

MINERAL NUTRITION

1. Which group of element is not essential for a normal plant?
(A) Potassium, calcium, magnesium
(B) Iron, zinc, manganese, boron
(C) Lead, nickel, iodine, sodium
(D) Magnesium, iron, molybdenum
2. Technique of growing plants without soil in nutrient solutions is called
(A) Parthenogenesis (B) Hydroponics
(C) Aquaculture (D) Tissue culture
3. Which element forms part of structure of chlorophyll molecule
(A) Fe (B) Mg
(C) K (D) Mn
4. Which of the following pair of minerals are required by plants for chlorophyll synthesis?
(A) Fe and Mn (B) Fe and Mg
(C) Cu and Mg (D) Mg and Mo

5. Which mineral element stimulates the activity of many enzymes but is not a constituent of any enzyme?
(A) P (B) S (C) Mn (D) K
6. Identify a common symptom caused by deficiency of essential minerals Cu, Ca, K and Mg in plants.
(A) Inhibition of Cell Division
(B) Formation of anthocyanin
(C) Poor development of vasculature
(D) Appearance of dead necrotic areas
7. Chlorosis occurs when plants are grown in
(A) Dark (B) Shade
(C) Strong light
(D) Fe free medium or (due to lack of iron or magnesium)
8. Which of the following is a micro-nutrient or a trace element
(A) Mg (B) Zn
(C) Ca (D) P
9. Which one of the following elements plays an important role in biological nitrogen fixation
(A) Molybdenum (B) Manganese

(C) Copper

(D) Zinc

10. Important contribution of molybdenum is

(A) Flower growth

(B) Nitrogen fixation

(C) Chromosome condensation (D) Carbon fixation

11. Conduction of inorganic materials in plants occur mainly through or Minerals absorbed by roots move to the leaf through

(A) Xylem

(B) Phloem

(C) Sieve tube

(D) None

12. The loss of water in the form of liquid droplets from the leaf margins and tips is called

(A) Transpiration

(B) Guttation

(C) Percolation

(D) Leaching

13. Most of the plants obtain or absorb nitrogen from soil in the form of

(A) Free nitrogen gas

(B) Nitric acid

(C) Nitrite

(D) Nitrates

14. Symbiotic microorganism is

(A) Clostridium

(B) Azotobacter

(C) Rhizobium

(D) Chromatium

15. N_2 fixation is

(A) $N_2 \rightarrow NH_3$

(B) $N_2 \rightarrow NO_3$

(C) $N_2 \rightarrow$ Amino acid

(D) Both (A) and (B)

16. Insectivorous plants usually grow in soils which are deficient in

(A) Nitrogen

(B) Water

(C) Organic matter

(D) Ca/Mg

17. Which bacteria convert ammonia to nitrite?

(A) Nitrobacter

(B) Pseudomonas

(C) Nitrosomonas

(D) Thiobacillus

18. Which genes do not control the formation of root nodules of bacteria?

(A) *nod*

(B) *nif*

(C) *fix*

(D) *cry*

19. One of the following is saprophytic angiosperm

(A) Rafflesia

(B) Cuscuta

(C) Loranthus

(D) Monotropa

20. Which one of the following is a parasitic plant

(A) Drosera

(B) Cuscuta

- (C) Nepenthes
- (E) Water Hyacinth

(D) Utricularia

21. Which of the following plant attracts the insects upon which it preys?

(A) Opuntia

(B) Pinus

(C) Eucalyptus

(D) Drosophyllum

22. *Dionaea muscipula* is

(A) Venus fly trap

(B) Butterwort

(C) Water fly trap

(D) Bladderwort

23. Insectivorous plants catch and digest insects for

(A) Obtaining nitrogen

(B) Protecting their leaves

(C) Protecting their fruits

(D) Being heterotrophs of consumer level

24. Match the columns

I	II
(A) Magnesium	(i) Found in middle lamella
(B) Sulphur	(ii) A structural component of chlorophyll
(C) Calcium	(iii) Required for enzyme activity
(D) Iodine	(iv) Found in some amino acids
(E) Manganese	(v) A component of sugars
	(vi) Not important for plants

	A	B	C	D	E
(A)	(ii)	(iv)	(i)		(vi) (iii)
(B)			(ii)	(iv) (v)	(vi) (iii)
(C)	(ii)	(vi)	(i)		(iv) (iii)
(D)	(iii)	(iv)	(i)		(vi) (ii)

