Agronomy 354
Test #2
Fall 2015

1. A
2. E
3. E
4. D
5. E
6. D
7. D
8. A
9. C
10. B
11. E
12. B
13. D
14. E
15. A
16. C
17. B
18. A
19. B
20. A
21. E
22. D
23. C
24. D
25. C

Range: 16 – 64
Mean: 41.5
S.D.: 12.0

A  49 & above
B  42 - 48
C  35 - 41
D  28 – 34
F  Below 28
POSSIBLE POINTS ARE INDICATED IN THE LEFT-HAND COLUMN.

26. In tropical soils, hydrous oxides of Al are common and provide either positive or negative charge. Explain the source of the charge. What mainly controls whether the charge is positive or negative?

\[ H^+ + H_2AIO_3^- \rightleftharpoons H_3AIO_3 = ALOH_2^+ + OH^- \]
\[ ALOH_2^+ + OH^- \rightleftharpoons \text{Al(OH)}_2^+ + OH^- \]
\[ \text{Al(OH)}_2^+ + OH^- \]
Show reactions or discuss

\[ \uparrow \text{pH} \rightarrow \uparrow \text{CEC} \]
\[ \downarrow \text{pH} \rightarrow \uparrow \text{AEC} \]
\[ \text{pH} \text{(a)} \quad \text{Explanations} \quad (3) \]

27. Soil acidity develops after several years. It may take 5 years on a sandy soil and 15 years on a clay loam for the same pH drop with the same management. Be specific in discussing why it likely would take longer on the finer-textured soil.

Relates to buffering capacity. pH only indicates active acidity. With higher CEC (clay & likely OM), clay loam much greater capacity to hold H\(^+\) generated without H\(^+\) in solution. Coffee urn concept.

Buffering capacity (3) Explanation (3)

28. What is the major mechanism for P delivery to the root? Briefly indicate two (2) factors that affect the rate of delivery.

Diffusion (3)
Fick's Law factors:

a) Area for diffusion
b) Concentration gradient
c) Water content

d) Temperature
e) Tortuosity
f) Buffer capacity—ability of soil to replace

1 point each

29. With time, why does leaching make a soil acidic and not basic. Discuss.

Need to discuss concept of lyotropic series

\[ Al^{3+} > H^+ > Ca^{2+} > Mg^{2+} > K^+ = NH_4^+ > Na^+ \]

Acidic ions (Al\(^{3+}\) & H\(^+\)) held by CEC more tightly than basic ions and thus basic ions leach more quickly.

Lyotropic series (2) Explanation (3)