Soil Science Reviewer Based On TOS (Module D: Soil Fertility and Management)

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1. A farm consistently tests high in essential macro and micronutrients but produces poor corn yields due to severe soil compaction and poor drainage. Which statement correctly evaluates this field based on agronomic principles?

a) The soil is highly productive but lacks inherent fertility.
b) The soil is fertile but currently not productive.
c) The soil lacks both fertility and productivity.
d) The soil is highly productive because nutrient indices are high.

2. A farmer decides to apply lime to a highly acidic Oxisol. The primary goal of this intervention is to directly modify which attribute before yield improvements can be realized?

a) Soil productivity through immediate physical tilth improvement
b) Soil fertility through pH adjustment enhancing nutrient availability
c) Soil structure by destroying clay skins
d) Soil biology by eliminating earthworm populations

3. An agricultural land situated in a semi-arid region possesses an optimal balance of nitrogen, phosphorus, and potassium. However, without irrigation, the harvest is negligible. This scenario best illustrates that:

a) Fertility is dependent solely on climatic conditions.
b) Productivity is dependent on environmental and physical factors beyond just nutrient status.
c) Fertilizers are ineffective in semi-arid environments.
d) Inherent fertility always guarantees high crop productivity.

4. Two adjacent fields share the exact same soil series and nutrient profile. Field A is well-drained, while Field B experiences seasonal waterlogging. When analyzing their economic return per hectare, Field A consistently outperforms Field B. This discrepancy is a measure of:

a) Base saturation
b) Soil fertility
c) Cation exchange capacity
d) Soil productivity

5. In evaluating a parcel of land for long-term agricultural lease, an agronomist finds the soil has a high cation exchange capacity and optimal base saturation, yet historical records show low crop yields. Which intervention focuses on shifting the land from merely fertile to highly productive?

a) Applying maintenance doses of nitrogen fertilizers
b) Installing subsurface tile drainage to alleviate waterlogging
c) Inoculating the soil with rhizobia
d) Broadcasting trace minerals

6. A volcanic ash soil exhibits high total phosphorus content but demonstrates severe phosphorus fixation, leading to poor crop growth. In terms of agronomic classification, this soil is described as:

a) Highly fertile and productive
b) Infertile and inherently productive
c) Potentially fertile but currently unproductive
d) Devoid of all nutrient retention capability

7. Which field condition exemplifies a soil that is productive but inherently infertile?

a) A deep Mollisol with high organic matter left uncultivated
b) A sandy loam with low organic matter supplemented heavily with fertigation under a controlled greenhouse environment
c) A saline-sodic soil in an arid climate with high natural phosphorus
d) A compacted clay soil with optimal nitrogen levels

8. During a period of rapid vegetative growth, a maize plant transpires heavily under bright, sunny conditions. Which mechanism of nutrient delivery is most significantly enhanced by this physiological activity?

a) Root interception of immobile ions
b) Mass flow of mobile nutrients like nitrate
c) Diffusion of phosphate ions
d) Cation exchange at the clay interface

9. A soil test indicates sufficient potassium levels, yet a soybean crop shows deficiency symptoms. The soil is currently experiencing a prolonged dry spell. The restriction of which nutrient transport mechanism is primarily responsible for this deficiency?

a) Root interception
b) Mass flow
c) Diffusion, due to lack of soil moisture reducing the tortuosity pathway
d) Active transport across the epidermis

10. When applying immobile nutrients such as phosphorus to a crop, banding the fertilizer near the seed row is recommended. This placement strategy primarily maximizes which mechanism of nutrient acquisition?

a) Mass flow and capillary action
b) Volatilization and atmospheric deposition
c) Root interception and localized diffusion
d) Symbiotic nitrogen fixation

11. In a flooded rice paddy, the movement of ammonium towards the rice roots is heavily dependent on concentration gradients. Which pathway dominates this specific nutrient-root interaction?

a) Mass flow
b) Diffusion
c) Root interception
d) Percolation

12. An agronomist observes that calcium and magnesium rarely show deficiency in crops grown on calcareous soils, even when transpiration rates are low. This is because these nutrients frequently arrive at the root surface in quantities exceeding plant demand via which process?

a) Diffusion
b) Osmosis
c) Mass flow
d) Root exudation

13. Mycorrhizal fungi form symbiotic relationships with plant roots, effectively extending the root network. This association primarily overcomes the limitations of which nutrient transport process in highly weathered soils?

a) Mass flow of nitrates
b) Diffusion of phosphorus
c) Leaching of potassium
d) Volatilization of ammonia

14. Under cold soil conditions in early spring, a winter wheat crop exhibits purpling of the lower leaves. Even if soil test phosphorus is adequate, this symptom appears because cold temperatures directly impede which physical process in the soil solution?

