Chapter 9

Mineral Nutrition

Solutions

SECTION - A

Objective Type Questions

(Methods to Study the Mineral Requirements of Plants)

1. Growing plants in a nutrient solution

   (1) Also require soil
   (2) Was first demonstrated by Arnon
   (3) Also allows growth of algae in containers
   (4) Requires prevention of reaction of light with roots

Sol. Answer (4)

Because in hydroponic we just wanted roots to be immersed in nutrient solution and want to grow them using it.

(Essential Mineral Elements)

2. Which is not a criteria for essentiality of a mineral?

   (1) Direct role in metabolism
   (2) Requirement is specific
   (3) Deficiency causes hunger signs
   (4) Dispensible for growth

Sol. Answer (4)

It is indispensible for growth.

3. Which is not a true statement regarding macronutrients?

   (1) Forms plant structure
   (2) Usually become toxic in excess
   (3) No role in electron transfer
   (4) Develop osmotic potential

Sol. Answer (2)

No, they are not toxic in excess, micronutrients are toxic in excess.

4. Choose correct statement regarding micronutrients

   (1) Become toxic in excess
   (2) Little role in protoplasmic structure
   (3) No role in enzyme activation
   (4) Both (1) & (2)

Sol. Answer (4)

Micronutrients become toxic in excess and they have little role in protoplasmic structure. Therefore, both (1) and (2).

5. Deficiency of which element causes deficiency of nitrogen

(1) Mo (2) K (3) Mn (4) S

Sol. Answer (1)

Deficiency of Mo causes deficiency of nitrogen if nitrate is primary source of nitrogen and if plant depends on symbiotic nitrogen fixation.

6. Minerals associated with redox reactions are

(1) N, Cu (2) Fe, Cu (3) Fe, K (4) Mn, Mo

Sol. Answer (2)

Fe, Cu, Zn, Ni & Mo are minerals associated with redox reactions.

7. Minerals which maintain cation - anion balance in cells are

(1) Cl, K (2) Fe, Cu (3) K, P (4) Ca, Fe

Sol. Answer (1)

K & Cl are maintain cation-anion balance.

8. Which of the following groups of elements are mobile?

(1) Fe, Ca, B (2) Cl, K (3) B, K, N, Ca (4) Ca, Mg, P

Sol. Answer (2)

N, P, K & Mg are mobile elements.

$\rightarrow$ Deficiency symptoms are first seen in mature part of the plant.

9. Which of the following elements are required for chlorophyll synthesis?

(1) Fe and Mg (2) Mo and Ca (3) Cu and Ca (4) Ca and K

Sol. Answer (1)

Fe and Mg

Mg is present in ring of chlorophyll

10. If chloroplast is burnt, then which of the following is left?

(1) Magnesium (2) Manganese (3) Iron (4) Sulphur

Sol. Answer (1)

Magnesium is chleated in pyrrole ring.

11. Which is not a trace element?

(1) Mn (2) Cu (3) Mo (4) K

Sol. Answer (4)

Potassium is a macronutrient.

12. Find odd one (w.r.t. critical element)

(1) Nitrogen (2) Potassium (3) Nickel (4) Phosphorus

Sol. Answer (3)

The elements mostly deficient in soil is called as critical elements like N, P & K.

13. Silicon, Cobalt, Sodium and Selenium are

(1) Essential minerals (2) Required by higher plants

(3) Macronutrients (4) Trace elements

Sol. Answer (2)

Si, Co, Se & Na all are beneficial elements.

They are required by higher plants.

14. Tryptophan synthesis, carboxylase activity and little leaf of plants are all associated with

(1) Zn (2) B (3) Ca (4) Cu

Sol. Answer (1)

These all are associated with Zn *i.e.*, Tryptophan synthesis carboxylase activity and little leaf of plants.

15. Mineral which is part of CoA, Fd, thiamine and lipoic acid is :

(1) Mn (2) Fe (3) S (4) Ca

Sol. Answer (3)

It is used in synthesis of some vitamins, CoA and ferrodoxin and lipoic acid.

