

CHAPTER – 12

I. MINERAL NUTRITION

1. Who demonstrated the plants growing in soil free nutrition or hydroponics for the first time?
2. Define hydroponics?
3. What is mineral nutrition?
4. What are mineral nutrients/essential elements?
5. What are toxic elements?
6. What is meant by necrosis?
7. What is meant by chlorosis?
8. What is biological nitrogen fixation?
9. What is ammonification?
10. What is nitrification?
11. What is denitrification?
12. Name two major compounds from which plant gets carbon, hydrogen and oxygen?
13. What are macronutrients?
14. What are Micronutrients/trace elements?
15. Name the micronutrient constituent for plant growth of cytochromes?
16. Name the essential nutrient that forms a major constituent of proteins?

17. Which element responsible for splitting of water during photo synthesis?
18. What is critical concentration?
19. What are deficiency symptoms?
20. What are toxicity symptoms?
21. Name any two bacteria that are involved in the steps of nitrification?
22. Name the enzyme capable of fixing atmospheric nitrogen?
23. Name the enzyme which is abundantly occurring in plants?
24. Mostly all the plants obtain inorganic nutrients from which form from the soil?
25. Name the oxygen scavenger during nitrogen fixation?

II. Two marks Questions:

1. Draw a labeled diagram of a typical set up for nutrient solution culture (hydro-phonic technique).
2. What are macronutrients? Give two examples.
3. What are micronutrients (trace elements)? Give two examples?
4. Name two major requirements for the preparation of different nutrient solutions?
5. List out any 4 metabolic processes takes place in plant cells due to the involvement of essential elements?

6. Differentiate between chlorosis and necrosis :-
7. Mention any two natural processes that are available for the supply of nutrients to the plants?
8. Write the equations that are involved in the steps of nitrification.
9. Name two bacteria carrying nitrifications?
10. Write over all equation representing the nitrogen fixation by modulated bacteria?
11. Name any two free living nitrogen fixing bacteria?
12. Give any two examples for living nitrogen fixing cyan bacteria?
13. What are deficiency symptoms? Write any two deficiency symptoms in plants?
14. In which chemical form the following essential elements absorbed as by the plants

1. Born	2. Molybdenum	3. Nitrogen
4. Iron	5. Sulphur	6. Phosphorus.

III.FOUR MARKS QUESTIONS WITH ANSWERS.

1. What are essential elements? Give three criteria for essentiality of an element in plants.
 - i. Explain the process of nodule formation in leguminous plants by Rhizobium
2. Write the schematic representation of nitrogen cycle:-

IV.Five marks questions with answer:-

- Q. 1. Write the steps of conversion of atmospheric N_2 to ammonia by the enzyme in the nitrogen fixing bacteria.
- Q. 2. Write the available form and physiological role of the following essential nutrient elements?
- a. Nitrogen b. Calcium. c. Manganese
 - d. Pottassium e. Iron f. Sulphur
 - g. Cholorine.
- Q. 3. What are the essential elements? How they are Classified into 4 groups based on functions with one Example for each group of essential elements?
- Q. 4. What is fat of ammonia? Explain two ways to Synthesis amino acids from ammonia in plants.