a) Mass flow rate of water
b) Diffusion rate of phosphate ions
c) Cation exchange capacity of clays
d) Nitrification of ammonium

15. A farmer cultivates cassava on a 15 percent slope. Following a typhoon with intense rainfall, the top 5 centimeters of the A horizon are lost. According to the Universal Soil Loss Equation, which factor directly mathematically accounts for the kinetic energy of this specific rainfall event?

a) Soil erodibility factor
b) Topographic factor
c) Rainfall erosivity factor
d) Conservation practice factor

16. On a steep mountainous agricultural terrain, an intense convective storm causes severe rill erosion. The loss of fertility is most acute because the eroded sediment is primarily composed of:

a) Coarse sand fractions devoid of nutrients

b) Unweathered parent material

c) Clay particles and organic matter which hold the highest cation exchange capacity

d) Iron and aluminum oxides exclusively

17. When comparing two cultivated hillsides with identical soil types and rainfall intensity, Hillside X has a 10 percent slope that is 50 meters long, while Hillside Y has a 10 percent slope that is 100 meters long. Fertility loss via erosion will be greater on Hillside Y primarily due to:

a) Decreased infiltration rates at the ridge

b) Increased velocity and volume of surface runoff accumulating downslope

c) Higher raindrop impact energy at higher elevations

d) Reduced root penetration in longer slopes

18. A tropical Alfisol situated on an 18 percent slope experiences a rainfall event of 100 mm per hour. The detachment of nutrient-rich soil aggregates in this scenario is initiated by:

a) Sheet flow scouring

b) Gully headcutting

c) Raindrop splash impact breaking aggregate bonds

d) Subsurface lateral flow

19. To estimate the potential loss of soil nitrogen and phosphorus from a sloping field subjected to monsoonal rains, an agronomist must heavily weight which topographic parameters in their assessment?

a) Elevation and aspect

b) Slope steepness and slope length

c) Depression storage and roughness

d) Soil depth and bedrock type

20. In an area prone to intense rainfall, a farmer observes that the lower portions of a sloping field consistently yield better than the upper portions. This spatial variability in fertility is primarily driven by:

a) Higher atmospheric nitrogen deposition at lower elevations

b) Erosional deposition of fine mineral particles and organic carbon from the upper slope

c) Increased solar radiation hitting the valley floor

d) Lower evapotranspiration rates at the bottom of the slope

21. An intense rainfall event hits a freshly tilled, steeply sloping field. The sudden decrease in soil fertility in the weeks following the storm is mostly attributed to the preferential loss of which soil component?

a) Sand fraction
b) Gravel fraction
c) Colloidal fraction
d) Macropore space

22. An upland farmer cultivating maize on a rolling topography establishes strips of vetiver grass along the contour lines. The primary mechanism by which this practice preserves soil fertility is by:

a) Increasing the rate of nitrogen volatilization
b) Reducing the velocity of overland flow and trapping nutrient-laden sediments
c) Providing deep shade to reduce soil temperature
d) Releasing allelopathic chemicals to suppress weeds

23. In an upland agroforestry system, trees like Gliricidia sepium are integrated with annual food crops. Beyond erosion control, how does this measure actively prevent the long-term loss of soluble nutrients like nitrate from the soil profile?

a) By forming an impermeable hardpan layer
b) By acting as a safety net, capturing leached nutrients from deeper soil layers and returning them via leaf litter
c) By completely stopping the percolation of rainwater
d) By converting all nitrates into insoluble mineral complexes

24. A steep upland field is converted from conventional tillage to no-till farming with continuous residue cover. This management shift protects soil fertility during heavy rains primarily by:

a) Dissipating the kinetic energy of raindrops and increasing infiltration rates
b) Decreasing earthworm activity to stabilize aggregates
c) Increasing the surface albedo to reduce evaporation
d) Promoting surface crusting to seal nutrients in

25. When constructing bench terraces on steep upland slopes for vegetable production, the agronomist recommends a slight reverse grade. This engineering feature aims to prevent fertility loss by:

a) Encouraging rapid runoff over the terrace edge
b) Directing runoff towards the inner toe drain, preventing overtopping and scouring of the terrace lip
c) Trapping cold air to delay crop maturity
d) Maximizing the exposure of subsoil

26. An upland farming community adopts the practice of planting Mucuna pruriens during the dry season fallow period. How does this specific cover cropping practice safeguard fertility against the onset of the rainy season?

a) By compacting the soil surface
b) By depleting residual soil moisture
c) By providing immediate vegetative armor against soil splash and contributing fixed nitrogen upon incorporation
d) By releasing toxic root exudates that bind heavy metals