16. Hunger signs in plants are

(1) Symptoms due to lesser water absorption in plants (2) Symptoms due to poor photosynthesis in plants

(3) Deficiency symptoms of mineral nutrients (4) Symptoms due to excess water absorption in plants

Sol. Answer (3)

It occurs due to deficiency symptoms of mineral nutrients.

17. (a) Moderate decrease or increase of micronutrients causes deficiency and toxicity symptoms respectively.

(b) Excess of manganese causes toxicity of iron, calcium and molybdenum.

(c) A macronutrient is said to be toxic when present below a critical concentration.

(1) Only (a) is correct (2) Only (b) is correct

(3) (b) & (c) are correct (4) (a) & (c) are correct

Sol. Answer (1)

18. Essential elements are :

(1) Only micronutrients (2) Only macronutrients

(3) C, H, O & N only (4) Both macro and micronutrients

Sol. Answer (4)

Both macro and micronutrients.

(Mechanism of Absorption of Elements)

19. Movement of electrolytes through the roots is generally

(1) Against electro chemical gradient and require energy

(2) Along electro chemical gradient and does not require energy

(3) A passive process

(4) Dependent on aquaporins

Sol. Answer (1)

Movement of electrolytes through roots is generally against electro-chemical gradient and require energy. Because, it is an active process.

20. Initial phase of ion uptake

(1) Is passive and apoplastic
(2) Occurs through symplast
(3) Is active process
(4) More than one option is correct

Sol. Answer (1)

Initial phase of ion uptake is a passive process and it is apoplastic, occurring through cell wall and intercellular spaces.

(Translocation of Solutes)

21. The translocation of solute is

(1) Equal to the rate of translocation of water
(2) Dependent on transpiration pull
(3) Through xylem vessel
(4) All of these

Sol. Answer (4)

Translocation of solute *i.e.*, minerals is by xylem through xylem vessels dependent on transpiration pull.

(Soil as Reservoir of Essential Elements)

22. The process of conversion of $2NO_3^- \rightarrow 2NO_2^- \rightarrow 2NO \rightarrow N_2O \rightarrow N_2$ is called _____ and is done by

(1) Nitrification, *Nitrosomonas*
(2) Denitrification, *Pseudomonas*
(3) Nitrate assimilation, Nitrogenase
(4) Ammonification, *Bacillus*

Sol. Answer (2)

$2NO_3^- \longrightarrow N_2$ is denitrification and it is caused by *Pseudomonas denitrification*.

(Metabolism of Nitrogen)

23. Process of nitrification and nitrate assimilation are

(1) Oxidation & reduction respectively
(2) Reduction & oxidation respectively
(3) Both are oxidation
(4) Both are reduction

Sol. Answer (1)

Oxidation and Reduction respectively.

$$\underset{-3}{NH_3} \longrightarrow \underset{-5}{NO_2^-} \longrightarrow \underset{-7}{NO_3^-}$$

Oxidation (→)

Reduction (←)

24. Conversion of $NO_3 \rightarrow NO_2 \rightarrow NH_3$ is called _____ and is catalysed by _____.

(1) Nitrate assimilation, nitrate and nitrite reductase
(2) Nitrification, nitrate and nitrite reductase
(3) Ammonification, glutamate dehydrogenase
(4) Denitrification, transaminase

Sol. Answer (1)

$NO_3 \xrightarrow{\text{Nitrate reductase}} NO_2$

$NO_2 \xrightarrow{\text{Nitrite reductase}} NH_3$

Nitrogen assimilation

25. Most common form of nitrogen uptake and usable forms for plants are respectively

(1) NO_3^-; NO_2^- (2) NH_3 ; NO_3^- (3) NO_3^-; NH_3 (4) NH_3 ; NO_2^-

Sol. Answer (3)

NO_3^- is form in which nitrogen is mainly absorbed. NH_3 is usable form for plants.

26. Which of the following is/are diazotrophs?

(1) *Rhizobium* and *Azotobacter* (2) *Frankia* and *Klebsiella*

(3) *Anabaena* and *Nostoc* (4) All of these

Sol. Answer (4)

Rhizobium, *Azotobacter*, *Frankia*, *Klebsiella*, *Anabaena* and *Nostoc*, these all are diazotrophs *i.e.*, organisms that fix atmospheric nitrogen into usable form.

