Chapter 12

Mineral Nutrition

FACT/DEFINITION TYPE QUESTIONS

1. Hydroponics refers to the plant development
(a) without soil.
(b) in saline soil.
(c) in water without soil.
(d) without soil with alkaline pH.

2. Which of the following scientist for the first time demonstrated the experiment on hydroponics?
(a) Von sachs (b) Arnon
(c) Knop (d) Skoog

3. More than 'X' elements of the 'Y' discovered so far are found in different plants. Identify 'X' and 'Y'.
(a) X - 0; Y - 110 (b) X - 80; Y - 105
(c) X- 60; Y - 105 (d) X- 70; Y - 115

4. The essential elements which are required by plants in large amounts are called_____ and those required in very small amount by the plants are called_____.
(a) micronutrients, macronutrients
(b) bulky elements, trace elements
(c) macronutrients, micronutrients
(d) trace elements, bulky elements

5. The amount of trace elements per kg dry matter is
(a) 10 m mole (b) above 10 m mole
(c) less than 10 m mole (d) 100 m mole

6. The major role of minor elements inside living organisms is to act as
(a) binder of cell structure.
(b) co-factors of enzymes.
(c) building blocks of important amino acids.
(d) constituent of hormones.

7. Boron in green plants assists in
(a) sugar transport
(b) activation of enzymes
(c) acting as enzyme cofactor
(d) photosynthesis

8. Which of the following element activate an enzyme, nitrogenase during nitrogen metabolism?
(a) SO_4^{2-} (b) Mg^{2+}
(c) K^+ (d) Mo

9. _____ is an constituent of the ring structure of chlorophyll and helps to maintain the ribosome structure.
(a) Manganese (b) Magnesium
(c) Molybdenum (d) Copper

10. Which of the following essential element is required for photochemical reaction involved in photolysis of water?
(a) Cu^{2+} (b) Cl^-
(c) Zn^{2+} (d) Mg^{2+}

11. Which of the following elements are constituents of protein?
(a) Nitrogen and phosphorus
(b) Nitrogen and chlorine
(c) Phosphorus and boron
(d) Chlorine and potassium

12. Which of the following elements in plants are relatively immobile and are a part of the structural component of the cell?
(a) Sulphur and calcium
(b) Sulphur and potassium
(c) Calcium and magnesium
(d) Potassium and magnesium

13. Which of the following element is necessary in plants for protein synthesis and also it is a constituent of hormones and many of the vitamins?
(a) Calcium (b) Phosphorus
(c) Nitrogen (d) Magnesium

14. Which of the following is not caused by deficiency of mineral nutrition?
(a) Necrosis (b) Chlorosis
(c) Etiolation (d) Shortening of internodes

15. Any mineral ion concentration in tissues that reduces the dry weight of tissues by about _____ is considered toxic.
(a) 10% (b) 20%
(c) 30% (d) 40%

16. The process by which mineral is absorbed is called
(a) passive absorption (b) active absorption
(c) both (a) and (b) (d) none of these

17. Denitrification is carried out by
(a) *Nitrosomonas* (b) *Pseudomonas*
(c) *Nitrobacter* (d) *Nitrococcus*

18. The bond in molecular nitrogen (N_2) is difficult to break, because it is a
(a) double ionic bond.
(b) quadraplex hydrogen bond.
(c) triple covalent bond.
(d) triple ionic bond.