27. Contour plowing is implemented on a 12 percent slope planted with sorghum. To maximize its effectiveness in preventing nutrient loss, this practice must be strictly combined with:

a) Up-and-down slope traffic for harvesting equipment
b) Maintaining vegetative waterways to safely convey excess concentrated runoff
c) Broadcasting fertilizers just before major storm events
d) Removing all crop residues post-harvest

28. In managing an upland Oxisol, a farmer applies heavy mulch using crop residues. During a high-intensity storm, this measure prevents the loss of applied potassium fertilizer primarily by:

a) Minimizing surface crusting, thereby enhancing percolation over surface runoff
b) Fixing potassium firmly within the clay lattice structures
c) Converting potassium into a gaseous form
d) Increasing the soil pH dramatically

29. In a lowland irrigated rice system, the practice of puddling destroys soil aggregates. Paradoxically, this practice is a critical fertility conservation measure because it:

a) Increases the rate of organic matter oxidation

b) Creates a hardpan that significantly restricts the downward leaching of water and dissolved nutrients

c) Promotes deep root penetration beyond 1 meter

d) Enhances the aerobic decomposition of crop residues

30. A lowland farmer incorporates rice straw into the flooded paddy weeks before transplanting. This measure prevents the loss of soil fertility by:

a) Accelerating the volatilization of ammonia gas

b) Immobilizing soluble nitrogen temporarily into microbial biomass, preventing leaching and denitrification losses

c) Causing severe zinc deficiency

d) Increasing the hydraulic conductivity of the topsoil

31. During the cultivation of lowland paddy rice, maintaining a continuous shallow flood is a standard practice. How does this hydrological management specifically conserve soil phosphorus availability?

a) By maintaining anaerobic conditions that reduce ferric iron to ferrous iron, releasing bound phosphates

b) By oxidizing organic phosphorus into elemental phosphorus gas

c) By lowering the soil pH to highly acidic levels

d) By preventing the diffusion of phosphorus to the root zone

32. A lowland field subjected to alternate wetting and drying experiences a decline in nitrogen use efficiency. To prevent this specific fertility loss, a farmer should carefully manage:

a) The broadcasting of nitrate fertilizers during the dry phase

b) The timing of urea application to coincide with the flooded phase to minimize nitrification-denitrification cycles

c) The complete drainage of the field during the vegetative stage

d) The application of uncomposted manure just prior to flooding

33. The construction and maintenance of peripheral bunds in lowland rice farming is a physical control measure primarily designed to:

a) Allow free drainage of excess rainfall

b) Retain nutrient-rich irrigation water and prevent the lateral export of suspended organic matter

c) Increase the aeration of the root zone

d) Facilitate the movement of mechanized harvesters

34. In managing a lowland clayey soil prone to prolonged submergence, the controlled use of mid-season drainage prevents the accumulation of phytotoxic substances while simultaneously:

a) Leaching all remaining nitrogen out of the profile

b) Promoting deeper root penetration to access subsoil nutrients before returning to flooded conditions

c) Killing off beneficial cyanobacteria populations permanently

d) Creating deep cracks that sever the root system

35. Azolla is introduced into a lowland rice paddy. This biological control measure enhances and maintains soil fertility under flooded conditions primarily by:

a) Acting as a hyperaccumulator of heavy metals

b) Fixing atmospheric nitrogen and releasing it into the floodwater upon decomposition

c) Suppressing the growth of the rice plants to conserve nutrients

d) Increasing the rate of water percolation

36. A soil analysis recommendation requires the application of 90 kg of nitrogen per hectare. If the farmer intends to use urea containing 46 percent nitrogen, how many kilograms of urea must be applied per hectare?

a) 41.4 kg
b) 195.65 kg
c) 220.5 kg
d) 136.0 kg

37. An agronomist recommends a fertilizer rate of 120-60-60 kg N-P2O5-K2O per hectare. The available fertilizers are ammonium sulfate (21-0-0), ordinary superphosphate (0-20-0), and muriate of potash (0-0-60). How much ammonium sulfate is required for one hectare?

a) 252.0 kg
b) 571.4 kg
c) 300.0 kg
d) 625.5 kg

38. Using the recommendation of 100-50-50 kg N-P2O5-K2O per hectare, a farmer decides to use a complete fertilizer with a grade of 14-14-14. After supplying the required P2O5 and K2O using the complete fertilizer, how much supplemental nitrogen must be applied using urea (46-0-0)?

a) 50.0 kg
b) 108.7 kg
c) 217.4 kg
d) 357.1 kg

39. A 5-hectare maize farm requires an application of 40 kg P2O5 per hectare. If diammonium phosphate (18-46-0) is utilized to supply the phosphorus, what is the total amount of DAP needed for the entire farm?