Answers
CHAPTER – 12

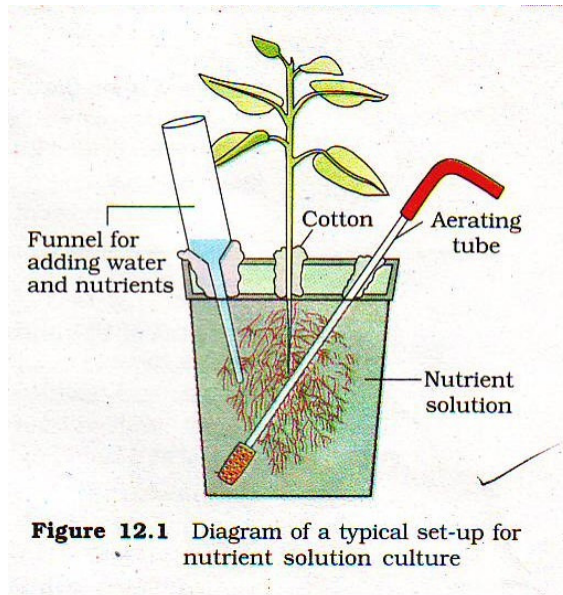
I. MINERAL NUTRITION

1. Julius von Sachs.
2. The technique of growing plants in nutrient medium without soil.
3. The phenomenon of absorption of nutrients by plants to growth and development.
4. The minerals which are essentially need for growth and development of plants.
5. The elements (Micronutrients) which cause toxicity in plants, when the plants uptake more than moderate amount of that element.
6. The death of plant tissues due to the deficiency of some nutrients.
7. The loss of chlorophyll leading to yellowing.
8. The reduction/fixation of atmospheric N_2 to ammonia by living organisms.
9. The process of conversion of N_2 into ammonia.
10. The process of conversion of ammonia into nitrites into nitrates by nitrifying bacteria.
11. The process of conversion of nitrates/nitrogen compound into gaseous nitrogen by denitrifying bacteria.

12. CO_2 and HO_2
13. The elements are needed in large amount for plant growth
14. The elements are needed in very small amount for plant growth.
15. Iron.
16. Nitrogen.
17. Manganese (Mn)
18. The concentration of the essential element below which plant growth is retarded is called critical concentration.
19. The morphological changes in plants are indicative of certain element deficiencies are called deficiency symptoms.
20. The symptoms appeared due to the presence of more than moderate amount of element.
21. Nitrosomas, Nitrobacter, Nitrococcus.
22. Nitrogenase.
23. Carbon.
24. Charged Ions
25. Leghaemoglobin present in root nodules.

II .TWO MARKS QUESTIONS.

1.



2. The elements are needed in large amount for plant growth

Examples:-

Carbon, Hydrogen, Oxygen, Nitrogen, Phosphorous, Sulphur, Potassium, Calcium & Magnesium.

3. The elements are needed in very small amount for plant Growth

Examples:-

Iron, Manganese, Copper, Molybdenum, Zinc, Boron, Chlorine and Nickel.

4. Purified water & Mineral nutrient salts.

- 5.** The various metabolic processes in the plant cells such as permeability of cell membrane, maintenance of osmotic cone of cell sap maintenance of buffering action. Maintenance of enzymatic activity acts as major constituents of Macromolecules and co-enzymes.

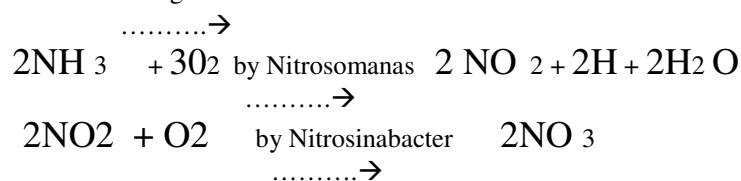
6. Chlorosis

Necrosis

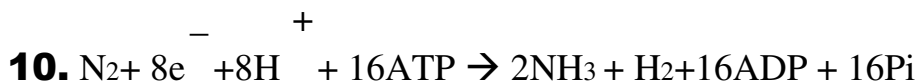
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|--|----|--|
| 1. Loss of chlorophyll | :: | Death of leaf tissue |
| 2. As a result leaves turn into yellow | :: | As a result, the leaves show spots or holes |
| 3. Caused by the deficiency of elements like N, K, Mg, S, Fe, Mn, Zn & Mo. | :: | Caused by the deficiency of Ca, Mg, Cu, K, etc., |

7. Weathering and breakdown of rocks.

8. $N \equiv N$ Nitrogenase NH_3



9. Pseudomonas & Thiobacillus



11. Azotobacter, Beijerinckia, Rhodospirillum

12. Nostoc & Anabaena

- 13.** The morphological changes occur due to the deficiency of certain elements in plants. Deficiency symptoms- chlorosis, necrosis, stunted plant growth, premature fall of leaves and buds.

- 14.**
1. Boron absorbed as BO_3^{3-} or $\text{B}_4\text{O}_7^{2-}$
 2. Molybdenum absorbed as molybdate ions (MoO_4^{2-})
 3. Nitrogen absorbed as NO_3^-
 4. Iron absorbed as Ferric ions (Fe^{3+})
 5. Sulphur absorbed as Sulphate SO_4^{2-}
 6. Phosphorus absorbed as hydrogen phosphate ions H_2PO_4^- or HPO_4^{2-}