19. Which of the following represents the abiotic mode to convert nitrogen to nitrogen oxides into the soil?
(a) Lightening (b) Temperature
(c) Ammonification (d) Nitrification

20. Conversion of N≡N to NH_3 occurs in plant cell by
(a) free-living bacteria (b) symbiotic bacteria
(c) anaerobic microbes (d) enzyme

21. The enzyme _____ which is capable of nitrogen reduction is present exclusively in prokaryotes. Such microbes are called_____.
(a) hydrogenase, N_2-fixers
(b) nitrogenase, N_2-fixers
(c) hydrogenase, aerobic microbes
(d) nitrogenase, aerobic microbes

22. *Frankia* produces nitrogen fixing nodules on the roots of
(a) leguminous plants (b) non-leguminous plants
(c) *Cycas* (d) monocot

23. Which one of the following is free-living, anaerobic nitrogen-fixer ?
(a) *Beijernickia* (b) *Rhodospirillum*
(c) *Rhizobium* (d) *Azotobacter*

24. The nodule in a plant root where nitrogen fixing bacteria live forms from cells of the
(a) epidermis (b) cortex
(c) endodermis (d) vascular cylinder

25. Which of the following plants will enrich the soil with nitrogen?
(a) Corn (b) Alfalfa
(c) Wheat grass (d) Beets

26. Leghaemoglobin helps in
(a) transport of food in plant.
(b) nitrogen fixation.
(c) protecting nitrogenase from O_2.
(d) nodule formation.

27. Pigment present in the root nodules of legume is
(a) chlorophyll-*c* (b) fucoxanthin
(c) phycoerythrin (d) leghaemoglobin

28. The primary amino acid from which other 17 amino acids are formed through the process of transamination is
(a) glycine (b) aspartic acid
(c) glutamic acid (d) arachidonic acid

29. Asparagine and glutamine are the two most important
(a) amino acid (b) amides
(c) imino acid (d) proteins

30. Nitrogen fixation is a process of
(a) converting nitrogen in the air to form a usable form by plants.
(b) recycling nitrogen from organic matter in the soil.
(c) absorbing nitrogen from the soil.
(d) conversion of NO_3 to N_2 .

STATEMENT TYPE QUESTIONS

31. Which of the following statements is not correct about macro- nutrients?
(a) They are present in plant tissues in excess of 100 m mole per kg of dry matter.
(b) They include C, H, O, N, P, S, K, Ca, Mg.
(c) Some elements attained from CO_2 and H_2O while the others are absorbed from the soil.
(d) C, H & O are mainly obtained from CO_2 and H_2O.

32. Which of the following statement is incorrect ?
(a) Soil supplies minerals, harbours N_2-fixing bacteria and other microbes, holds water, supplies O_2 to root at acts as matrix that stabilises the plant.
(b) Both macro and micronutrients forms component of fertilizers and are applied as per need.
(c) Weathering and breaking down of rock enrich the soil with dissolved ions and inorganic salts.
(d) Denitrification is not done by bacteria *Pseudomonas* and *Thiobacillus*.

33. Which of the following statements about *Rhizobium* legume nodule formation is not correct ?
(a) *Rhizobium* can only fix nitrogen after it becomes a bacteroid within a root cortex cell.
(b) *Rhizobium* induces invagination of root hairs.
(c) Within an infection thread, *Rhizobium* is still extracellular to the plant.
(d) The infection thread can fuse with any root cell of an appropriate legume species.

34. Which of the following statements about nitrification is not correct ?
(a) *Nitrobacter* oxidizes nitrite to nitrate.
(b) *Nitrosomonas* and *Nitrosococcus* convert ammonium ions to nitrite.

(c) Nitrification reactions are energy-producing (exergonic) reactions.

(d) Heterotrophic plants are more directly dependent on the nitrifying bacteria for usable nitrogen than autotrophic plants.

35. Which of the following statements about nitrogen fixation is correct ?

(i) Nitrogenase is only catalytic under anaerobic conditions.

(ii) The energy for nitrogen fixation can be provided by either photosynthesis or respiration.

(iii) In nitrogen fixation, nitrogen is reduced by the addition of three successive pairs of hydrogen atoms.

(iv) Most nitrogen fixing microbes are aerobic.

(a) (i) and (ii) only (b) (ii) and (iv) only

(c) (i), (ii) and (iii) only (d) All of the above

36. Read the following statement and answer the question

Infected thread carries the bacteria to the inner 'X' cells. The bacteria get modified into rod-shaped bacteroids and cause inner 'X' and 'Y' cells to divide. Division and growth of 'X' and 'Y' cells lead to nodule formation.

