Situation: You are going to grow corn with a yield potential of 165 bu grain acre\(^{-1}\). Your crop last year was soybean with a yield of 45 bu/acre. Your field is conventionally tilled and corn and soybean are the only crops grown on this field.

SOIL TEST REPORT

<table>
<thead>
<tr>
<th>pH</th>
<th>Buffer pH</th>
<th>Organic matter (%)</th>
<th>Bray P(_i)</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>CEC cmol(^+) kg(^{-1})</th>
<th>Base Saturation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.7</td>
<td>6.7</td>
<td>2.7</td>
<td>11</td>
<td>127</td>
<td>1320</td>
<td>175</td>
<td>12</td>
<td>58</td>
</tr>
</tbody>
</table>

Subsoil pH is > 6.0.

1. How many pounds of nitrogen per acre should you apply for this corn crop? (3 points)

2. How many pounds of 28-0-0 per acre should you apply to achieve the target nitrogen rate you calculated in Question 1? (3 points)

3. What is the critical soil test P level for this soil in mg P kg\(^{-1}\) soil? (2 points)

4. What is the soil test P maintenance limit for this soil in mg P kg\(^{-1}\) soil? (2 points)

5. What is the lowest soil test P level in mg P kg\(^{-1}\) soil you can have to get a fertilizer P recommendation of 0 lb acre\(^{-1}\)? (2 points)

6. According to the Tri-state Fertilizer Recommendations, how many pounds of P\(_2\)O\(_5\) per acre should be applied this corn crop? (3 points)

Total points this page = 15 out of 100.

7. Your answer to Question 6 is equivalent to how many pounds of P per acre? (3 points)
8. How many pounds of \( P_2O_5 \) per acre in excess of crop removal do you need to apply to raise your soil test P level to the critical level? (3 points)

9. What is the critical soil test K level for this soil in mg K kg\(^{-1}\) soil? (3 points)

10. What is the soil test K maintenance limit for this soil in mg K kg\(^{-1}\) soil? (2 points)

11. What is the lowest soil test K level in mg K kg\(^{-1}\) soil you can have to get a fertilizer K recommendation of 0 lb acre\(^{-1}\)? (2 points)

12. According to the Tri-state Fertilizer Recommendations, how many pounds of K\(_2\)O per acre should be applied this corn crop? (3 points)

13. Your answer to Question 12 is equivalent to how many pounds of K per acre? (3 points)

14. What is the equation used to determine the amount of K\(_2\)O it takes to increase or decrease soil test K by 1 mg K kg\(^{-1}\) soil? (2 points)

15. What is the soil solution H\(^+\) activity/concentration in moles H\(^+\) L\(^{-1}\)? (3 points)

16. What is the recommended soil solution pH for this soil if you are growing only corn and soybean? (2 points)

17. If your limestone has a relative neutralizing value (RNV) of 65, how many tons per acre should be applied to this field? (3 points)

Total points this page = 29 out of 100.
18. If your limestone has a relative neutralizing value (RNV) of 80, how many tons per acre should be applied to this field? (3 points)

19. What is the critical soil test level for Mg in mg Mg kg⁻¹ for this soil? (2 points)

20. Please complete the table below (1 point each, 15 points)

<table>
<thead>
<tr>
<th>Nutrient Element</th>
<th>Mobility in plants</th>
<th>Primary mechanism of root-nutrient contact</th>
<th>One physiological role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphorus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnesium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulfur</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

21. Please fill in the blanks (1 point each, 4 points)

The maximum rate of N + K₂O to apply when we are using starter fertilizers in a 2 x 2 placement for corn is _____________ lbs/acre. Because soybeans are more salt sensitive, the maximum rate of N + K₂O to apply when we are using starter fertilizers in a 2 x 2 placement for 30 inch row soybean is _____________ lbs/acre. If we are using ammonium phosphates in our starter fertilizer, again in a 2 x 2 placement, we do not want the N rate in the starter fertilizer material to exceed __________ lbs N/acre for corn. We would not expect a yield response to adding potassium in starter fertilizer unless soil test K is at or below __________ mg K kg⁻¹ soil.

22. There are two situations where nitrogen should be always added to starter fertilizer in corn production. Please list them. (2 points)
Total points this page = 26 out of 100.

23. I am growing a corn crop with 140 bu acre\(^{-1}\) yield potential. I applied 100 of 28-0-0 per acre in my starter fertilizer. My PSNT is 18 ppm. How many lb N acre\(^{-1}\) should I apply? (3 points)

24. Why is soil P availability maximized at pH 6.5? (3 points)

25. What nutrient is primarily responsible for reducing P availability when P fertilizers are broadcast on agricultural soils here in the midwest? (2 points)

26. Please discuss the fate of fertilizer P when it is applied in a band. Include in your discussion what happens to pH, solution P levels, Fe and Al concentrations and solubility, and the reactions that change P availability with time. Feel free to include a diagram if it will help you in your discussion. (8 points)

27. Briefly explain or diagram fixed K, exchangeable K, and soil solution K. (6 points)

28. Why do low moisture and low temperatures decrease P and K availability to plants? Please be specific (4 points)

29. In forested ecosystems of the Midwestern US, approximately what percent of total soil P is in the organic form? (2 points)

30. If the soil pH is 5.5, what is the predominant form of P in the soil solution? (2 points)
Total points this page = 30 out of 100.