III. Four Marks Questions with Answers.

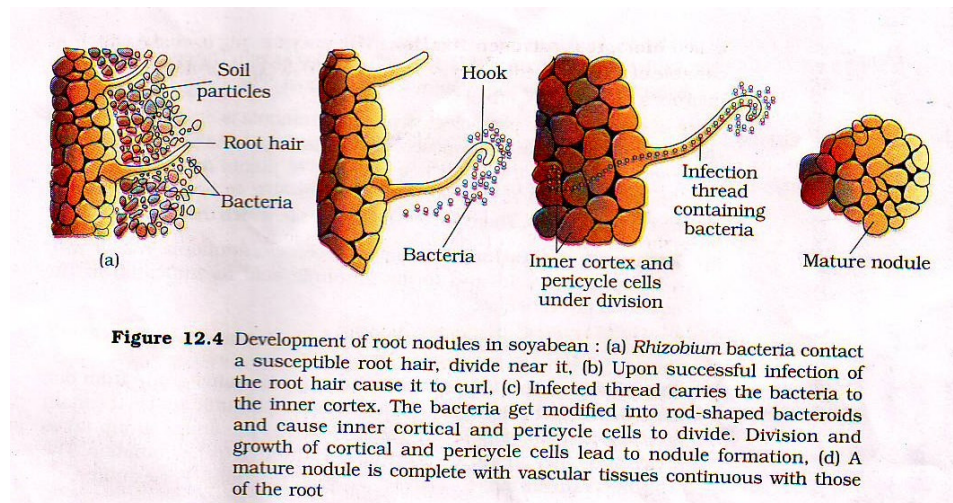
Q.1. The minerals that are essentially need for growth and development of plants is called essential elements.

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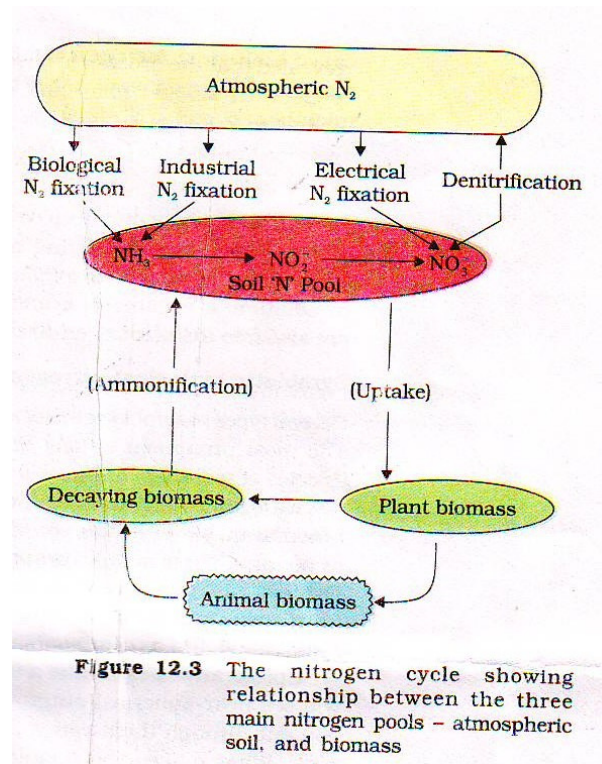
- i. The element must be absolutely necessary for Supporting normal growth and reproduction in plants.
- ii. The element must be required in specific and not replaceable by another element.
- iii. The element directly involved in the metabolism of the plant.

Q.2. Stages involved in the process of nodule formation as follows:

1. *Rhizobia* multiplies and colonizes the surroundings of leguminous roots and gets attached to epidermal and root hair cells
2. As a result of bacterial infection the root hairs become curled
3. An infection thread is formed, which is carrying the bacteria into the cortex of root.
4. The bacteria initiate the formation of nodules in the cortex of the root.
5. The nodules thus formed, are directly contact with vascular tissues for the exchange of nutrients.