Identify 'X' and 'Y'.

(a) X-pericycle, Y - cortical

(b) X - cortical, Y - pericycle

(c) X - endodermis, Y - cortical

(d) X - epidermis, Y -pericycle

37. Which of the following statements are correct?

(i) Magnesium competes with iron and manganese for uptake and with iron for binding with enzymes.

(ii) Magnesium inhibit calcium translocation in shoot apex.

(iii) Excess of manganese may induce deficiencies of iron, magnesium and calcium.

(iv) Symptoms of manganese toxicity may actually be the deficiency symptoms of iron, magnesium and calcium.

(a) (i), (ii) and (iii) (b) (i) and (ii)

(c) (iii) and (iv) (d) (ii), (iii) and (iv)

38. How many of the given statements are correct?

(i) The deficiency of any element can cause multiple symptoms.

(ii) Same symptoms may be caused by the deficiency of one or several different elements.

(iii) The concentration of the essential element below which plant growth is retarded is termed as critical concentration.

(iv) Chlorosis is the loss of chlorophyll due to deficiency of N, K, Mg, Fe, S, Mn, Zn Mo.

(v) Different plants respond differently to the deficiency of the same element.

(a) (iii) and (iv) (b) (i) and (iv)

(c) (i) and (iii) (d) All of these

39. Which of the following statement(s) is/are correct?

(i) Conversion of organic nitrogen to NH_4^+ by soil microbes is called ammonification.

(ii) Ammonia is first oxidized to nitrite by *Nitrosomonas* and *Nitrosococcus*.

(iii) The nitrite is further oxidized to nitrate with the help of the bacterium *Thiobacillus*.

(iv) In leaves, nitrate is reduced to form ammonia that finally forms the $-NH_2$ group of amino acids.

(v) *Nitrosomonas*, *Nitrosococcus* and *Nitrobacter* are Chemoautotrophs.

(a) (i), (ii) and (iii) (b) (ii), (iii), (iv) and (v)

(c) (i), (iii) and (v) (d) (i), (ii), (iv) and (v)

40. Which of the following statements are incorrect ?

(i) The morphological changes are indicative of certain element deficiencies and are called deficiency symptoms.

(ii) The part of plants that show the deficiency symptoms depend on the mobility of the element in the plant.

(iii) Deficiency symptoms appear first in the young tissues whenever the element are relatively mobile.

(iv) The deficiency symptoms of Cl, Z, N, O, are visible first in the senescent leaves.

Of the above statements.

(a) (iii) and (iv) (b) (i) and (iii)

(c) (i) and (iv) (d) (ii) and (iv)

41. Read the following statements (i to v) and answer the following question.

(i) Nitrogen is very essential for the sustenance of life.

(ii) N_2 - fixation requires a strong reducing agent.

(iii) N_2 - fixation is accomplished with the help of nitrogen fixing microbes, mainly *Frankia.*

(iv) The enzyme nitrogenase which plays an important role in biological N_2 fixation is very sensitive to carbon dioxide.

(v) The energy, ATP, required is provided by the respiration of the host cells.

How many of the above statements are incorrect?

(a) (i), (ii) and (iii) (b) (iii) and (v)

(c) (iii) and (iv) (d) (ii), (iv) and (v)

42. Which of the following statements are correct ?

(i) Solution culture/hydroponics contains all essential minerals except one, the usefulness of which is to be determined.

(ii) Na, Si, Co and selenium are beneficial element required by higher plants.

(iii) Zn is the activator of nitrogenases while Mo is the

activator of alcohol dehydrogenase.

(iv) Zn is needed for auxin synthesis.

(a) (i), (ii), (iii) (b) (i), (ii), (iv)

(c) All of these (d) None of these

43. Ion transport in root occurs

(i) passively through channels.

(ii) actively through channels.