27. Which is not true for nitrogenase enzyme in root nodules in legumes?

(1) Synthesized by nif genes of *Rhizobium* (2) Site of reduction of N_2 into NH_3

(3) It is a Mo-F protein (4) Resistant to O_2 conc.

Sol. Answer (4)

It is not resistant to oxygen concentration.

Oxygen concentration is toxic to Nitrogenase enzyme.

28. Leghemoglobin is found in which one of the following organisms?

(1) *Anthoceros* (2) *Aulosira* (3) *Nostoc* (4) Groundnut

Sol. Answer (4)

Leghemoglobin is found in groundnut.

29. How many electron and protons are required to fix a dinitrogen?

(1) 32 each (2) 8 each (3) 16 each (4) 4 each

Sol. Answer (2)

$8e^-$ each.

$N_2 + 8e^- + 8H^+ + 16\ ATP \rightarrow 2NH_3 + H_2 + 16ADP + 16\ Pi$

30. *Cycas* and *Azolla* plants are associated with

(1) *Bacillus* (2) *Klebsiella* (3) *Anabaena* (4) *Rhizobium*

Sol. Answer (3)

Cycas and *Azolla* plants are associated with *Anabaena*.

31. Select the correct statements from the given

(a) Nitrogenase is a heterodimeric protein.

(b) Root hairs curl by action of nitrogenase and plant 'nod factors'.

(c) During symbiotic N_2 fixation ATP is provided by legume plant

(1) (b), (c) (2) (a), (c) (3) only (c) (4) (a), (b)

Sol. Answer (2)

Nitrogenase is a heterodimeric dimer and during symbiotic nitrogen fixation ATP are provided by legume plant. But root hair curling is not caused by nitrogenase.

32. Nitrogenase enzyme found in root nodules in legumes contains

(1) Mo, Mn, S (2) Co, Mo, Ca (3) Mo, Fe, S (4) Mo, B, S

Sol. Answer (3)

Mo, Fe, S (Present as cofactor)

33. The amino acid which plays a central role in nitrogen metabolism is/are

(1) Glutamic acid (2) α-ketoglutaric acid

(3) Aspartic acid (4) Double aminated keto acids

Sol. Answer (1)

It is the primary amino acid through which other amino acids are formed through transamination

34. Transported and storage form of nitrogen in plants are

(1) Amides (2) Polypeptides (3) Amino acids (4) α-ketoglutaric acids

Sol. Answer (1)

Amides and ureids are transported through xylem.

35. Ureides are preferred forms for storage and transport of nitrogen in

(1) *Triticum aestivum* (2) *Solanum nigrum* (3) *Glycine max* (4) *Allium cepa*

Sol. Answer (3)

Glycine i.e., Soyabean

Leguminous plant

SECTION - B

Previous Years Questions

1. Which of the following bacteria reduce nitrate in soil into nitrogen? **[NEET-2019 (Odisha)]**

(1) *Nitrosomonas* (2) *Nitrobacter* (3) *Nitrococcus* (4) *Thiobacillus*

Sol. Answer (4)

Nitrates (soil) $\xrightarrow[\text{Denitrification}]{}$ Nitrogen

Pseudomonas denitrificans &

Thiobacillus denitrificans

2. *Thiobacillus* is a group of bacteria helpful in carrying out **[NEET-2019]**

(1) Nitrogen fixation (2) Chemoautotrophic fixation

(3) Nitrification (4) Denitrification

Sol. Answer (4)

Thiobacillus denitrificans cause denitrification *i.e.*, conversion of oxides of nitrogen to free N_2.

3. In which of the following forms is iron absorbed by plants? **[NEET-2018]**

(1) Ferric (2) Ferrous (3) Both ferric and ferrous (4) Free element

Sol. Answer (1*)

Iron is absorbed by plants in the form of ferric ions. (According to NCERT)

*Plants absorb iron in both form i.e. Fe^{++} and Fe^{+++}. (Preferably Fe^{++})

4. Which of the following elements is responsible for maintaining turgor in cells? **[NEET-2018]**

(1) Magnesium (2) Sodium (3) Calcium (4) Potassium

Sol. Answer (4)

Potassium helps in maintaining turgidity of cells.

