CBSE Class 12 Biology

Important Questions

Chapter 12

Mineral Nutrition

1 Marks Questions

1.Name a soil bacteria which is capable of converting ammonia to nitrates.

Ans . Nitrosomonas.

2.Which macronutrient is essential for synthesis of auxin.

Ans. Zinc

3.What do you mean by “chlorosis”?

Ans . Lack of development of chlorophyll in the leaves.

4.Name any two elements having toxic effect on protoplasm?

Ans. Lead, mercury and arsenic.

5.What is hydroponics?

Ans. Plant growth in nutrient rich liquid culture medium.

6.Give the function of enzyme nitrate reductase.

Ans. It reduces nitrate ions to ammonia.

7.Name essential components of biomolecules.

Ans. C, H, O and N.

8.Name the enzyme that can reduce nitrogen to ammonia.
Ans. Nitrogenase enzyme.

9.What are micronutrients?
Ans. Elements which are required by the plants in very small or trace quantities are termed as micronutrients for eg; zinc copper, etc.

10.Name one symbiotic nitrogen-fixing bacteria.
Ans. Rhizobium

11.Give two examples of photosynthetic micro-organisms, which also fix atmospheric nitrogen.
Ans. Anabaena, Nostoc.

12.Name two organisms each which fix nitrogen asymbiotically and symbiotically.
Ans. Asymbiotically – Azotobacter, Bacillus polymyxa.
Symbiotically – Rhizobium, Anabaena.

13. Which substance imparts pink colour to the root nodule of a leguminous plant and also mention its role ?
Ans. Leghemoglobin. It is an oxygen scavenger, which protects the enzyme nitrogenase.

14. What is the term used for mineral deficiency symptom in plants in which leaves become yellow in different pattern ?
Ans. Necrosis.

15. Define hydroponics.
Ans. The technique of growing plants in a nutrient solution without soil is called hydroponics.

CBSE Class 12 Biology
Important Questions
Chapter 12
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2 Marks Questions

1.A farmer adds azotobacter culture to the soil before sowing maize. How does it increase the yield of maize?

Ans. Azotobacter provides nitrogen fixing bacteria which converts free nitrogen into nitrous and nitrites. It increases soil fertility. So it increases yield of maize.

2.Name the pigment found in root nodules of legumes. What is its function?

Ans. Root nodules of leguminons plants contain pigment leghaemglobin. Its function is to protect nitrogenase from oxygen. Hence called 'oxygen scavenger'.

3.What is hydroponics? Mention its uses?

Ans. Hydroponics is the cultivation of plants in the nutrient solution by placing their rooted part in nutrient solution. By hydroponics or water culture experiment, essentiality of an element for plant growth can be determined by exceeding a particular element in culture solution and by observing the symptoms caused by its deficiency.

4.What is balanced nutrient solution?

Ans. Balanced nutrient solution or balanced salt solution is prepared by dissolving definite proportions of salts in distilled water needed for normal plant growth. The plants growing in these solutions survive munch longer as they get all essential as well as the trace elements from medium.

5.What is nitrification? Name any two nitrifying bacteria in soil?

Ans. Nitrification is the process of conversion of ammonia into nitrites. It involves two steps:-

(i) Ammonium ions are oxidized into nitrates by the bacteria like Nitrosomonas and Nitrosococcus.

(ii) Nitrites are converted into nitrates by the bacteria like Nitrobacter.

6.In what form is magnesium absorbed by plants from the soil. Given two functions of magnesium in plants & its deficiency symptoms.

Ans. Magnesium is absorbed by the plants from the soil in the form of divalent Mg^{2+}.

Functions –

1) Synthesis of DNA and RNA.

2) It activates enzymes in respiration and photosynthesis.

Deficiency symptoms –

1) Chlorosis between the leaf veins.

2) Premature leaf abscission.

7.List the four broad groups of essential elements.

Ans.

