

Name: _____

SOILS 446-02
SOIL FERTILITY AND PLANT NUTRITION II
SPRING 2008 – FINAL EXAM
100 POINTS

Answer the questions completely. Show all your work. Work alone – this is not a group project. The answers to the questions below must be typed and submitted to me as a Microsoft WORD (or MAC WORD) document by May 2, 2008. Send your completed exam to: bmahler@uidaho.edu.

1. Describe SOIL conditions that make specific placement of fertilizers for the following nutrients very important: (12 points; 2 points each)
 - a. Phosphorus:
 - b. Potassium:
 - c. Sulfur:
 - d. Manganese
 - e. Copper
 - f. Zinc

2. Discuss TWO key ways that a fertilizer P management program should differ from a nitrogen management program. (4 points)

3. What is the fertilizer grade of the following material? K_2HCaPO_4 (Atomic weights: K=39; P=31; Ca=40; O=16; H=1) (4 points)

4. Describe soil conditions under which you might expect an appreciable downward movement of phosphorus through the soil profile. (3 points)

5. How could liming an acid soil from pH 4.5 to pH 6.8 affect the availability of the following nutrients? Defend your answer. (12 points; 2 points each)
 - a. Phosphorus:
 - b. Potassium:
 - c. Sulfur:
 - d. Manganese
 - e. Copper
 - f. Zinc

6. Which of the following nutrients – P, K, or S is most likely to be limiting to tree production in northern Idaho forest soils? Defend your answer. (3 points)

7. Formulate 8 tons of a 12-12-26-4 fertilizer using the following fertilizer materials: (10 points)

TSP, K_2SO_4 , KCl, MAP, Urea

8. Answer the following for P, K, and S fertilizers (10 points; 2 points each)
 - a. What is the percent P in a fertilizer that has a grade of 0-6-10?
 - b. If I want to apply 210 pounds of P to an acre, how many pounds of DAP do I need?
 - c. What is the percent K in a fertilizer with a grade of 0-23-16?
 - d. What is the grade of a fertilizer that contains 8% P and 15% K?
 - e. How many pounds per acre of ammonium sulfate would I need to supply 84 pounds of sulfur?

9. How does excess rainfall (rainfall during a 10 day period exceeding 3 inches of precipitation) affect the availability in soils of the following: (12 points; 2 points each)
 - a. Phosphorus:
 - b. Potassium:
 - c. Sulfur:
 - d. Boron
 - e. Iron
 - f. Zinc

10. What forms of K in the soil does a potassium soil test measure? (2 points)

11. What impact does soil organic matter content have on potassium availability? Discuss. (2 points)

12. Answer the following about the element sulfur: (8 points; 2 points each)

- a. Are S deficiencies often observed in the Palouse region of northern Idaho and eastern Washington? Why?
- b. Of all the sulfur fertilizer materials sold today which product is the most acidifying? Why?
- c. Are S deficiencies likely to occur in forests? Defend your answer.
- d. Why are legumes more likely to show S deficiencies than grasses under pasture conditions?

13. Phosphorus chemistry in the soil is often very complex. Answer the following about phosphorus: (8 points; 1 point each)

- a. Define and discuss the differences between soil solution P, labile P, and non-labile P:
- b. How is P retained in a soil having a pH value of 4.4?
- c. How is P retained in a soil having a pH value of 6.1?
- d. How is P retained in a soil having a pH value of 8.1?
- e. Would P in soil organic matter be more likely to be labile or non-labile? Why?
- f. What is measured in a P soil test?
- g. How would you increase P availability in a soil with a pH of 7.9? (you can not add or place fertilizer P to/in the soil)
- h. If you were going to test a soil with a pH of 6.2 for available P would you use the NaOAc or NaHCO₃ extractant?

14. Under what conditions would the following micronutrients be deficient in southern Idaho? Defend your answer. (10 points; 2 points each)

- a. Boron
- b. Zinc
- c. Copper
- d. Chlorine
- e. Iron