5. Which is essential for the growth of root tip? **[NEET (Phase-2)-2016]**

(1) Zn (2) Fe (3) Ca (4) Mn

Sol. Answer (3)

Calcium is required by dividing and differentiating cells.

6. In which of the following all three are macronutrients? **[NEET-2016]**

(1) Nitrogen, sulphur, phosphorus (2) Boron, zinc, manganese

(3) Iron, copper, molybdenum (4) Molybdenum, magnesium, manganese

Sol. Answer (1)

Nitrogen, sulphur, phosphorus are macronutrients.

7. During biological nitrogen fixation, inactivation of nitrogenase by oxygen poisoning is prevented by : **[Re-AIPMT-2015]**

(1) Cytochrome (2) Leghaemoglobin

(3) Xanthophyll (4) Carotene

Sol. Answer (2)

8. Minerals known to be required in large amounts for plant growth include **[AIPMT-2015]**

(1) Magnesium, sulphur, iron, zinc (2) Phosphorus, potassium, sulphur, calcium

(3) Calcium, magnesium, manganese, copper (4) Potassium, phosphorus, selenium, boron

Sol. Answer (2)

Macronutrients are required in large amounts for plant growth.

9. Deficiency symptoms of nitrogen and potassium are visible first in **[AIPMT-2014]**

(1) Senescent leaves (2) Young leaves (3) Roots (4) Buds

Sol. Answer (1)

Nitrogen and potassium are mobile elements.

10. The first stable product of fixation of atmospheric nitrogen in leguminous plants is: **[NEET-2013]**

(1) Ammonia (2) NO_3^- (3) Glutamate (4) NO_2^-

Sol. Answer (1)

Ammonia is the first stable product of nitrogen-fixation.

11. Which one of the following is **wrong** statement? **[AIPMT (Prelims)-2012]**

(1) Phosphorus is a constituent of cell membranes, certain nucleic acids and all proteins

(2) *Nitrosomonas* and *Nitrobacter* are chemoautotrophs

(3) *Anabaena* and *Nostoc* are capable of fixing nitrogen in free-living state also

(4) Root nodule forming nitrogen fixers live as aerobes under free-living conditions

Sol. Answer (1)

Phosphorus is not constituent of all proteins.

12. Which one of the following is **correctly** matched ? **[AIPMT (Prelims)-2012]**

(1) Potassium – Readily mobilization (2) Bakane of rice seedings – F.Skoog

(3) Passive transport of nutrients – ATP (4) Apoplast – Plasmodesmata

Sol. Answer (1)

13. For its action, nitrogenase requires **[AIPMT (Mains)-2012]**

(1) High input of energy (2) Light (3) Mn^{2+} (4) Super oxygen radicals

Sol. Answer (1)

Nitrogenase is an enzyme which catalyses nitrogen-fixation and requires energy.

14. Best defined function of Manganese in green plants is **[AIPMT (Prelims)-2012]**

(1) Nitrogen fixation (2) Water absorption (3) Photolysis of water (4) Calvin cycle

Sol. Answer (3)

Mn is used in photolysis of water.

15. Nitrifying bacteria **[AIPMT (Prelims)-2011]**

(1) Reduce nitrates to free nitrogen (2) Oxidize ammonia to nitrates

(3) Convert free nitrogen to nitrogen compounds (4) Convert proteins into ammonia

Sol. Answer (2)

Oxidises ammonia to nitrate

$$NH_3 \longrightarrow \underbrace{NO_2^- \longrightarrow NO_3^-}_{\text{Nitrification}}$$

16. The function of leghaemoglobin in the root nodules of legumes is **[AIPMT (Prelims)-2011]**

(1) Expression of *nif* gene (2) Inhibition of nitrogenase activity

(3) Oxygen removal (4) Nodule differentiation

Sol. Answer (3)

Leghaemoglobin acts as oxygen scavenger.

17. Which one of the following elements in plants is not remobilised? **[AIPMT (Prelims)-2011]**

(1) Sulphur (2) Phosphorus (3) Calcium (4) Potassium

Sol. Answer (3)

Ca is not a mobile element.

