nitrogen fixation (D) Transaminase
- (98) Which enzyme is essential for reductive amination ?
 (A) Glutamate dehydrogenase (B) Transaminase
 (C) Nitrogenase (D) Leg haemoglobin
- (99) From the following number which is correct for N_2 reformation ?
 (A) $2\text{NO}_3 - 2\text{NO}_2 - 2\text{NO} - \text{N}_2\text{O} - \text{N}_2$ (B) $2\text{NO}_3 - 2\text{NO}_2 - \text{N}_2\text{O} - 2\text{NO} - \text{N}_2$
 (C) $2\text{NO}_2 - 2\text{NO}_3 - 2\text{NO} - \text{N}_2\text{O} - \text{N}_2$ (D) $2\text{NO}_2 - 2\text{NO} - 2\text{NO}_3 - \text{N}_2\text{O} - \text{N}_2$
- (100) In which process glutamic acids behave as a main donor ?
 (A) Reductive amination (B) Trans amination (C) Nitrification (D) Amonification
- (101) Which is the similarity for reductive amination ?
 (A) $2\text{NH}_3 + \alpha\text{-Succinic acid} \rightarrow \text{diglutamic acid}$ (B) $2\text{NH}_3 + \alpha\text{-Keto glutarate} \rightarrow \text{glutamic acid}$
 (C) $2\text{N} + 3\text{H}_2 \rightarrow 2\text{NH}_3$ (D) $2\text{NH}_3 \rightarrow 2\text{N} + 3\text{H}_2$
- (102) Nitrogen absorption takes place in plant by which form ?
 (A) Nitrate (B) Nitrite (C) Ammonium (D) Phosphate
- (103) Nonsymbiotic nitrogen fixing bacteria
 (A) Rhizobium (B) Nostoc (C) Frenchea (D) Azotobacter

- (104) In which type of soil carnivorous plants live ?
 (A) In wet soil
 (B) Sugar deficient soil
 (C) The soil which is rich in micro element
 (D) Nitrogen compound deficient soil
- (105) Which element is important for nitrogen fixation ?
 (A) FAD (B) Nitrogenase (C) ATP (D) All above
- (106) What is ammonification ?
 (A) The formation of NH_3 after decomposition of dead body
 (B) The formation of NH_2 after decomposition of dead body
 (C) The process of formation of NO_2 from ammonia
 (D) The process of formation of NH_3 from N_2
- (107) Which compound of N_2 is obtained on a large scale from soil ?
 (A) Nitric acid (B) Nitrite (C) Nitrate (D) Gaseous form of N_2
- (108) $\text{N}_2 + 8e^- + 8\text{H}^+ + 16\text{ATP} \rightarrow 2\text{NH}_4 + \text{H}_2 + 16\text{ADP} + 16\text{Pi}$ which reaction indicate the following equation ?
 (A) Ammonification (B) Nitrification (C) Nitrogen fixation (D) Denitrification
- (109) What is necessary for fixation of N_2 ?
 (A) Wet soil (B) Leghemoglobin (C) Keratinoids (D) Chlorophyll

Answers : (88-D), (89-B), (90-A), (91-B), (92-B), (93-C), (94-C), (95-A), (96-C), (97-A), (98-A), (99-A), (100-B), (101-B), (102-A), (103-D), (104-C), (105-D), (106-D), (107-B), (108-A), (109-B)

A - Assertion, R - Reason :

Choose correct option among the given options for answer.

- (A) A and R both are correct, R is correct explanation of A.
 (B) A and R both are correct, R is not correct explanation of A.
 (C) A - correct, R - incorrect.
 (D) A - incorrect, R - correct.
- (110) Assertion A : In aeroponic plants are cultured by the fine drop of nutrient solution.
 Reason R : In static solution culture film technique is used.
 (A) (B) (C) (D)
- (111) Assertion A : Potassium is essential for regulation of stomatal pore size.
 Reason R : Yellowing of leaves is due to the potassium deficiency.
 (A) (B) (C) (D)
- (112) Assertion A : Bark of tree becomes rough and gets split and exudes gum – like secretion.
 Reason R : Mass of copper is less in plants.
 (A) (B) (C) (D)