(iii) actively through carriers.

(iv) through both symplast and apoplast.

(a) (i) and (iii) (b) (ii), (iii) and (iv)

(c) (i), (iii) and (iv) (d) (iii) and (iv)

44. Refer the given statements and answer the question.

(i) The element must be absolutely necessary for supporting normal growth and reproduction.

(ii) The requirement of the element must be specific and not replaceable by another element.

(iii) The element must be directly involved in the metabolism of the plant.

The above statements apply to

(a) Criteria for hydroponics (b) Criteria for essentiality

(c) Role of micronutrients (d) Role of macronutrients

45. Which of the following mineral is associated with the characters/functions given below ?

(i) Helps in formation of middle lamella.

(ii) Needed in mitotic spindle formation.

(iii) Accumulates in older leaves.

(iv) Involves in normal functioning of the cell membranes.

(v) Activate certain enzymes.

(vi) Plays an important role in regulating metabolic activities.

(a) K^+ (b) Fe^{3+}

(c) NO_3^- (d) Ca^{2+}

46. The functions given below are performed by which of the following mineral ?

(i) An important constituent of proteins involved in ETS.

(ii) Activator of catalase.

(iii) Essential for chlorophyll synthesis.

(a) N (b) Mg

(c) Fe (d) Cd

ASSERTION/REASON TYPE QUESTIONS

In the following questions, a statement of Assertion is followed by a statement of Reason.

(a) If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.

(b) If both Assertion and Reason are true but the Reason is not the correct explanation of the Assertion.

(c) If Assertion is true but Reason is false.

(d) If both Assertion and Reason are false.

47. **Assertion :** Deficiency of sulphur causes chlorosis in plants.

Reason : Sulphur is a constituent of chlorophyll, protein and nucleic acids.

48. **Assertion** : Macromtrients are generally present in plant tissues in large amounts (in excess of 10 mmole kg^{-1} of dry matter)

Reason : Macronutrient includes iron manganese copper, molybdenum, zinc, boron, chlorine and nickel

49. **Assertion** : Nitrogen is the essential nutrient element requird by plants in the greatest amount.

Reason : Nitrogen is absorbed mainly as NO_3^- though some are also taken up NO_2^- or NH_4^+

50. **Assertion** : Chlorosis is the loss of chlorophyll leading to yellowing of leaves.

Reason : This symptom is caused by the deficiency of elements N,K, Mg, S, Fe and Mo.

51. **Assertion** :Ammonia is first oxidized to nitrate by the bacteria *Nitrosomonas* or *Nitrococcus*.

Reason : These nitryfying Bacteria are chemoheterotrophs .

MATCHING TYPE QUESTIONS

52. Match column-I with column-II and choose the correct option.

	Column - I (Nutrients)		**Column -II (Functions)**
A.	Mg^{2+}	I.	Activator of dehydrogenase
B.	Zn^{2+}	II.	Activator for both Ru BP carboxylase-oxygenase and PEP are
C.	K^+	III.	Required for all Phosphorylation reactions
D.	$H_2PO_4^-$	IV.	Plays an important role in opening and closing of stomata

(a) A – II, B – IV, C – I, D – III

(b) A – II, B – I, C – IV, D – III

(c) A – III, B – I, C – IV, D – II

(d) A – III, B – I, C – II, D – IV

53. Match the items given in column-I with their examples given in column-II and choose the correct answer.

	Column-I		**Column-II**
A.	Free living aerobic nitrogen fixers	I.	*Anabaena* and *Nostoc*
B.	Anaerobic nitrogen fixers	II.	*Pseudomonas* and *Thiobacillus*
C.	Nitrogen fixing cyanobacteria	III.	*Nitrosomonas* and *Nitrococcus*

D. Denitrifying bacteria IV. *Azotobacter* and *Beijernickia*
E. Nitrifying bacteria. V. *Rhodospirillum*
(a) A – IV, B – V, C – I, D – II, E – III
(b) A – V, B – IV, C – I, D – III, E – II
(c) A – IV, B – V, C – II, D – III, E – I
(d) A – IV, B – III, C – I, D – II, E – V