25. EDTA is much used in tissue cultures, it is a

- (A) Hormone (B) Vitamin
(C) Buffer (D) Nutrient

26. Calcium works as catalyst for

- (A) ATPase (B) Phospholipids
(C) Succinic dehydrogenase (D) All the above

27. Which of the following contains phosphorous?

- (A) Vitamin A
- (C) Lecithin

- (B) Vitamin K
- (D) Serine

28. Woodward (1669) observed that plant grew better in muddy water than in rain water because

- (A) Muddy water had most of essential elements dissolved in it.
- (B) Muddy water had micro nutrients dissolved in it.
- (C) Muddy water had macro nutrients dissolved in it.
- (D) None of these

29. What residue is left if a plant material is dried and burnt in a crucible at a temperature of 600°C?

- (A) Waste product
- (B) Inorganic substances
- (C) Organic substances
- (D) All of these

30. Which element helps in the uptake and utilization of Ca^{2+} in plants?

- (A) Calcium
- (B) Copper
- (C) Zinc
- (D) Boron

31. Which of the following is deficient in the soil of Gujrat, U.P. and Maharashtra in a large area

- (A) Nitrogen
- (C) Zinc

- (B) Copper
- (D) Potassium

32. On the basis of symptoms of chlorosis in leaves, a student inferred that this was due to the deficiency of nitrogen. This inference could be correct only if yellowing of leaves appeared first in

- (A) Young leaves
- (B) Old leaves
- (C) Young leaves followed by old leaves
- (D) Old leaves followed by young leaves

33. Nickel deficiency leads to production of non-viable seeds in:

- (A) Barley
- (B) Wheat
- (C) Paddy
- (D) Maize

34. Which of the following shows that metabolic energy is required in the absorption of ions

- (A) More ions absorption in presence of oxygen
- (B) Less absorption of ions in presence of oxygen
- (C) More ions absorption in presence of ATP
- (D) More ions absorption in presence of NAD

35. According to the well-known theory of transport of solutes across a cell membrane, what happens when sugar is passed through it

- (A) Na⁺ flows in the direction of the sugar
- (B) Na⁺ flows independent of sugar molecules
- (C) Na⁺ flows against the sugar molecules
- (D) Na⁺ ions do not flow at all

36. How the level of organic acid varies with the absorption of cations

- (A) Acid level remains unchanged
- (B) Acid level increases
- (C) Acid level decreases
- (D) Acid synthesis stopped

37. Which element is added to apples to develop attractive colour?

- (A) Silicon
- (B) Boron
- (C) Nitrogen
- (D) Chlorine

38. Fertility of the soil in rice fields can be improved by

- (A) Gypsum
- (B) Sodium chloride
- (C) Blue-green algae
- (D) Rhizobium

39. Which of the following infests dicots and is a stem parasite?

- (A) *Rafflesia*
- (B) *Cuscuta reflexa*
- (C) *Atkinsonia*
- (D) *Nuytsia*

40. Which element encourages the root development?

- (A) Mn
- (B) Zn
- (C) Fe
- (D) Ca

41. Which of the following is a symbiotic nitrogen fixer of legumes?

- (A) *Rhizobium*
- (B) *Frankia*
- (C) *Cyanobacteria*
- (D) All of these

42. Identify the deficiency symptom/s of sulphur in plants.

- (A) Hard and woody stems
- (B) Reduction in juice content in citrus
- (C) Extension of root system
- (D) All of these

43. The deficiency of which element causes 'little leaf' and 'rosette' of apples and peaches?

- (A) Zinc
- (B) Copper
- (C) Molybdenum
- (D) Boron

44. Which of the following is NOT a macronutrient?

(A) S

(B) Ca

(C) K

(D) Cu

45. Which of the following method would be best for artificial nitrogen fixation?

(A) Meyerhoff- Paranas method

(B) Haber-Bosch method

(C) Deacon method

(D) Fisher-tropsch method

ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
C	B	B	B	A	D	D	B	A	B	A	B	D	C	D	
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
A	C	D	D	B	D	A	A	A	C	D	C	C	B	D	
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	
C	B	A	C	A	B	C	C	C	D	A	D	A	D	B	

SOLUTIONS

3. Mg is present in centre of chlorophyll molecule head.
4. Fe is essential in chlorophyll synthesis and takes part in electron transport systems in photosynthesis and respiration for the release of energy. Mg is present in tetrapyrrolic chlorophyll. Thus, it is found in all the green parts of the plants and helps in photosynthesis.
5. Potassium is essential activator of several enzymes. It is needed in the enzyme system in the change of sugar to starch, amino acids to proteins and citric acid synthesis. Hence, option A is the correct answer.
6. Necrosis or death of leaf tissue is caused by deficiency of minerals - Cu, Ca, K and Mg. It occurs after chlorosis leading to yellowing of leaves that appears at specific regions of leaves like tips, interveinal, margins, etc.