- (113) Assertion A : Protoplasm is a permeable membrane.
Reason R : Protoplasm is made up of lipid and protein.
(A) (B) (C) (D)
- (114) Assertion A : Nostoc and Anabaena are capable to convert Nitrogen to nitrate.
Reason R : In the cell of nostoc and Anabaena nucleous is non develop.
(A) (B) (C) (D)
- (115) Assertion A : N, P, K fertilizer is necessary for the growth of plants.
Reason R : N, P, K fertilizer are usually not enough in the soil.
(A) (B) (C) (D)
- (116) Assertion A : They involved in cation exchange.
Reason R : Soil acts as nutrients reservoir.
(A) (B) (C) (D)
- (117) Assertion A : Rhizobium bacteria live as a symbiotic relationship in root nodules.
Reason R : A NiF-gene present in Rhizobium is responsible for synthesis of nitrogenase enzyme.
(A) (B) (C) (D)
- (118) Assertion A : The concentration of macro nutrients in the dry mass of plants is about 1 to 5 mg per gram.
Reason R : The concentration of micro nutrients in the dry mass of plants is about 0.1 mg or less than that.
(A) (B) (C) (D)
- (119) Assertion A : Nitrogen fixation aerobic bacteria – Azotobacter
Reason R : Nitrogen fixation anaerobic bacteria – Clostridium
(A) (B) (C) (D)
- (120) Assertion A : Calcium is necessary for cell differentiation
Reason R : Calcium helps for creation of bipolar spindle.
(A) (B) (C) (D)
- (121) Assertion A : Ions are transported in massflow with water from root.
Reason R : Metabolic energy is necessary for transportaion of ion from root.
(A) (B) (C) (D)
- (122) Assertion A : Carrier molecules are present as a carrier in plasmamembrane.
Reason R : Carrier molecules are carbonic molecules.
(A) (B) (C) (D)
- (123) Assertion A : The transportation of minerals towards soil is depended on the pH and the quantity of water.
Reason R : The transportation of minerals through root in the form of ion is responsible pH and high water pressure.
(A) (B) (C) (D)

- (124) Assertion A : In epiphytes root system are non developing.
Reason R : In epiphytes maximum water absorbtion take place by the root surface.
(A) (B) (C) (D)
- (125) Assertion A : Mineral absorbed by the root dissolve in water and transported in various part of plant through xylem.
Reason R : Phloem transported the inorganic and organic elements.
(A) (B) (C) (D)
- (126) Assertion A : In crystalline solution all molecules are in the form of crystal and they transport individually from each other.
Reason R : In true solution the size of molecules are too small which helps to remain as a floating partical in the liquid.
(A) (B) (C) (D)
- (127) Assertion A : For plants Fe^{+2} and Fe^{+3} ions are essential.
Reason R : Defficiency of Fe is very common in soil.
(A) (B) (C) (D)
- (128) Assertion A : Fe and Cu are main electron transport minerals.
Reason R : Volancy are variable in Fe and Cu.
(A) (B) (C) (D)

Answers : (110-C), (111-B), (112-A), (113-C), (114-B), (115-A), (116-B), (117-B), (118-D), (119-B), (120-B), (121-B), (122-B), (123-A), (124-A), (125-B), (126-B), (127-C), (128-B)

- (129) Name of elements, their importance and their defficient effect are given column I, II and III which one is the correct pair identify :

Column – I	Column – II	Column – III
(P) Potassium	(I) Constitution of co-enzyme	(a) Stemtip become dead
(Q) Calcium	(II) Tugidity of Cell	(b) Less green leaves
(R) Sulphur	(III) In middle lamella	(c) Increase respiration rate
(A) P - II a, Q - I - c, R - II - b		(B) P - II c, Q - III - a, R - I - b
(C) P - I c, Q - II - a, R - III - b		(D) P - II a, Q - III - b, R - I - c

- (130) Method and its concerned option are given column-I and II, which one is the correct pair identify ?