54. Match the column-I with column-II and choose the correct option.

	Column-I		**Column-II**
A.	Manganese	I.	Component of various enzymes and participate in nitrogen metabolism.
B.	Zinc	II.	Required for pollen germination and carbohydrate translocation
C.	Molybdenum	III.	Helps in splitting of water to liberate oxygen during photosynthesis
D.	Boron	IV.	Needed in the synthesis of auxin

(a) A – I, B – IV, C – III, D – IV
(b) A – III, B – II, C – I, D – IV
(c) A – III, B – IV, C – I, D – II
(d) A – IV, B – III, C – II, D – I

55. Match the column-I containing minerals with the functions given in column-II and choose the correct combination given.

	Column-I (Minerals)		**Column-II (Functions)**
A.	K	I.	Stomatal opening
B.	Mo	II.	Constituent of cell membrane
C.	P	III.	Photolysis of water
D.	Mn	IV.	Free ion
		V.	Component of nitrogenase and nitrate reductase

	A	**B**	**C**	**D**
(a)	I, IV	V	II	III
(b)	I, V	IV	III	II
(c)	I , V	IV	II	III
(d)	IV	I	III	II, V

56. Match the column-I with column-II and choose the correct combination from the option given below.

	Column -I		**Column-II**
A.	Zinc	I.	Chlorophyll
B.	Sulphur	II.	IAA
C.	Magnesium	III.	Nitrate reductase
D.	Molybdenum	IV.	Cysteine

(a) A – I, B – II, C – III, D – IV
(b) A – III, B – IV, C – I, D – II
(c) A – III, B – I, C – II, D – IV
(d) A – II, B – IV, C – I, D – III

57. Match the column-I with column-II and choose the correct option.

	Column-I		**Column-II**
A.	P	I.	Found in some amino acids
B.	S	II.	All phosphorylation reaction
C.	I	III.	Not important for plants
D.	Mn	IV.	Required for photolysis of water

(a) A – II, B – I, C – III, D – IV
(b) A – I, B – II, C – III, D – IV
(c) A – I, B – III, C – IV, D – II
(d) A – II, B – III, C – I, D – IV

58. Which of the following bacteria is correctly matched with their function ?

A. *Nitrosomonas* – Nitrite to nitrate
B. *Thiobacillus* – Dentrification
C. *Nostoc* – Free-living nitrogen-fixer
D. *Azotobacter* – Anaerobic nitrogen-fixer
(a) A and B (b) C and D
(c) B and C (d) B and D

59. Which of the following is the mismatched pair?

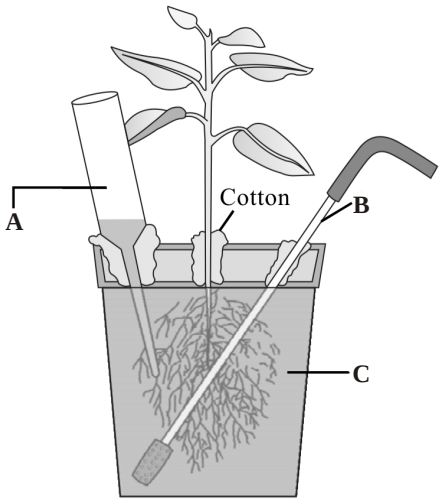
Mineral elements	**Form that is absorbed by plant**
(a) Nitrogen	NO_3^-
(b) Phosphorus	$H_2PO_4^-$
(c) Sulphur	H_2SO_4
(d) Iron	Fe^{3+}

60. Which of the following is an incorrect match of essential element and function?
(a) Manganese - Structural component of chlorophyll.
(b) Calcium - Component of the middle lamella.
(c) Zinc - Enzyme activator.
(d) Iron - Component of ferredoxin.