	Type	**Examples and its Role**
1.	Components of bimolecules	C,H,O,N is a component of nucleic acids and proteins.
2.	Components of energy related chemical compounds.	Mg. P. P is a constituent of ATP molecule.
3.	Activate or Inhibit enzymes.	Mg^{2+}, Zn^{2+}, Mo. Mo is activator of nitrogenase in N_2 metabolism.
		Potassium. It is a essential. In opening of

4.	Alter osmotic potential of a cell.	closing of stomata leaves.

8.How is hydroponics useful?

Ans. Hydroponics is essential to know the following-

(i) Essentiality of mineral element.

(ii) Deficiency symptom due to non – availability of specific nutrient.

(iii) Toxicity to plant if element is present is excess.

(iv) Role of essential elements is metabolism of a plant.

9.What is mineral nutrition? Name one essential element that is a component of energy – related chemical compounds.

Ans. Plants require mineral nutrients for their growth and development which do not occur in the plant body in Free State. The utilization of there elements by the plants for its growth and development is called mineral nutrition. Mg in chlorophyll is essential component of energy-related chemical compound.

10. Name the following:

(a) Bactoria which converts ammonia into nitrite.

(b) Bacteria which oxidises nitrite into nitrate.

Ans. (i) Nitrifying Bacteria – Nitrosomonas.

(ii) Nitrifying Bacteria – Nitrobacter.

CBSE Class 12 Biology
Important Questions
Chapter 12
Mineral Nutrition

3 Marks Questions

1.What do you understand by "Donnan Equilibrium?

Ans. This theory explains that the passive accumulation of ion that are fixed on non-diffusible, against an ecp gradient. A membrane that separates a cell from the external medium and allows exchange of some ions and not the other. On the inner side of this membrane are anions (fixed & non-diffusible). The membrane becomes impermeable to these anions. In such condition (for equilibrium) mobile cations are needed to balance the negative charges of the anions. According to it Donnan equilibrium is reached, if the product of anions and cations is the internal solution becomes equal to the product of anions and cations in the external solution.

$[Ci^+]\ [Ai^-] = [Co^+]\ [Ao^-]$

Where Ci^+ = cations inside

Ai^- = Anions in side

Co^+ = Cations outside

Ao^- = Anions outside.

2.What are essential mineral elements?

Ans. Mineral elements found in soil which may enter plants through the roots. More than 60 elements of 105 discovered so far occur in different plants. Some accumulate selenium but some others gold. Some plants growing near nuclear test sites takes up radioactive strontium.

3.Differentiate between active & passive absorption.

Ans.

	Active Absorption	**Passive Absorption**
1.	Absorption of minerals is against the concentration gradient.	Absorption of minerals is along the concentration gradient by simple diffusion.
2.	Energy is utilized for absorption.	Energy is not utilized for absorption
3.	It is fast.	It is slow.
4.	It is unidirectional.	It may be bidirectional.
5.	It is a biochemical process.	It is a physical process.

4.List the criteria for essentiality of elements as nutrient in plants.

Ans. Criteria for essentiality of element are fallowing-

1) The element must be absolutely essential for supporting normal growth and reproduction.

2) The requirement are need of the element must be specific and not replaceable by another element.

3) An element should be directly involved in the metabolism of the plant.

5.Describe the process of nitrogen fixation in plants. Mention the site where this process actually occur is such plants.

Ans. Nitrogen fixation occurs in nodules in legume plants is gram and arhar. They act as sites for it. The legume plants like pea, gram show symbiosis or mutualism with bacterium, Rhizobium leguminasauram. Nitrogen fixation occurs with the help of enzymes nitrogenase & leghaemoglobin. Leghaemoglobin act as O_2 scavenges and nitrogenase catalyse the conversion of N_2 into NH_3

