Correct answers to questions 1 through 5 are worth 3 points each.

1. Charges in soils due to isomorphous substitution are
   a) pH dependent.
   b) permanent.
   c) found only in 1:1 clays.
   d) found only in soil organic matter.

2. If the concentration of $H^+$ in the soil solution is 0.0001 M/l, the pH is
   a) 10.
   b) 7.
   c) 4.
   d) 1.

3. A soil has a CEC of 25 meq/100 g. and had the following cation concentrations:
   calcium – 16 meq/100 g.
   magnesium – 2 meq/100 g.
   potassium – 2 meq/100 g.
   sodium – 1 meq/100 g.
   hydrogen – 1 meq/100 g.
   aluminum – 3 meq/100 g.

   What is the percent base saturation?
   a) 100%
   b) 40%
   c) 58%
   d) 84%

4. The atomic weight of aluminum is 27 g/M. What is its equivalent weight?
   a) 27 g/eq
   b) 13.5 g/eq
   c) 9 g/eq
   d) 3 g/eq

5. Which secondary mineral is a 1:1 layer silicate clay?
   a) kaolinite
   b) smectite
   c) illite
   d) vermiculite
6. The essential nutrient that is the atom in the middle of the chlorophyll molecule is
   a) calcium.
   b) magnesium.
   c) aluminum.
   d) iron.

   **Correct answers to questions 7 through 14 are listed behind each question.**

7. Please give a brief definition of soil reserve acidity. (5 points)

8. Estimate the CEC of a soil that contains 1.6% organic carbon and 28% clay using
   the equation of Foth and Ellis – CEC = 3.2 + 3.67 OC + 0.196 C. Your answer
   should use the correct units. (5 points)

9. Please convert 2 cmol K⁺/kg soil into parts per million (ppm). (5 points)
   Some information that may be helpful:
   atomic weight of K = 39 g/M
   atomic weight of H = 1 g/M
   pH of the soil solution = 7.3
10. Please list two ways that acidity is created in soils. (5 points)

11. List two soil chemical properties that change when soil pH increases. Also tell how they change. (5 points)

12. Please write the chemical equation that shows the neutralization of soil acidity by calcium carbonate. (5 points)

There is no 13th question – I’m superstitious.

14. Why do farmers apply limestone to their fields? (2 points)