61. Find the incorrectly matched pair.
(a) *Rhizobium* → Alfalfa
(b) *Frankia* → *Alnus*
(c) *Rhodospirillum* → Aerobic
(d) *Bacillus* → Free -living

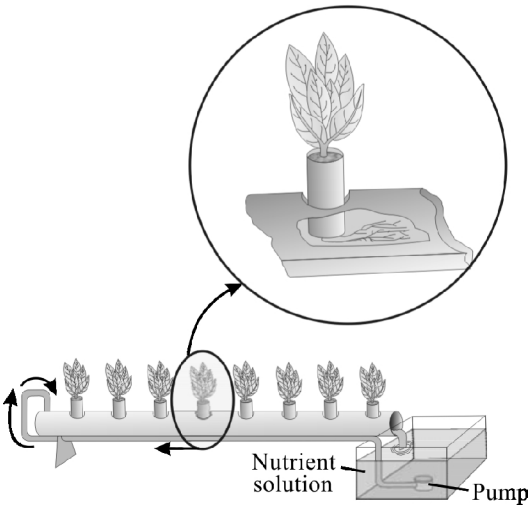
DIAGRAM TYPE QUESTIONS

62. The given figure shows a typical set up with their parts marked as A, B and C. Identify A, B and C and determine which experiment is demonstrated in the given figure?



	A	B	C	D
(a)	Funnel for adding water and nutrients	Aerating tube	Nutrient solution	Hydroponics
(b)	Funnel for adding water only	Aerating tube	Nutrient solution	Aeroponics
(c)	Funnel for adding nutrients only	Aerating tube	Water	Tissue culture
(d)	Funnel for adding water and nutrients	Aerating tube	Water	Hydroponics

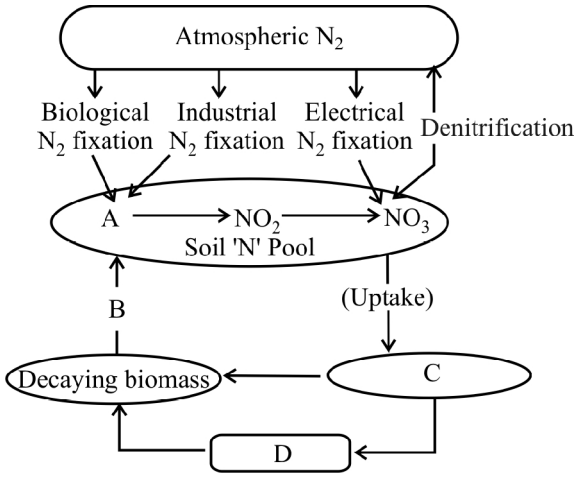
63. The given diagram shows hydroponic/soilless plant production. Plants are grown in a tube or trough placed on a slight incline. The arrows indicate the direction of flow of nutrient solution.



Nutrient solution is sent to the elevated end of the tube from the reservoir by ___X___ and it flows back to the reservoir due to ___Y___ . Identify X and Y.

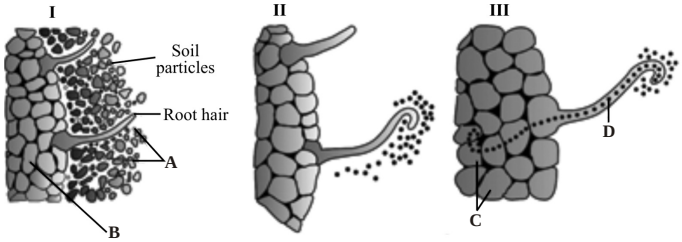
(a) pump, pump
(b) gravity, gravity
(c) pump, gravity
(d) gravity, pump

64. Refer the figure given below and select the option which gives correct labelling for all the four blanks A, B, C and D.