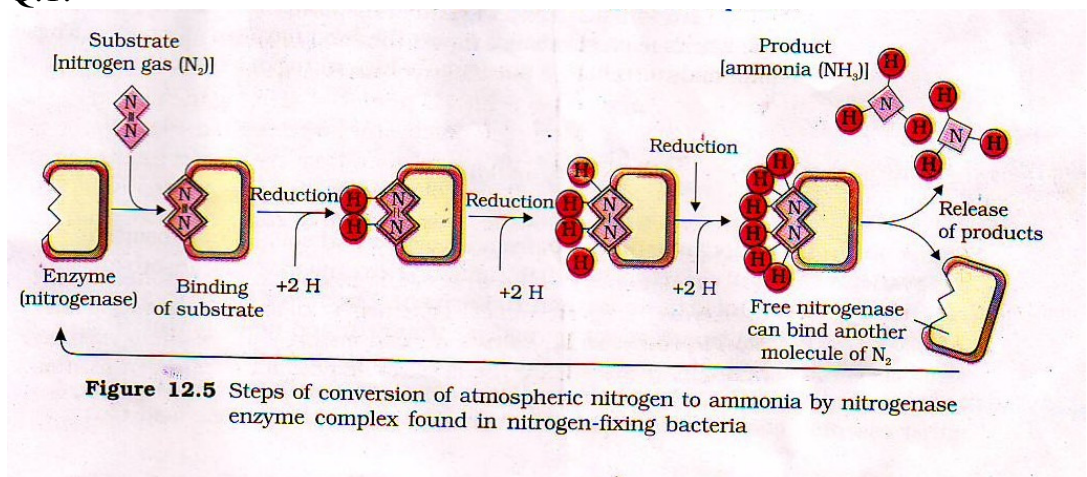


Q.3 . Write the schematic representation of nitrogen cycle.



IV. Five marks questions with answer:-

Q.1.



Q.2. a. Nitrogen- It is absorbed in the form of



Physiological role- N_2 required for meristematic cells, Constituents of proteins, Nucleic acids, Vitamins & hormones

b. Calcium:- it is absorbed in the form of Ca^{2+}
(Calcium ions)

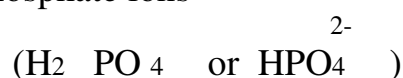
Role:- used in the synthesis of cell wall (Middle Lamella) formation of spindle fibers regulating Metabolic activities, activates enzymes normal Functioning of cell membranes.

c. Manganese – it is absorbed in the form of



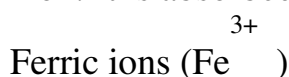
Role : Activates many enzymes involved in photosynthesis, respiration and nitrogen metabolism
Splitting of water during photosynthesis.

d. Potassium:- It is absorbed by the plants in the form of phosphate ions



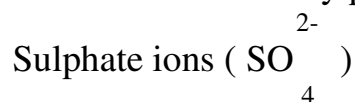
Role : it is required for all phosphorylation reactions.

e. Iron: It is absorbed by plants in the form of



Role: It is involved in the transfer of electrons
During electron transport system, formation of chlorophyll.

f. Sulphate:- It is absorbed by plants in the form of



Role:- It is Main constituent of several co-enzymes, vitamins and proteins like ferredoxin.

- g. Chlorine:- It is absorbed by plants in the form of chloride anion (Cl^-)
Role : Maintain anion-cation balance in cells.

Q.3. The mineral elements which are essentially need for growth and development of plants are called essential elements.

Essential elements are grouped into 4 broad categories as Follows:

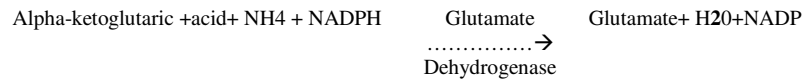
- a. Essential elements as components of biomolecules
i.e. structural elements of cells.
Ex: Carbon, Hydrogen, Oxygen & N_2
- b. Essential elements that activate or inhibit
Ex: Magnesium is an activator,
Zinc is an activator.
- c. Essential elements that are components of energy
Related chemical components in plants.
Ex: Magnesium in chlorophyll,
Phosphorous in ATP
- d. Some essential elements can alter the osmotic potential of a cell .
Ex: Potassium- plays role in opening and Closing of stomata.
Chlorine, sodium – help in determining the solute Concentration.

Q.4. In plants absorbed ammonia is assimilated (converted) to nitrate and ammonium ions. The ammonium ions are quite toxic to plants and hence it is under go used up for the synthesis amino acids.

The synthesis of ammono acids from ammonium ions in plants occurs in two main pathways as follows:

1. Reductive admiration:-

In this process ammonia is reduced with Alpha-Ketoglutaric acid to form glutamic acid in presence of an enzyme Glutamate dehydrogenase.



2. Transamination:-

This process involves the transfer of aminogroups from one amino acid to ketogroup of a keto acid to form other amino acids like glutamic acid, catalysed by transaminase.