18. A prokaryotic autotrophic nitrogen fixing symbiont is found in **[AIPMT (Prelims)-2011]**

(1) *Pisum* (2) *Alnus* (3) *Cycas* (4) *Cicer*

Sol. Answer (3)

Bacteria *Anabaena* is autotroph and found in symbiotic association with non-leguminous plants. like *Cycas*, *Azolla*.

19. Which one of the following helps in absorption of phosphorus from soil by plants? **[AIPMT (Prelims)-2011]**

(1) *Anabaena* (2) *Glomus* (3) *Rhizobium* (4) *Frankia*

Sol. Answer (2)

20. Which one of the following is essential for photolysis of water? **[AIPMT (Mains)-2011]**

(1) Copper (2) Boron (3) Manganese (4) Zinc

Sol. Answer (3)

Mn is essential for photolysis of water.

21. Which one of the following **is not** an essential mineral element for plants while the remaining three are? **[AIPMT (Mains)-2011]**

(1) Cadmium (2) Phosphorus (3) Iron (4) Manganese

Sol. Answer (1)

Cadmium is not an essential element. It does not come under 17 essential elements.

22. Leguminous plants are able to fix atmospheric nitrogen through the process of symbiotic nitrogen fixation. Which one of the following statements is **not** correct during this process of nitrogen fixation? **[AIPMT (Mains)-2011]**

(1) Leghaemoglobin scavenges oxygen and is pinkish in colour

(2) Nodules act as sites for nitrogen fixation

(3) The enzyme nitrogenase catalyses the conversion of atmospheric N_2 to NH_3

(4) Nitrogenase is insensitive to oxygen

Sol. Answer (4)

Nitrogen is sensitive to oxygen, thus leghaemoglobin acts as oxygen sacavenger.

23. An element playing important role in nitrogen fixation is **[AIPMT (Prelims)-2010]**

(1) Molybdenum (2) Copper (3) Manganese (4) Zinc

Sol. Answer (1)

Mo is an element which plays role is nitrogen fixation

Nitrogenase < Mo-Fe, Fe

24. The common nitrogen-fixer in paddy fields is **[AIPMT (Prelims)-2010]**

(1) *Frankia* (2) *Rhizobium* (3) *Azospirillum* (4) *Oscillatoria*

Sol. Answer (3)

Oscillatoria is a common nitrogen fixer in paddy fields.

25. Which one of the following is **not** a micronutrient? **[AIPMT (Prelims)-2010]**

(1) Boron (2) Molybdenum (3) Magnesium (4) Zinc

Sol. Answer (3)

Mg is a macronutrient.

26. One of the free-living, anaerobic nitrogen-fixer is **[AIPMT (Prelims)-2010]**

(1) *Azotobacter* (2) *Beijernickia* (3) *Rhodospirillum* (4) *Rhizobium*

Sol. Answer (3)

Rhodospirullum is an anaerobic, free living photosynthetic bacteria.

27. Manganese is required in **[AIPMT (Prelims)-2009]**

(1) Plant cell wall formation (2) Photolysis of water during photosynthesis

(3) Chlorophyll synthesis (4) Nucleic acid synthesis

Sol. Answer (2)

Mn is required for photolysis of water.

28. Nitrogen fixation in root nodules of *Alnus* is brought about by **[AIPMT (Prelims)-2008]**

(1) *Azorhizobium* (2) *Bradyhizobium* (3) *Clostridium* (4) *Frankia*

Sol. Answer (4)

Frankia causes nitrogen-fixation in *Alnus*.

29. Which of the following is a flowering plant with nodules containing filamentous nitrogen-fixing microorganism? **[AIPMT (Prelims)-2007]**

(1) *Cicer arietinum* (2) *Casuarina equisetifolia* (3) *Crotalaria juncea* (4) *Cycas revolute*

Sol. Answer (2)

Frankia involved in nitrogen fixation in *Casuarina* and *Alnus*.

30. Which one of the following elements is not an essential micronutrient for plant growth? **[AIPMT (Prelims)-2007]**

(1) Ca (2) Mn (3) Zn (4) Cu

Sol. Answer (1)

It is a macronutrients.

