

# Agriculture Review

## Soil Science (Soil Chemistry and Fertility) Review

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**1. Which of the following refers to the capacity of soil to hold and exchange positively charged ions?**

- A. Anion Exchange Capacity
- B. Base Saturation
- C. Cation Exchange Capacity
- D. Electrical Conductivity

**2. What is the primary agricultural amendment used to raise the pH of acidic soils?**

- A. Gypsum
- B. Elemental Sulfur
- C. Agricultural Lime
- D. Ammonium Sulfate

**3. Which nutrient deficiency typically causes interveinal chlorosis in the older leaves of plants?**

- A. Iron
- B. Nitrogen
- C. Magnesium
- D. Calcium

**4. What type of soil acidity is represented by the hydrogen and aluminum ions present in the soil solution?**

- A. Reserve acidity
- B. Active acidity
- C. Exchangeable acidity
- D. Residual acidity

**5. Which clay mineral typically exhibits the lowest Cation Exchange Capacity (CEC)?**

- A. Montmorillonite
- B. Vermiculite
- C. Illite
- D. Kaolinite

**6. Which of the following essential plant nutrients is classified as a micronutrient?**

- A. Magnesium
- B. Sulfur
- C. Zinc
- D. Potassium

**7. The percentage of the cation exchange capacity occupied by basic cations such as calcium, magnesium, potassium, and sodium is known as:**

- A. Exchangeable sodium percentage
- B. Percentage base saturation
- C. Buffering capacity
- D. Anion exchange capacity

**8. Which soil amendment is primarily used to reclaim sodic soils by displacing sodium with calcium?**

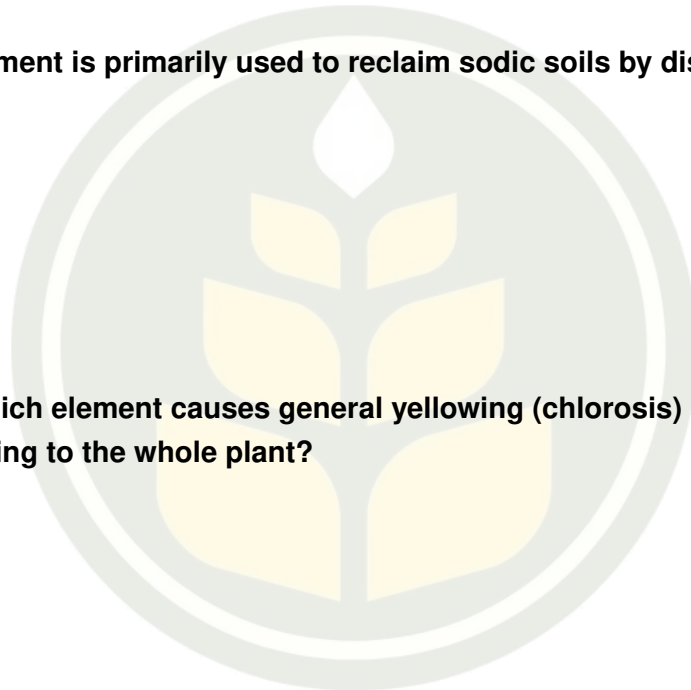
- A. Dolomite
- B. Gypsum
- C. Urea
- D. Calcitic Lime

**9. A deficiency of which element causes general yellowing (chlorosis) starting at the older leaves and progressing to the whole plant?**

- A. Nitrogen
- B. Sulfur
- C. Iron
- D. Boron

**10. What is the form of nitrogen most commonly absorbed by plants in well-aerated upland soils?**

- A. Ammonium ( $\text{NH}_4^+$ )
- B. Nitrite ( $\text{NO}_2^-$ )
- C. Nitrate ( $\text{NO}_3^-$ )
- D. Nitrogen gas ( $\text{N}_2$ )



**11. Purpling or reddish coloration on the undersides of older leaves is a classic deficiency symptom of which nutrient?**

- A. Potassium
- B. Phosphorus
- C. Calcium
- D. Molybdenum

**12. Which of the following is considered a basic cation in soil chemistry?**

- A. Hydrogen (H<sup>+</sup>)
- B. Aluminum (Al<sup>3+</sup>)
- C. Iron (Fe<sup>3+</sup>)
- D. Potassium (K<sup>+</sup>)