	A	B	C	D
(a)	K	Ammonification	Animal biomass	Plant biomass
(b)	NH_3	Ammonification	Plant biomass	Animal biomass
(c)	CO_2	Denitrification	Animal biomass	Plant biomass
(d)	CHO	Nitrification	Plant biomass	Animal biomass

65. The given diagram shows the development of root nodule in soyabean. Thus structures are marked as A, B, C and D.



Identify the correct labelling of A, B, C & D.

(a) A-*Rhizobial* bacteria; B-Cortex cell; C-Outer cortex; D-Infection thread containing virus.
(b) A-*Rhizobial* bacteria; B-Cortex cell; C-Inner cortex and pericycle cells; D-Infection thread containing bacteria
(c) A-*Rhizobial* bacteria; B-Endodermal cell; C-Inner

endodermis; D-Infection thread containing virus

(d) A-*Nitrosomonas* bacteria; B-Cortex cell; C-Inner cortex and pericyele cells; D-Infection thread containing bacteria.

CRITICAL THINKING TYPE QUESTIONS

66. Plants absorb nitrogen from soil mainly in the form of
(a) N_2-gas (b) nitric acid
(c) nitrite (d) nitrate

67. Which of the following element is involved in plants for protein synthesis?
(a) Potassium (b) Calcium
(c) Iron (d) Zinc

68. An important essential element which is required by plants in the greatest amount is
(a) nitrogen (b) iron
(c) sulphur (d) copper

69. The minerals involved in the synthesis of DNA and RNA, for maintenance of the turgidity of cells and for the activation of the enzyme catalase are respectively
(a) potassium, magnesium, chlorine
(b) sulphur, potassium, iron
(c) phosphorus, potassium, chlorine
(d) magnesium, potassium, iron

70. The term critical concentration means
(a) essential element concentration below which plant remains in the vegetative phase.
(b) essential element concentration below which the plant growth is retarded.
(c) essential element concentration above which the plant growth is stunted.
(d) non-essential element concentration below which plant growth is retarded.

71. Which one of these do plants require for the formation of adenosine triphosphate?
(a) N, Cu (b) N, Ca
(c) N, P (d) N, K

72. In an active process, the entry or exit of ions to and from the symplast requires
(a) ATP (b) cyclic AMP
(c) NADH (d) NADPH

73. A small aquatic plant was put in each of the petridishes - X, Y & Z, containing different culture solutions. After six weeks the plant in dish X had the same number of leaves as it had previously & were all small and yellowish. Plant in dish Y had more leaves of normal size and dark green colour. Plants in dish Z had more leaves of normal size but very pale. Which of the following show the element missing in the culture?

	X	Y	Z
(a)	Magnesium	Phosphorus	Nitrogen
(b)	Phosphorus	Magnesium	Nitrogen
(c)	Phosphorus	Nitrogen	Magnesium
(d)	Magnesium	Nitrogen	Phosphorus

74. Some bacteria such as 'X' and 'Y' occur in soil which reduce nitrate to nitrogen by the process of 'Z'. Identify 'X', 'Y' and 'Z'
(a) 'X'-Nitrogen, 'Y'-*Pseudomonas*, 'Z'-Ammonification
(b) 'X'-*Nitrosomonas*, 'Y'-*Thiobacillus*, 'Z'-Ammonification
(c) 'X'-*Pseudomonas*, 'Y'-*Thiobacillus*, 'Z'-Nitrification
(d) 'X'-*Pseudomonas*, 'Y'-*Thiobacillus*, 'Z'-Dentrification

75. Biological nitrogen fixation is the
(a) reduction of nitrogen to ammonia by living organisms.
(b) oxidation of nitrogen to ammonia by living organism.
(c) conversion of nitrogen to ammonia by UV radiation.
(d) conversion of ammonia to nitrogen by electrical discharge.