31. Which one of the following statements is correct? **[AIPMT (Prelims)-2007]**

(1) At present it is not possible to grow maize without chemical fertilizers.

(2) Extensive use of chemical fertilizers may lead to eutrophication of nearby water bodies.

(3) Both *Azotobacter* and *Rhizobium* fix atmospheric nitrogen in root nodules of plants.

(4) Cyanobacteria such as *Anabaena* and *Nostoc* are important mobilizers of phosphates and potassium for plant nutrition in soil.

Sol. Answer (2)

Excess growth of living organism in water bodies due to fertilizers is called eutrophication.

32. A plant requires magnesium for : **[AIPMT (Prelims)-2007]**

(1) Cell wall development (2) Holding cells together

(3) Protein synthesis (4) Chlorophyll synthesis

Sol. Answer (4)

Mg is required for chlorophyll synthesis.

33. About 98 percent of the mass of every living organism is composed of just six elements including carbon, hydrogen, nitrogen, oxygen and: **[AIPMT (Prelims)-2007]**

(1) Calcium and phosphorous (2) Phosphorus and sulphur

(3) Sulphur and magnesium (4) Magnesium and sodium

Sol. Answer (1)

34. Sulphur is an important nutrient for optimum growth and productivity in **[AIPMT (Prelims)-2006]**

(1) Pulse crops (2) Cereals

(3) Fibre crops (4) Oilseed crops

Sol. Answer (4)

35. The deficiencies of micro-nutrients, not only affects growth of plants but also vital functions such as photosynthetic and mitochondrial electron flow. Among the list given below, which group of three elements shall affect most, both photosynthetic and mitochondrial electron transport? **[AIPMT (Prelims)-2005]**

(1) Cu, Mn, Fe (2) Co, Ni, Mo (3) Mn, Co, Ca (4) Ca, X, Na

Sol. Answer (1)

Cu	Mn	Fe
↓	↓	↓
Complex IV	Photolysis of water	Activates enzymes

36. Which of the following elements is a constituent of biotin?

(1) Sulphur (2) Magnesium (3) Calcium (4) Phosphorus

Sol. Answer (1)

Sulphur is a constituent of Co-A, vitamins like thiamine and biotin and ferredoxin.

37. Which one of the following elements is almost non-essential for plants?

(1) Zn (2) Na (3) Ca (4) Mo

Sol. Answer (2)

Na is a beneficial element.

38. Plants take zinc in the form of

(1) $ZnSO_4$ (2) Zn^{++} (3) ZnO (4) Zn

Sol. Answer (2)

It is absorbed in the form of Zn^{2+} ions.

39. Element necessary for the middle lamella is

(1) Ca (2) Zn (3) K (4) Cu

Sol. Answer (1)

Ca is necessary for middle lamella. Calcium pectate forms this middle lamella.

40. Boron in green plants assists in

(1) Activation of enzymes (2) Acting as enzyme co-factor

(3) Photosynthesis (4) Sugar transport

Sol. Answer (4)

41. The most abundant element present in the plants is

(1) Carbon (2) Nitrogen (3) Manganese (4) Iron

Sol. Answer (1)

C, H & O are the framework elements.

42. Necrosis in crops is due to the deficiency of

(1) Ca, K, S and Mo (2) N, K, S and Mo

(3) N, S, Fe and Zn (4) Mg, S, Mn and Ca

Sol. Answer (1)

Necrosis in crops is due to deficiency of Ca, K, S, & Mo.

43. Which of the following is not caused by deficiency of mineral nutrition?

(1) Etiolation (2) Shortening of internode

(3) Necrosis (4) Chlorosis

Sol. Answer (1)

Yellowing of leaf due to absence of light is called etiolation.

44. When the plants are grown in magnesium deficient but urea rich soil, the symptoms expressed are

(1) Yellowish leaves (2) Colourless petiole

(3) Dark green leaves (4) Shoot apex die

Sol. Answer (1)

Mg deficiency causes chlorosis.

45. The major portion of the dry weight of plants comprises of

(1) Nitrogen, phosphorus and potassium (2) Calcium, magnesium and sulphur

(3) Carbon, nitrogen and hydrogen (4) Carbon, hydrogen and oxygen

Sol. Answer (4)

Carbon, hydrogen and oxygen are framework elements form 94% of dry weight of plants.