**13. What is the optimal soil pH range for the maximum availability of most essential plant nutrients?**

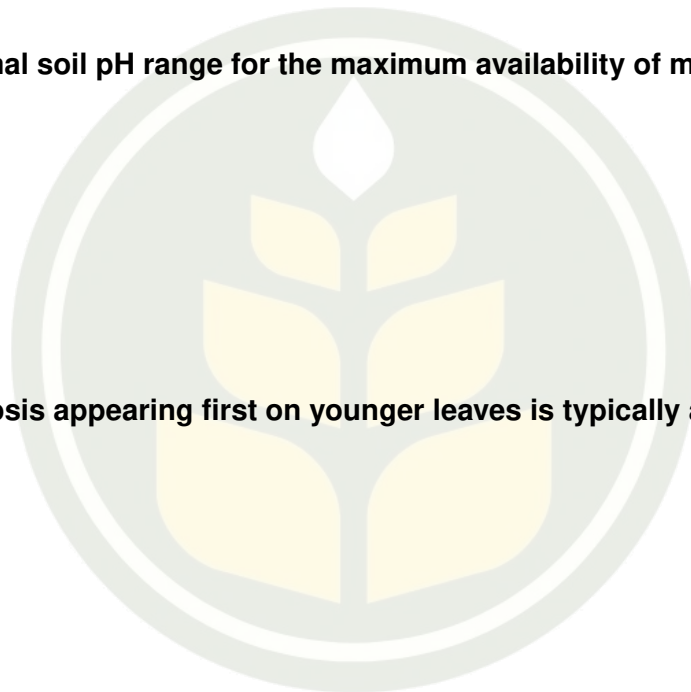
- A. 4.5 - 5.5
- B. 6.0 - 7.0
- C. 7.5 - 8.5
- D. 8.5 - 9.5

**14. Interveinal chlorosis appearing first on younger leaves is typically associated with a deficiency in:**

- A. Iron
- B. Magnesium
- C. Nitrogen
- D. Potassium

**15. Which of the following components of soil organic matter contributes most significantly to soil CEC?**

- A. Cellulose
- B. Lignin
- C. Humus
- D. Hemicellulose



**16. Which macronutrient is primarily responsible for stomatal regulation and osmoregulation in plants?**

- A. Phosphorus
- B. Potassium
- C. Calcium
- D. Sulfur

**17. Blossom end rot in tomatoes and tip burn in lettuce are physiological disorders caused by a deficiency in which relatively immobile nutrient?**

- A. Copper
- B. Calcium
- C. Magnesium
- D. Manganese

**18. Which of the following fertilizers is known to have an acidifying effect on the soil over time?**

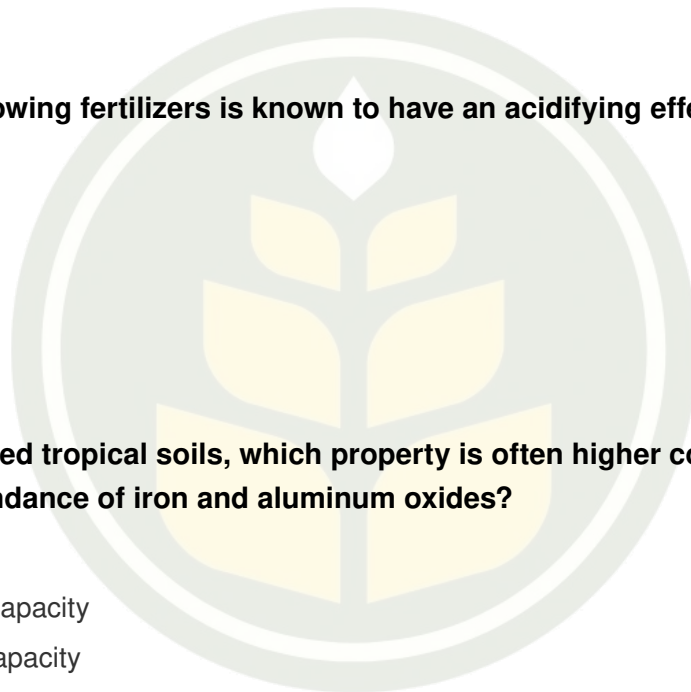
- A. Ammonium sulfate
- B. Calcium nitrate
- C. Potassium chloride
- D. Rock phosphate