Column – I	Column – II	
(P) diffusion	(i) carrier molecules	(A) P - ii, Q - iii, R - i
(Q) mass flow	(ii) ionic channels	(B) P - iii, Q - i, R - ii
(R) active absorbtion	(iii) absorbtion pressure	(C) P - i, Q - ii R - iii
		(D) P - ii Q - i, R - iii

(131) Name of enzymes and their functions are given column-I and II which one is correct pair identify :

Column – I	Column – II	
(P) Glutamate dehydrogenase	(i) Regulation of nitrogen fixation	(A) P - i, Q - ii, R - iii
(Q) Hydrogenase	(ii) amino group is separated from amino acid	(B) P - ii, Q - iii, R - i
(R) Transaminase	(iii) Synthesis of glutamic acid	(C) P - iii, Q - i, R - ii
		(D) P - i, Q - iii, R - ii

(132) Match the column in proper sequence :

Column – I	Column – II	
(1) deficiency of nitrogen	(P) stunted growth of root	(A) 1 – R, 2 – P, 3 – S, 4 – Q
(2) deficiency of potassium	(Q) induction of dormancy in seeds	(B) 1 – R, 2 – Q, 3 – S, 4 – P
(3) deficiency of phosphorous	(R) reduction in cambial activity	(C) 1 – S, 2 – R, 3 – Q, 4 – P
(4) deficiency of calcium	(S) Chlorosis	(D) 1 – R, 2 – S, 3 – Q, 4 – P

(133) In the column given below number the proper sequence of deficiency effect of minerals :

Column – I	Column – II	
(1) Magnesium	(P) black or grayish spots appear	(A) 1 – R, 2 – P, 3 – S, 4 – Q
(2) Sulphur	(Q) middle area of leaves become yellowish	(B) 1 – R, 2 – Q, 3 – S, 4 – P
(3) Iron	(R) purple blots	(C) 1 – S, 2 – R, 3 – Q, 4 – P
(4) Manganese	(S) completely yellowing of leaves	(D) 1 – R, 2 – S, 3 – Q, 4 – P

(134) Match proper pair :

Column – I	Column – II	
(P) Iron	(i) activation of many enzymes	(A) P – i, Q – ii, R – iii, S – iv
(Q) Chlorine	(ii) formation of cell wall	(B) P – iv, Q – iii, R – i, S – iii
(R) Manganese	(iii) active space of electron conductor	(C) P – iii, Q – iv, R – i, S – ii
(S) Boron	(iv) photosynthesis and ionic balance	(D) P – iii, Q – iv, R – ii, S – i

(135) Match proper pair :

Column – I	Column – II	
(a) Sodium	(p) Osmosis and ionic balance in plants	
(b) Cobalt	(q) activity of nitrogenase type of enzymes	
(c) Silicon	(r) for nitrogen fixation	
(d) Vanadium	(s) the element of cell wall	
(A) (a – s), (b – p), (c – r), (d – q)	(B) (a – p), (b – r), (c – s), (d – q)	
(C) (a – p), (b – q), (c – r), (d – s)	(D) (a – q), (b – r), (c – p), (d – s)	

(136) Match proper pair :

Column – I

Column – II

- | | | |
|--------|-----------------------------|------------------------------------|
| (P) K | (i) Element of ferredoxin | (A) P - ii, Q - i, R - iv, S - iii |
| (Q) S | (ii) Role in stomatal-pore | (B) P - i, Q - ii, R - iii, S - iv |
| (R) Mo | (iii) Synthesis of oxygen | (C) P - iv, Q - iii, R - ii, S - i |
| (S) Mn | (iv) Element of nitrogenase | (D) P - i, Q - iii, R - iv, S - ii |

(137) Match proper pair :

Column – I

Column – II

- | | | |
|--------|---|------------------------------------|
| (P) Mg | (i) are seen in amino acid | (A) P - ii, Q - i, R - iv, S - iii |
| (Q) S | (ii) not important for plants | (B) P - iii, Q - i, R - ii, S - iv |
| (R) I | (iii) constituent of chlorophyll | (C) P - iii, Q - i, R - ii, S - v |
| (S) Mn | (iv) constituent of sugar | (D) P - iv, Q - iii, R - i, S - v |
| | (v) required in the activation of enzymes | |

(138) Match proper pair :

Column – I

Column – II

- | | | |
|--------|-------------------------------------|------------------------------------|
| (P) N | (i) copper coloured plant body | (A) P - iv, Q - iii, R - i, S - ii |
| (Q) Mg | (ii) immature leaf fall | (B) P - i, Q - ii, R - iii, S - iv |
| (R) B | (iii) chlorosis take place in veins | (C) P - i, Q - iii, R - iv, S - ii |
| (S) P | (iv) chlorosis and Necrosis happen | (D) P - ii, Q - iii, R - iv, S - i |