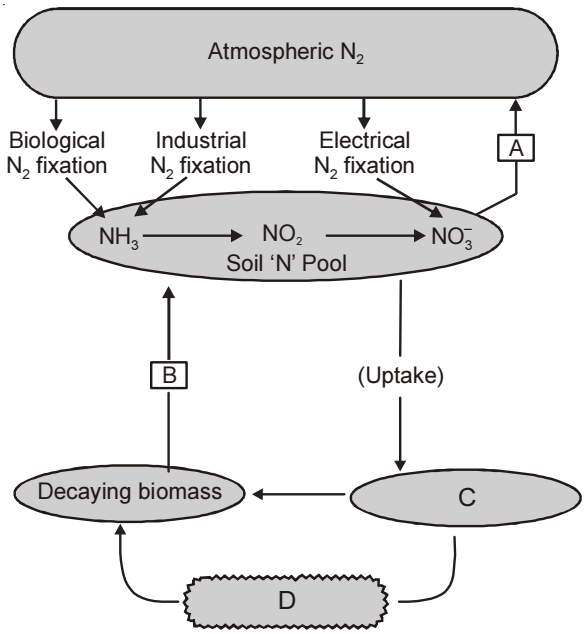
46. Grey spots of oat are caused by deficiency of

(1) Cu (2) Zn (3) Mn (4) Fe

Sol. Answer (3)

Grey spot of oat are caused by deficiency of Mn.

47. Study the cycle shown below and select the option which gives correct words for all the four blanks A, B, C and D.



Options:

(1) A – Nitrification B – Ammonification
C– Animals D – Plants

(2) A – Denitrification B – Ammonification
C – Plants D – Animals

(3) A – Nitrification B – Denitrification
C– Animals D – Plants

(4) A – Denitrification B – Nitrification
C– Plants D – Animals

Sol. Answer (2)

48. Which two distinct microbial processes are responsible for the release of fixed nitrogen as dinitrogen gas (N_2) to the atmosphere?

(1) Anaerobic ammonium oxidation, and denitrification

(2) Aerobic nitrate oxidation, and nitrite reduction

(3) Decomposition of organic nitrogen, and conversion of dinitrogen to ammonium compounds

(4) Enteric fermentation in cattle, and nitrogen fixation by *Rhizobium* in root nodules of legumes

Sol. Answer (1)

$NO_3^- \longrightarrow N_2$ Dentrification

$NH_3 \longrightarrow NO_2^- \longrightarrow NO_3^-$ *i.e.*, Oxidation

49. Nitrifying bacteria

(1) Reduce nitrates to free nitrogen

(2) Oxidize ammonia to nitrates

(3) Convert free nitrogen to nitrogen compounds

(4) Convert proteins into ammonia

Sol. Answer (2)

Oxidises ammonia to nitrate

$NH_3 \longrightarrow \underbrace{NO_2^- \longrightarrow NO_3^-}_{\text{Nitrification}}$

50. Passive absorption of minerals depend on

(1) Temperature (2) Temperature and metabolic inhibitor

(3) Metabolic inhibitor (4) Auxin

Sol. Answer (1)

Passive absorption of mineral depends on temperature

51. In root nodules of legumes, leg-haemoglobin is important because it

(1) Transports oxygen to the root nodule (2) Acts as an oxygen scavenger

(3) Provides energy to the nitrogen fixing bacterium (4) Acts as a catalyst in transamination

Sol. Answer (2)

LHb acts as an oxygen scavenger.

52. Leghemoglobin is

(1) An oxygen carrier in human blood (2) A protein used as food supplement

(3) An oxygen scavenger in root nodules (4) A plant protein with high lysine content

Sol. Answer (3)

LHb is oxygen scavanger in root nodules.