a) 86.95 kg
b) 200.0 kg
c) 434.78 kg
d) 1111.1 kg

40. A fertilizer recommendation calls for 60 kg of K2O per hectare. A farmer has 50 kg bags of potassium sulfate (0-0-50). How many bags of this fertilizer are needed to treat a 2.5-hectare field?

a) 3 bags
b) 6 bags
c) 12 bags
d) 15 bags

41. If an application of 150 kg N per hectare is desired, and the farmer applies 200 kg of complete fertilizer (16-16-16) per hectare, how much additional nitrogen must be supplied by ammonium nitrate (33-0-0) per hectare?

a) 118.0 kg
b) 357.6 kg
c) 454.5 kg
d) 625.0 kg

42. A fertigation system requires a concentration of 200 ppm nitrogen. If the irrigation flow rate is 1000 liters per hour and the fertilizer source is calcium nitrate (15.5 percent N), how many grams of calcium nitrate must be injected per hour?

a) 310.0 grams
b) 1000.0 grams
c) 1290.3 grams
d) 2000.0 grams

43. A farmer wants to prepare a custom fertilizer blend equivalent to a 10-20-10 grade using urea (46-0-0), triple superphosphate (0-46-0), and muriate of potash (0-0-60). To produce 1000 kg of this blend, what is the required amount of triple superphosphate?

a) 200.0 kg
b) 434.8 kg
c) 500.0 kg
d) 869.6 kg

44. A crop requires 100 kg of available nitrogen per hectare. If poultry manure contains 2.5 percent total nitrogen and has an estimated mineralization rate of 40 percent in the first year, how much fresh poultry manure must be applied per hectare to meet the nitrogen requirement?

a) 4,000 kg
b) 10,000 kg
c) 25,000 kg
d) 40,000 kg

45. Vermicompost has a moisture content of 30 percent and a dry weight nitrogen content of 2.0 percent. To apply 50 kg of actual nitrogen per hectare, what is the total weight of the moist vermicompost required?

a) 2,500.0 kg
b) 3,571.4 kg
c) 5,000.0 kg
d) 7,142.8 kg

46. An organic farming standard limits total phosphorus application to 40 kg P2O5 per hectare. If dairy manure contains 0.8 percent P2O5 on a fresh weight basis, what is the maximum allowable application rate of this manure per hectare?

a) 3,200 kg
b) 5,000 kg
c) 8,000 kg
d) 12,500 kg

47. A farmer incorporates 5 tons per hectare of crop residue containing 0.5 percent nitrogen. If the C:N ratio is high, causing an initial immobilization period, how much total nitrogen is added to the soil system by this incorporation?

a) 2.5 kg
b) 10 kg
c) 25 kg
d) 50 kg

48. To achieve a target application of 80 kg of potassium (K2O) per hectare, a grower utilizes composted municipal green waste containing 1.2 percent K2O on a dry weight basis. Assuming a 40 percent moisture content in the compost, how much bulk compost is needed per hectare?

a) 4,000 kg
b) 6,667 kg
c) 8,333 kg
d) 11,111 kg

49. Swine slurry contains 3 kg of available nitrogen per 1000 liters. A maize field requires a top-dress application of 45 kg of nitrogen per hectare. How many cubic meters of swine slurry must be applied to a 3-hectare field?

a) 15 cubic meters
b) 30 cubic meters
c) 45 cubic meters
d) 60 cubic meters

50. An organic agronomist calculates that a soil requires 60 kg of slow-release nitrogen per hectare. Using bat guano with an analysis of 10-3-1, and assuming a 50 percent availability factor in the first season, how many kilograms of guano must be applied to a 2-hectare plot?

a) 600 kg
b) 1,200 kg
c) 2,400 kg
d) 4,800 kg

Detailed Answer Key

Q1: **b**	Q2: **b**	Q3: **b**	Q4: **d**	Q5: **b**
Q6: **c**	Q7: **b**	Q8: **b**	Q9: **c**	Q10: **c**
Q11: **b**	Q12: **c**	Q13: **b**	Q14: **b**	Q15: **c**
Q16: **c**	Q17: **b**	Q18: **c**	Q19: **b**	Q20: **b**
Q21: **c**	Q22: **b**	Q23: **b**	Q24: **a**	Q25: **b**
Q26: **c**	Q27: **b**	Q28: **a**	Q29: **b**	Q30: **b**
Q31: **a**	Q32: **b**	Q33: **b**	Q34: **b**	Q35: **b**
Q36: **b**	Q37: **b**	Q38: **b**	Q39: **c**	Q40: **b**
Q41: **b**	Q42: **c**	Q43: **b**	Q44: **b**	Q45: **b**
Q46: **b**	Q47: **c**	Q48: **d**	Q49: **c**	Q50: **c**