(139) Method and matter are given in column-I and II which one is the correct pair identify :

Column – I

Column – II

- | | | |
|--------------------------------------|----------------------------------|----------------------------|
| (a) Static solution culture | (i) Automated flow | (A) a - i, b - ii, c - iii |
| (b) Continuous flow solution culture | (ii) Fine drops (aerosol) | (B) a - ii, b - iii, c - i |
| (c) Aeroponics | (iii) Plant culture in glass jar | (C) a - iii, b - i, c - ii |
| | | (D) a - iii, b - ii, c - i |

(140) Name of elements and their importance are given column I and II which one is correct pair identify :

Column – I

Column – II

- | | | |
|-----------------|----------------------------------|----------------------------|
| (a) Nitrogen | (i) In ionic balance | (A) a - i, b - ii, c - iii |
| (b) Potassium | (ii) Constitution of chlorophyll | (B) a - ii, b - i, c - iii |
| (c) Phosphorous | (iii) Process of phosphorylation | (C) a - iii, b - i, c - ii |
| | | (D) a - iii, b - ii, c - i |

- (141) Name of elements and their importance are given column I and II which one is the correct pair identify :

Column – I	Column – II	
(a) Calcium	(i) In bipolar spindle	(A) a - i, b - ii, c - iii
(b) Sulphur	(ii) maintenance of ribosomal constituion	(B) a - i, b - iii, c - ii
(c) Magnesium	(iii) a constituent of amino acid	(C) a - ii, b - i, c - iii
		(D) a - iii, b - ii, c - i

- (142) Name of bacteria and their function are given in column I and II which one is the correct pair identify :

Column – I	Column – II	
(a) Rhizobium	(i) $\text{NH}_3 \rightarrow$ nitrite ion	(A) a - iii, b - iv, c - i, d - ii
(b) Nitrobactor	(ii) Nitrate $\rightarrow \text{N}_2$ gas	(B) a - iii, b - i, c - iv, d - ii
(c) Nitrosomonas	(iii) Formation of root nodules	(C) a - iii, b - iv, c - ii, d - i
(d) Pseudomonas	(iv) Nitrite ion $\rightarrow$ Nitrate	(D) a - iii, b - i, c - iv, d - ii

- (143) Match proper pair :

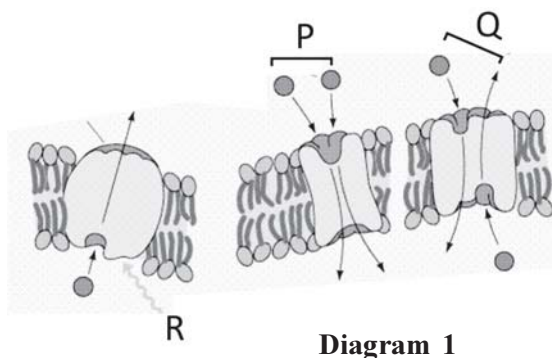
Column – I	Column – II	
(P) Mg	(i) seen in few amino acid	(A) P - iii, Q - iv, R - ii, S - i
(Q) S	(ii) not important for plants	(B) P - iii, Q - i, R - ii, S - iv
(R) I	(iii) constituent of chlorophyll	(C) P - iii, Q - i, R - ii, S - v
(S) Mn	(iv) constituent of sugar	(D) P - iv, Q - iii, R - i, S - v
	(v) required in the constituent of enzymes	

- (144) Match proper pair :

Column – I	Column – II	
(P) N	(i) copper coloured plant body	(A) P-iv, Q-iii, R-i, S-ii
(Q) Mg	(ii) immature leaves fall	(B) P-i, Q-ii, R-iii, S-iv
(R) B	(iii) chlorosis take place in veins	(C) P-i, Q-iii, R-iv, S-ii
(S) P	(iv) chlorosis and nephrosis happen	(D) P-ii, Q-iii, R-iv, S-i

Answers : (129-B), (130-A), (131-C), (132-C), (133-A), (134-C), (135-B), (136-A), (137-C), (138-A), (139-C), (140-B), (141-B), (142-C), (143-C), (144-B)

- (145) What does 'p' indicate in the given diagram-1 ?
 (A) more concentration (B) Transportive molecules
 (C) ion channel (D) Uniport
- (146) What does 'Q' indicate in given diagram-1 ?
 (A) carrier molecule (B) ion channel
 (C) protein (D) lipid