76. All are free-living nitrogen fixers except
(a) *Azotobacter* (b) *Beijernickia*
(c) *Anabaena* (d) *Rhizobium*

77. Plant absorbs nitrogen from the soil in the form of
(a) ammonia (b) N_2
(c) nitrite (d) nitrate

78. Which of the following is an anaerobic N_2 fixing bacterium?
(a) *Azotobacter* (b) *Bacillus*
(c) *Rhodospirillum* (d) *Beijernickia*

79. $N_2 + 8e^- + 8H^+ + 16\,ATP \rightarrow 2NH_4 + H_2 + 16ADP + 16Pi$
The above equation refers to
(a) ammonification (b) nitrification
(c) nitrogen fixation (d) denitrification

80. Nitrogen fixation by organisms requires conditions that are
(a) aerobic (b) anaerobic
(c) saturated with sunlight (d) free of water

81. Which of the following bacteria can fix nitrogen for plants such as clover and beans ?
(a) *Denitrovibri* (b) *Rhizobium*
(c) *Pseudomonas* (d) *Nitrobacter*

82. At physiological pH, for the formation of ammonium ion, ammonia is
(a) protonated (b) deprotonated
(c) carbonylated (d) decarbonylated

83. Which of the following expression describes nitrogen fixation?

(a) $N_2 + 3H_2 \rightarrow 2NH_3$

(b) $2NH^+_4 + 2O_2 + 8e^- \rightarrow N_2 + 4H_2O$

(c) $2NH_3 \rightarrow N_2 + 3H_2$

(d) $2N_2$ + glucose $\rightarrow$ 2 amino acids

84. A gardner purchases a commercial fertilizer. The label says that it is 10-20-10. This label refers to the

(a) percentage of nitrogen, phosphate and potassium.

(b) percentage of nitrogen, carbon and oxygen.

(c) rate at which nitrogen is released from the fertilizer.

(d) ratio of organic to inorganic matter in the fertilizer.

85. The deficiencies of micronutrients, 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?

(a) Co, Ni, Mo (b) Ca, K, Na

(c) Mn, Co, Ca (d) Cu, Mn, Fe

86. Which of the following can fix atmospheric nitrogen ?

(a) *Albugo* (b) *Cystopus*

(c) *Saprolegnia* (d) *Anabaena*

87. Which of the following is a free living aerobic non-photosynthetic nitrogen-fixer?

(a) *Rhizobium* (b) *Azotobacter*

(c) *Azospirillum* (d) *Nostoc*

88. In plant nutrition, elements are classified as major or minor nutrients depending on

(a) their availability in the soil.

(b) their relative production in the ash obtained after burning the plants.

(c) the relative amounts required by the plants.

(d) their relative importance in plant growth.

89. Minerals are known to enter the plant root by means of a number of mechanisms, including all except one of the following. Which one of the following is a mechanism for moving minerals into roots?

(a) Foliar feeding (b) Active transport

(c) Proton (H^+) pump (d) Cation exchange

90. The most abundant gas in our atmosphere cannot be utilized by plants directly in its atmospheric form and is, therefore, captured by certain bacteria that live symbiotically in the nodules of roots. Identify the gas?

(a) Oxygen (b) Nitrogen

(c) Neon (d) Hydrogen

91. Legume's roots have swellings called nodules that

(a) produce antibiotics that protect the plant from soil bacteria.

(b) provide a steady supply of sugar to the host plant.

(c) increases the surface area for water uptake.

(d) contain nitrogen-fixing bacteria.

92. In plants a common symptom caused by deficiencies of Cu, K, Ca and Mg is the

(a) formation of anthocyanin.

(b) bending of leaf tip.

(c) poor development of vasculature.

(d) appearance of dead necrotic tissues.

93. A boy notices that the young leaves of his tomato plants are very yellow. Deficiency of which of the following nutrient does this suggest ?

(a) Nitrogen (b) Carbon

(c) Water (d) Iron

94. Which of the following groups contain no species that are able to fix nitrogen ?

(a) Cyanobacteria in the ocean and fresh water.

(b) Soil bacteria including *Rhizobium.*

(c) Cyanobacteria in lichens.

(d) Aerobic bacteria in the genera *Bacillus* and *Pseudomonas.*