**19. In highly weathered tropical soils, which property is often higher compared to temperate soils due to the abundance of iron and aluminum oxides?**

- A. Base Saturation
- B. Cation Exchange Capacity
- C. Anion Exchange Capacity
- D. Electrical Conductivity

**20. Which of the following is an acidic cation?**

- A. Calcium ( $\text{Ca}^{2+}$ )
- B. Magnesium ( $\text{Mg}^{2+}$ )
- C. Sodium ( $\text{Na}^+$ )
- D. Aluminum ( $\text{Al}^{3+}$ )



**21. What type of lime contains both calcium carbonate and magnesium carbonate?**

- A. Calcitic lime
- B. Quicklime
- C. Slaked lime
- D. Dolomitic lime

**22. Which essential element is a structural component of the chlorophyll molecule?**

- A. Iron
- B. Magnesium
- C. Sulfur
- D. Zinc

**23. Marginal necrosis or 'scorching' along the edges of older leaves indicates a deficiency of which nutrient?**

- A. Phosphorus
- B. Potassium
- C. Nitrogen
- D. Boron

**24. Which soil property acts as a resistance to sudden changes in soil pH?**

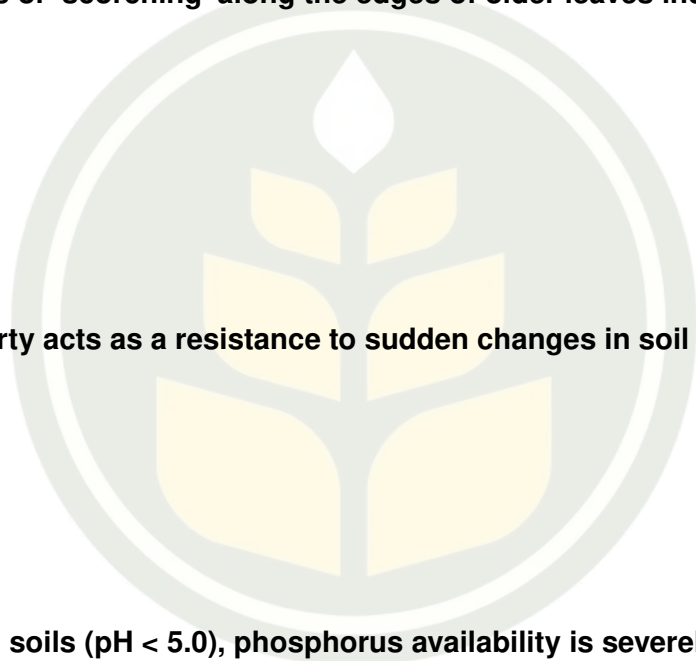
- A. Base saturation
- B. Flocculation
- C. Buffering capacity
- D. Salinization

**25. In strongly acidic soils (pH < 5.0), phosphorus availability is severely reduced primarily due to fixation by:**

- A. Calcium and Magnesium
- B. Iron and Aluminum
- C. Sodium and Potassium
- D. Manganese and Zinc

**26. Which essential plant nutrient is taken up as either a divalent cation (Ca<sup>2+</sup>) or not at all?**

- A. Nitrogen
- B. Phosphorus
- C. Calcium
- D. Boron



**27. What happens to the Cation Exchange Capacity (CEC) of soil organic matter as soil pH increases?**

- A. It decreases
- B. It remains constant
- C. It increases
- D. It becomes zero