7. Deficiency symptom of chlorosis is therefore, common, e.g., Mg, Fe, N, Ca, S.
8. Plants require this mineral (Zn) only in traces and its higher concentrations are highly toxic.
9. Molybdenum is required for nitrogen fixation. Nitrate metabolism depends upon enzyme nitrate reductase. It is an activator of nitrate reductase. Therefore, the element is important for nitrogen fixation.
11. Because inorganic materials move with water.
12. Due to root pressure droplets of liquid come out through special openings (hydathodes) at the vein endings of the leaf. This loss of water in the form of liquid droplets from the leaf margins and tips is called guttation.
13. Higher plants generally utilize the oxidized forms such as nitrate (NO_3^-) and nitrite (NO_2^-) the reduced form (NH_4^+) chief source of nitrogen are the nitrates of calcium and potassium.
16. Insectivorous plants usually grow in water logged and swampy soil deficient in nitrogen compounds. These plants leaves trap and digest the insects and other small animals to get their nitrogen requirements.
17. During nitrification, ammonia is oxidized into nitrite by Nitrosomonas and Nitrococcus.
18. The formation of root nodules and nitrogen fixation occur under the control of *nod* genes of legumes and the *nod*, *nif*

and fix genes of bacteria. Hence, option D is the correct answer.

21. *Drosophyllum* is a carnivorous plant that grows in dry soil. It has a distinct sweet aroma, which attracts the insects upon which it preys.
23. Plants usually grow in nitrogen deficient soils and fulfill their nitrogen requirement by digesting insects.
25. EDTA is buffer solution and it maintains the pH of culture medium.
26. Calcium is involved in the activation of certain enzymes such as succinate dehydrogenase, ATPase and some kinase in the metabolism process. It occurs as calcium pectate in the middle lamella of cell wall, hence it is necessary for cell enlargement. It is necessary for selective permeability of cell membranes. Hence, option D is the correct option.
27. Phosphorous is present in cell membranes as phospholipids. Lecithin is a phospholipid containing phosphoric acid as one of its constituents. Hence, lecithin contains phosphorous.
28. Because rain water are not capable to dissolve minerals it drains fastly.
29. If a plant material is dried and burnt at a temperature of 600°C in silica crucible, the remaining plant ash would contain inorganic substances or only mineral elements as all the organic substances vaporizes.

30. Boron is required for uptake and utilization of Ca^{2+} and nodulation of roots.
31. In these areas the deficiency of Zn is due to presence of black soil in which naturally Zn compounds are lacking.
32. Chlorosis is the main symptom of nitrogen deficiency. As a result, the leaves gradually become pale or yellow. These symptoms first appear in old leaves and later in young leaves.
33. Nickel deficiency in barley plants results in the production of non-viable seeds which show various anatomical abnormalities.
34. The absorption of ions, involving use of metabolic energy is called active absorption. Energy is generally obtained from ATP. Therefore, active absorption is linked to hydrolysis of ATP.
37. Nitrogen is required for metabolic processes so during ripening of apples, it is added in small quantity that increases its carbohydrate content and thus increases its colouration.
38. *Aulosira fertilissima* (Blue-green algae) is an important nitrogen fixer of rice fields.
39. *Cuscuta reflexa* is a stem parasite that infests most of the dicots. It do not have cotyledons and roots but initially grows on soil.
40. Calcium encourages the root development. Its deficiency leads to decomposition of root epidermis and the growing

zone of root or root tip die off. Hence, Ca is essential for the growth of root tip.

41. *Rhizobium* is a symbiotic nitrogen fixer in the roots of legumes.
42. The deficiency of sulphur in young leaves causes chlorosis throughout the entire leaf including vascular bundles. It causes the reduction in juice content in citrus and the root system becomes extensive and the stems become hard and woody. Hence, option D is correct.
43. Deficiency of zinc causes reduction in the growth of young leaves and stem internodes and thus causes 'little leaf' and 'rosette' of apples and peaches.
44. Macronutrients are the elements which are generally present in large amounts in the plant tissues whereas micronutrients are trace elements needed in minute quantities in plants. Cu is a not a macronutrient, it is a micronutrient whereas all the other three elements are macronutrients.
45. Haber–Bosch process is an artificial nitrogen fixation process for the production of ammonia. It converts atmospheric nitrogen (N_2) to ammonia (NH_3) by reacting with hydrogen (H_2) using a metal catalyst under high temperatures and pressures.