- (147) In the given diagram – 1 the indicated part – R is not used in which process ?
 (A) simple diffusion (B) facilitated diffusion (C) active absorption (D) ATP
- (148) In the given diagram – 1 show the function of 'P'.
 (A) carrier molecule (B) inner side of plasma membrane
 (C) ion-protein complex (D) Antiport
- (149) What does 'R' indicate in given diagram-2 ?
 (A) Transported ion (B) Energy
 (C) Symport (D) Anti port
- (150) What does 'S' indicate in given diagram-2 ?
 (A) Active transport (B) Coupled transport
 (C) Antiport (D) Symport
- (151) In the given diagram-2 which option is not matched with part 'T' ?
 (A) Carrier molecule (B) Slowly absorption
 (C) Consumption of ATP (D) None above
- (152) Which type of passive absorption indicate the given diagram-2 ?
 (A) diffusion (B) Donnan equilibrium (C) ion exchange (D) active transport
- (153) Which in the given diagram-2 where the absorptive ion take place ?
 (A) Outer surface of plasma membrane (B) inner surface of plasma membrane
 (C) on surface of cell wall (D) Both A and B

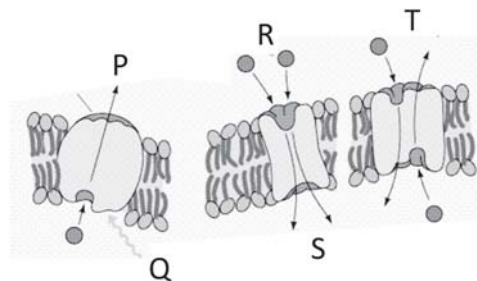


Diagram – 2

Answers : (145-A), (146-C), (147-A), (148-A), (149-C), (150-D), (151-C), (152-A), (153-C)

True - False (T - F) type questions :

Choose correct alternative option for answer :

- (154) (1) Nitrogenase is an iron containing enzyme.
 (2) FAD is reduction inducing unit in nitrogen fixation.
 (3) The enzyme transaminase is responsible for Reductive Amination.
 (4) Glutamic acid acts as a main donor of amino group.
 (A) T F T F (B) T T F T (C) T T F F (D) F F T T
- (155) (1) Sulphur is constituent of some amino acids like Cystine and Methionine.
 (2) Sulphur occurs in constitution of Vitamin Biotin (H_1) and thiamine (B_1).
 (3) Iron is in the constitution of ferredoxin and cytochrome.
 (4) Magnesium is to induce photolysis of water during photosynthesis.
 (A) T T T F (B) T F F T (C) T T F F (D) F F T T

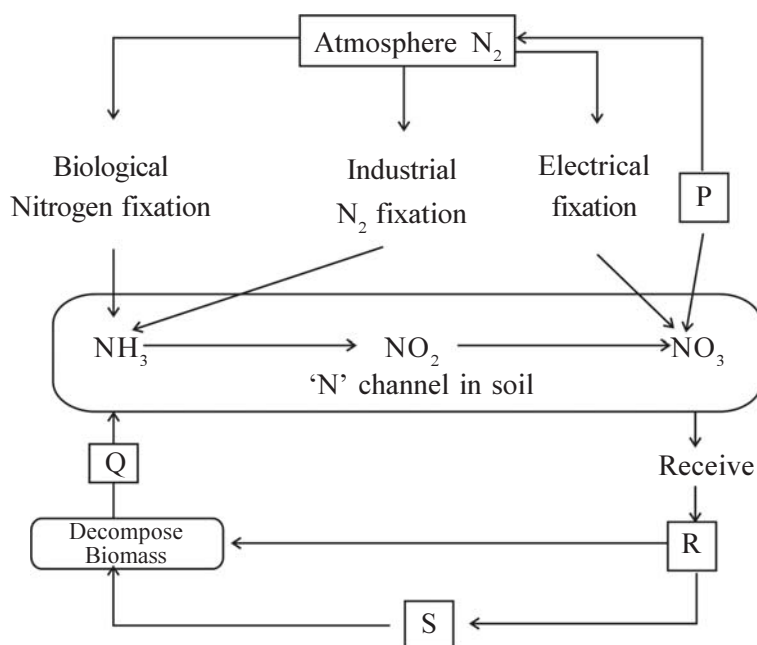
Answers : (154-B), (155-A)