53. Which one of the following statements is correct?

(1) Legumes fix nitrogen only through the specialized bacteria that live in their roots

(2) Legumes fix nitrogen independently of the specialized bacteria that live in their roots

(3) Legumes fix nitrogen only through specialized bacteria that live in their leaves

(4) Legumes are incapable of fixing nitrogen

Sol. Answer (1)

Legumes fix nitrogen only through specialised bacteria that live in their roots. (Bacteroids)

54. Enzyme first used for nitrogen fixation

(1) Nitrogenase (2) Nitroreductase (3) Transferase (4) Transaminase

Sol. Answer (1)

Nitrogenase enzyme helps in the conversion of nitrogen into ammonia *i.e.*, nitrogen fixation.

55. Which one of the following mineral elements play an important role in biological nitrogen fixation ?

(1) Copper (2) Manganese (3) Zinc (4) Molybdenum

Sol. Answer (4)

Nitrogenase < Mo-Fe, Fe

56. A free living nitrogen-fixing cyanobacterium which can also form symbiotic association with the water fern *Azolla* is

(1) *Tolypothrix* (2) *Chlorella* (3) *Nostoc* (4) *Anabaena*

Sol. Answer (4)

Anabaena is a filamentous autotroph which is found in symbiotic association with non legumes plants like *Cycas* and *Azolla*

57. If by radiation all nitrogenase enzyme are inactivated, then there will be no

(1) Fixation of nitrogen in legumes
(2) Fixation of atmospheric nitrogen
(3) Conversion from nitrate to nitrite in legumes
(4) Conversion from ammonium to nitrate in soil

Sol. Answer (1)

No fixation of nitrogen in legume because it occurs through nitrogenase enzyme.

58. Roots of which plant contains a red pigment which have affinity for oxygen?

(1) Carrot
(2) Soyabean
(3) Mustard
(4) Radish

Sol. Answer (2)

In legumes, root nodule contains a red or pink pigment called as leghaemoglobin. It is an O_2 scavenger.

SECTION - C

Assertion-Reason Type Questions

1. A : Some mineral nutrients are essential.

R : They can be synthesized by the plants.

Sol. Answer (3)

First statement is right *i.e.*, 17 essential elements are there, but second statement is wrong because these are not synthesized in the plant body but they are absorbed as mineral nutrients from soil, atmosphere etc.

2. A : Bacteria enters only the polyploid cells of root cortex.

R : These cells provide cytokinins to bacteria, that promotes bacteria cell division.

Sol. Answer (3)

Bacterial cell enters only polyploid cells of root cortex and bacterial cells also provide/produce cytokinin that induces polyploidy.

3. A : N, P, K are called critical elements.

R : They become deficient easily in soil due to leaching and higher requirement.

Sol. Answer (1)

N, P, K are critical elements because they are deficient in soil.

4. A : Influx of ions into inner space of cells is an active process.

R : Ions are available for free exchange in free space.

Sol. Answer (2)

Inward moment of ions is called influx but ions available for exchange is not reason.

5. A : Manganese toxicity cause brown spots, chlorotic veins and inhibition of calcium translocation to shoot apex.

R : Toxic effects may be due to direct excess of micronutrients or its interference in the absorption and functioning of other nutrients.

Sol. Answer (1)

Manganese toxicity induces the deficiency of Fe, Mg and Ca.

6. A : Jar for nutrient solution culture contains a split cover with holes which hold a bent tube for aeration.

R : Regular aeration of culture solution is necessary for proper growth and activities of roots.

Sol. Answer (1)

Aeration tube help in aeration which is necessary for proper growth.

7. A : All the diverse minerals element found in plants are not essential for them.

R : Some plants accumulate heavy and toxic minerals such as gold and selenium from the soil.

Sol. Answer (2)

There are 60 elements found in protoplasm but all are not essential. Also this is true that some plants accumulate radioactive isotopes when growing in near by areas like nuclear plants.

8. A : Ammonia is oxidised first to nitrate then to nitrite by the action of *Nitrosomonas* and *Nitrobacter* respectively.

R : Nitrite thus formed is absorbed by leaves.

Sol. Answer (4)

Nitrate formed is absorbed by plants and transported to leaves where reduced to form ammonia.

9. A : Soyabean export the fixed nitrogen as ureides.

R : Amides contain excess nitrogen and they are transported via phloem sieve tubes.

Sol. Answer (3)

Transport occurs through xylem.