**28. A plant exhibiting 'whiptail' disease in cauliflower is likely deficient in which micronutrient?**

- A. Zinc
- B. Molybdenum
- C. Copper
- D. Iron

**29. Which form of soil acidity represents the  $H^+$  and  $Al^{3+}$  ions bound to the surfaces of soil colloids?**

- A. Active acidity
- B. Reserve acidity
- C. Free acidity
- D. Neutral acidity

**30. Sulfur deficiency symptoms typically appear first on which part of the plant?**

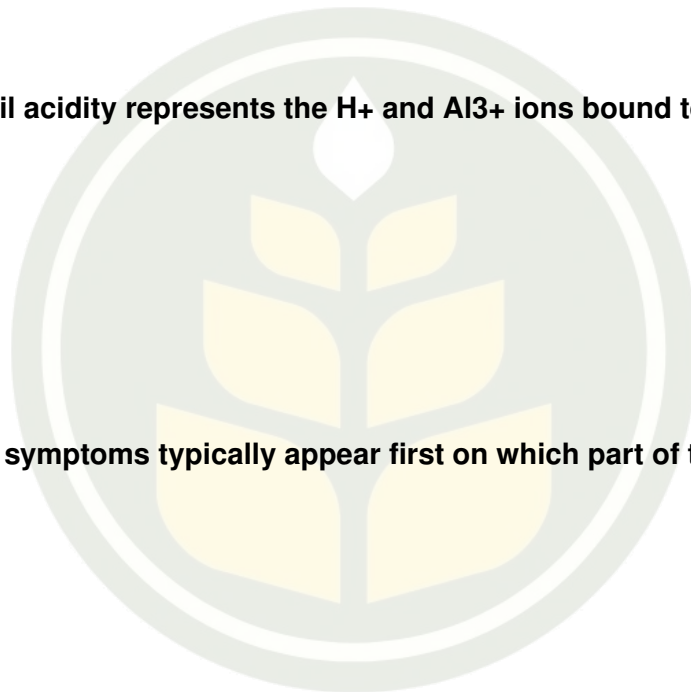
- A. Older leaves
- B. Younger leaves
- C. Roots only
- D. Stems only

**31. Which element is essential for nitrogen fixation by root nodule bacteria in legumes?**

- A. Cobalt
- B. Molybdenum
- C. Chlorine
- D. Sodium

**32. Soil colloids generally carry what type of net electrical charge?**

- A. Positive
- B. Negative
- C. Neutral
- D. Variable only



**33. Which essential nutrient is involved primarily in the transport of sugars across cell membranes?**

- A. Zinc
- B. Manganese
- C. Boron
- D. Copper

**34. The chemical formula for Agricultural Lime is:**

- A. CaO
- B. Ca(OH)<sub>2</sub>
- C. CaSO<sub>4</sub>
- D. CaCO<sub>3</sub>

**35. Which among the following nutrients is considered a macronutrient because it is required in large quantities?**

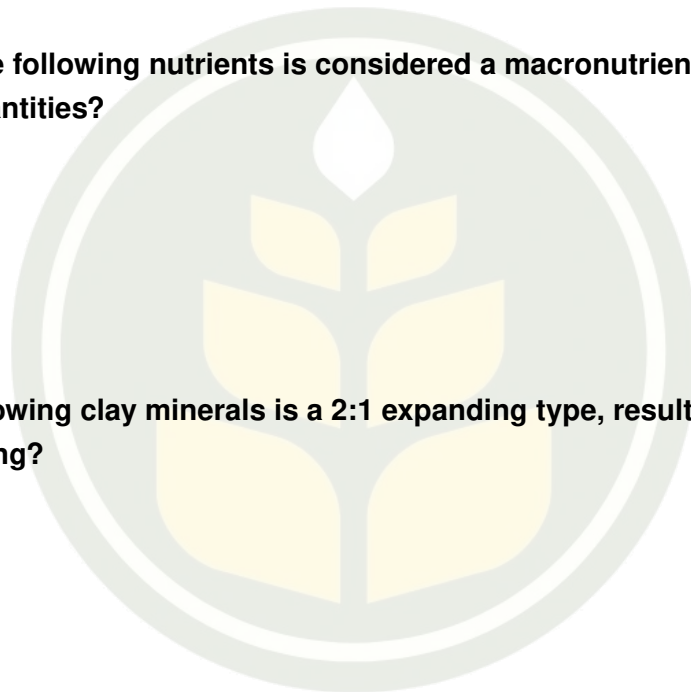
- A. Manganese
- B. Chlorine
- C. Sulfur
- D. Iron

**36. Which of the following clay minerals is a 2:1 expanding type, resulting in significant shrinking and swelling?**

- A. Kaolinite
- B. Montmorillonite
- C. Illite
- D. Chlorite

**37. If a soil has a total Cation Exchange Capacity of 20 cmol(+)/kg and the sum of exchangeable bases is 15 cmol(+)/kg, what is the percentage base saturation?**

- A. 25%
- B. 50%
- C. 75%
- D. 100%



**38. How does the application of gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) affect the pH of a non-sodic, neutral soil?**

- A. It significantly raises the pH.
- B. It significantly lowers the pH.
- C. It has little to no direct effect on soil pH.
- D. It buffers the pH strictly at 7.0.