$N2 + 8e^- + 16ATP + 8H^+ \rightarrow H_2 + 2NH_3 + 16ADP + 16\ Pi$

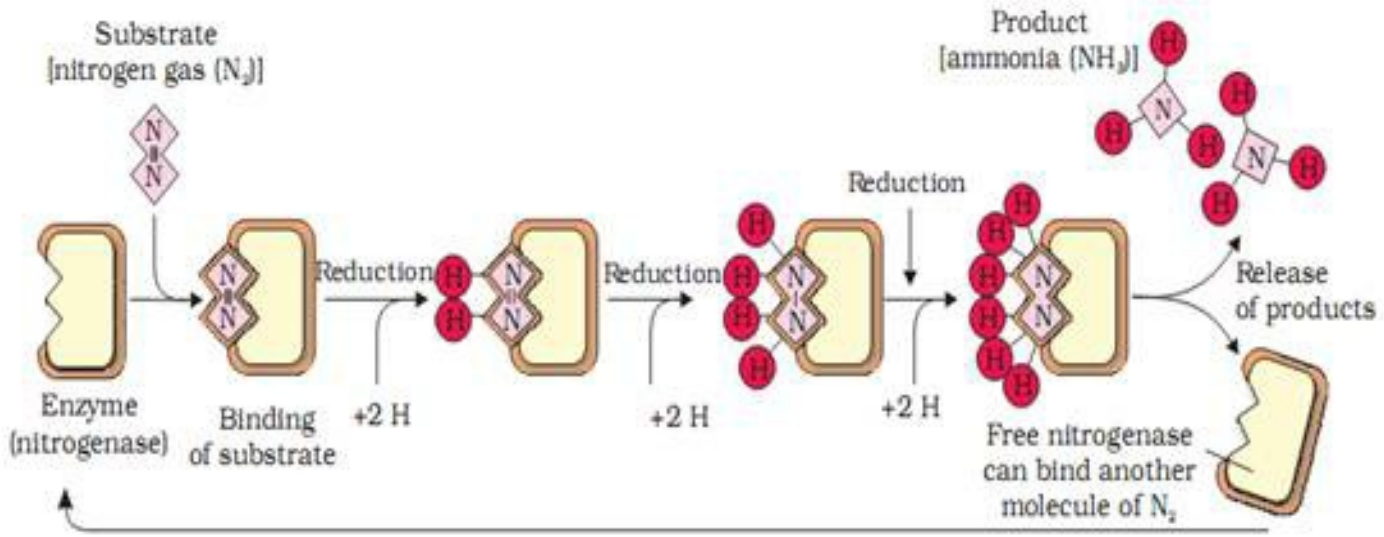

Figure 12.5 Steps of conversion of atmospheric nitrogen to ammonia by nitrogenase enzyme complex found in nitrogen-fixing bacteria

6.Differentiate between apoplast and symplast.

Ans.

	Apoplast (outer space)	**Symplast (Inner space)**
1.	It includes cell wall and intercellular space.	It includes the cytoplasm and vacuole of the cell.
2.	Uptake of ions into space is a passive process and involves no expenditure of energy.	Uptake of ions is an active process and involves expenditure of energy.
3.	Initially, the ions are taken up quickly into outer space into medium.	Uptake of ions occurs slowly from the outer space.

CBSE Class 12 Biology
Important Questions
Chapter 12
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5 Marks Questions

1.Describe the process of development of root nodules in leguminous plant. Name the oxygen scavenger molecule present in root nodules?

Ans. Mineral elements found in soil which may enter plants through the roots. More than 60 elements of 105 discovered so far occur in different plants. Some accumulate selenium but some others gold. Some plants growing near nuclear test sites takes up radioactive strontium.

Formation of root nodules in a leguminous plant:

1) When a root hair of a leguminous plant comes in contact with Rhizobium, the root hair becomes curled or deformed, due to chemicals secreted by bacterium.

2) At the site of curling or deformation, the bacteria invade the root and multiply within the root hair.

3) Some of the bacteria enlarge to become membrane – bound structures known as bacteroids, which help in spreading infection.

4) An infection thread made of plasma membrane is formed by the host that separates the infected cell from rest of the tissue.

5) Cell division is stimulated in the infected tissue and more bacteria enter the newly formed cells.

Leghaemoglobin (Lb) is the oxygen scavenger found in root nodules of legume plants.