NEET questions :

- (156) Which element is necessary for the growth of root hair ?
 (A) Zn (B) Ca (C) Mo (D) S

- (157) The deficiency of micromolecule not only resist the growth in plants but also resist some, living process like photosynthesis, mitochondrial electron transfer from given below which group effect on both photosynthesis and mitochondrial electron transport ?
- (A) Cu, Mn, Fe (B) Co, Ni, No
(C) Mn, Co, Ca (D) Ca, K, Na
- (158) The process of conversion of NH_3 into NO_3^- by Nitrosomonas bacteria called ...
- (A) Nitrogen fixation (B) Nitrification
(C) Denitrification (D) Ammonification
- (159) Characteristic of Leghemoglobin
- (i) Source of energy
(ii) pink coloured pigment which shows in rootnodules
(iii) It is active in presence of Mg^{+2}
(iv) It protects the nitrogenase from oxygen side effect
- (A) (i), (ii) and (iii) are true (B) (i) and (ii) are true
(C) (ii) and (iv) are true (D) (i) and (iii) are true
- (160) 'Little leaf disease' is caused by which mineral deficiency ?
- (A) Cu (B) Zn (C) B (D) Fe
- (161) Nitrifying Bacteria is :
- (A) Conversion of ammonia in to nitrate.
(B) Free N_2 is converted in to salt nitrogen.
(C) Conversion of protein in to ammonia.
(D) Conversion of nitrate through reduction to free nitrogen.
- (162) The function of leghemoglobin.
- (A) regulates the mass of O_2 in cell (B) regulates the mass of CO_2 in cell
(C) it produce the phenotic solution in all (D) regulates the mass of Mo in cell
- (163) Given below is not the characteristic of essential mineral.
- (A) It is necessary for constitution of Biomolecules
(B) It convert the chemical characteristic of soil.
(C) It comes in the constitution of energy giving chemical compound.
(D) It is responsible for activeness and passiveness of enzymes.
- (164) Which three group of micro molecule effect on photosynthesis and mitochondrial electron transfer ?
- (A) Cu, Mn, Fe (B) Co, Ni, Mo (C) Ca, K, Na (D) Mn, CO, Ca
- (165) By whom nitrite is converted in to nitrate ?
- (A) Nitrobactor (B) Nitrosomonas (C) Psuedomonas (D) Chlostridium
- (166) Suppose in protoplasm of cell there are $3X \text{ K}^+$ ion and $2X \text{ K}^+$ ion outside in active respiration after sometime amount of X of K^+ ion enter in the cell by which reaction K^+ ion transported ?
- (A) primary active transport (B) secondary active transport
(C) passive transport (D) diffusion

- (167) Which mineral deficiency in leaf is responsible for the dead tissue ?
 (A) N, K, Mg, Fe, Mn, Zn and Mo (B) Ca, Mg, Cu and K
 (C) N, K and S (D) N, K, Mg and Fe
- (168) In nitrification who does the first oxidation of ammonia to nitrite ?
 (A) Nitrosomonas and Nitrococcus (B) Nitrosomonas and Nitrobacter
 (C) Pseudomonas and Nitrococcus (D) Pseudomonas and Thyobacilus
- (169) Choose the proper option which give the real identification of P, Q, R and S :
- | P | Q | R | S |
|---------------------|-----------------|---------|---------|
| (A) Nitrification | Ammonification | Animals | Plants |
| (B) Denitrification | Ammonification | Plants | Animals |
| (C) Nitrification | Denitrification | Animals | Plants |
| (D) Denitrification | Nitrification | Plants | Animals |



- (170) Which of the following statement is true ?
 (A) Nitrogenfixator who construct root nodules in free living condition are aerobic.
 (B) Phosphorous is structural component of plasmamembrane some nucleic acid and some types of proteins.
 (C) Nitrosomonas and nitrobacter are chemically synthesised free living organisms.
 (D) Nostoc and Anabena are capable free living to nitrogenfixation in free living condition.

Answers : (154-B), (155-A) (156-B), (157-A), (158-B), (159-C), (160-C), (161-B), (162-A), (163-C), (164-A), (165-A), (166-B), (167-A), (168-B), (169-A), (170-B)

Concept Map