**39. Calcareous soils, characterized by the presence of free calcium carbonate, are most likely to induce a deficiency of which set of nutrients?**

- A. N, P, K
- B. Ca, Mg, S
- C. Fe, Zn, Mn
- D. Mo, Cl, B

**40. Isomorphous substitution in phyllosilicate clay minerals primarily results in which of the following?**

- A. pH-dependent positive charge
- B. Permanent negative charge
- C. Increased soil acidity
- D. Decreased surface area

**41. Which process describes the conversion of organic nitrogen into inorganic ammonium ( $\text{NH}_4^+$ ) by soil microorganisms?**

- A. Nitrification
- B. Denitrification
- C. Immobilization
- D. Mineralization

**42. In highly alkaline soils ( $\text{pH} > 8.5$ ), phosphorus availability is restricted due to its precipitation with which element?**

- A. Iron
- B. Aluminum
- C. Calcium
- D. Hydrogen

**43. When measuring soil pH using a 1:1 soil-to-water ratio versus a 1:1 soil-to-1N KCl ratio, what is the typical result?**

- A. pH in water is lower than pH in KCl
- B. pH in water is higher than pH in KCl
- C. Both methods yield identical pH values
- D. pH in KCl becomes highly alkaline

**44. Which condition must be met to classify an element as essential according to Arnon and Stout's criteria?**

- A. The element must be present in large quantities in the soil.
- B. The plant cannot complete its life cycle without the element.
- C. The element enhances plant growth but can be replaced by another.
- D. The element must improve the plant's resistance to pests.

**45. A plant's continued uptake of a nutrient (like Potassium) beyond what is needed for maximum yield, without further increase in growth, is termed:**

- A. Antagonism
- B. Synergism
- C. Luxury consumption
- D. Nutrient toxicity

**46. Which of the following equations accurately depicts the generation of active acidity from exchangeable acidity?**

- A.  $Al^{3+}(\text{clay}) + 3H_2O \rightarrow Al(OH)_3 + 3H^+$
- B.  $Ca^{2+}(\text{clay}) + 2H_2O \rightarrow Ca(OH)_2 + 2H^+$
- C.  $CO_2 + H_2O \rightarrow H_2CO_3 \rightarrow HCO_3^- + H^+$
- D.  $NH_4^+ + 2O_2 \rightarrow NO_3^- + H_2O + 2H^+$

**47. The Relative Neutralizing Value (RNV) or Effective Calcium Carbonate Equivalent (ECCE) of a liming material is determined by its Calcium Carbonate Equivalent (CCE) and its:**

- A. Solubility product
- B. Fineness factor (particle size)
- C. Moisture content
- D. Base saturation

**48. Calculate the exact milliequivalents per 100 grams (meq/100g) of Calcium ( $\text{Ca}^{2+}$ , atomic weight = 40) if a soil contains 400 mg of exchangeable Ca per kg of soil.**

- A. 1.0 meq/100g
- B. 2.0 meq/100g
- C. 0.2 meq/100g
- D. 4.0 meq/100g

**49. In evaluating lime requirement, why is the measurement of buffer pH more critical than water pH?**

- A. Buffer pH measures active acidity which directly harms plants.
- B. Buffer pH determines both active and reserve acidity to calculate total neutralization needed.
- C. Buffer pH solely isolates the specific toxic aluminum concentration.
- D. Buffer pH estimates the soil's organic matter content for nitrogen release.

**50. If an agronomist recommends 4 tons per hectare of pure  $\text{CaCO}_3$  (CCE = 100%) to neutralize a severely acidic soil, how many tons of dolomitic limestone with a CCE of 109% would theoretically be required to achieve the exact same neutralizing effect?**

- A. 3.67 tons
- B. 4.00 tons
- C. 4.36 tons
- D. 5.09 tons



# Answer Key

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1. C	14. A	27. C	40. B
2. C	15. C	28. B	41. D
3. C	16. B	29. B	42. C
4. B	17. B	30. B	43. B
5. D	18. A	31. B	44. B
6. C	19. C	32. B	45. C
7. B	20. D	33. C	46. A
8. B	21. D	34. D	47. B
9. A	22. B	35. C	48. C
10. C	23. B	36. B	49. B
11. B	24. C	37. C	50. A
12. D	25. B	38. C	
13. B	26. C	39. C	