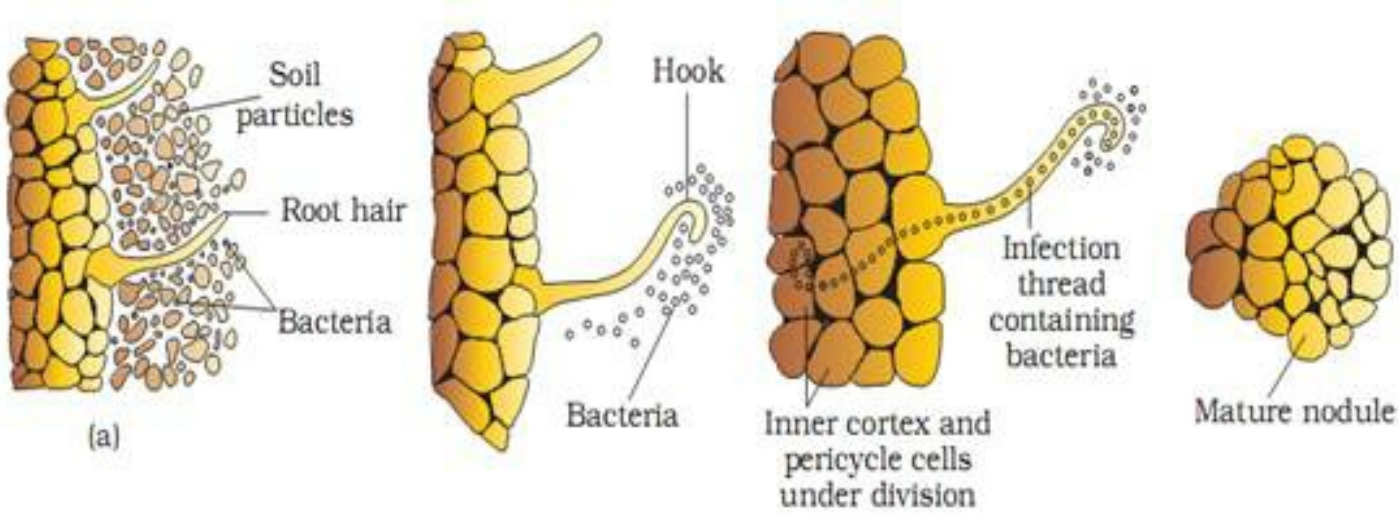

Figure 12.4 Development of root nodules in soyabean : (a) *Rhizobium* bacteria contact a susceptible root hair, divide near it, (b) Upon successful infection of the root hair cause it to curl, (c) Infected thread carries the bacteria to the inner cortex. The bacteria get modified into rod-shaped bacteroids and cause inner cortical and pericycle cells to divide. Division and growth of cortical and pericycle cells lead to nodule formation, (d) A mature nodule is complete with vascular tissues continuous with those of the root

2. Write role of different elements in a plant?

Ans. Some important functions of mineral elements are –

(1) Maintenance of the osmotic pressure in the plant cells – The mineral salts and organic compounds of the cell sap produce necessary osmotic pressure.

(2) Constituents of the plant body – Elements form constitution of the plant body. For ex – Carbon, Hydrogen and oxygen are essential constituents of carbohydrates. Hence, called framework elements. Nitrogen, sulphur and phosphorous are required for synthesis of proteins. Magnesium is important constituent of chlorophyll.

(3) Influence on the PH of the cell sap – They also influence the PH of the cell sap.

(4) They influence the permeability of cytoplasmic membrane – They increase or decrease the permeability of the plasma membrane.

(5) They take part in enzymatic reactions – some elements work as activators while the others works as inhibitors in various enzymatic reactions.

(6) They have balancing functions reactions – some of the minerals balance the effects of the other.

3. Mention the role of micronutrients in plants life?

Ans.

	Micronutrient	**Role in plants life**
1.	Boron (B)	Pectin formation in cell wall, Translocation of sugar, Absorption of water.
2.	Molybdenum (Mo)	Reduction of nitrates constituent of nitrate reductases. Activation for photophosphorylation.
3.	Manganese (Mn)	Nitrogen metabolism, chlorophyll synthesis, Activation of enzymes.
4.	Copper (Ca)	Component of enzymes. Component of plastocyanin.
5.	Chloride (Cl)	Transfer of electron.
6.	Zinc (Zn)	Synthesis of auxins. Acts as an activator.