Quiz for Nutrient Management Module No. 2: Plant Nutrition and Soil Fertility
1 CEU in nutrient management and 0.5 CEU in soil water management

1. Why are elements such as Fe and Zn called micronutrients? Because they are:
   - ☐ a. all very small elements.
   - ☐ b. minimally important to the growth and reproduction of plants.
   - ☐ c. taken up in very small amounts by plants.
   - ☐ d. rare in the soil.

2. Which nutrient(s) are particularly important to place near the seed in small amounts in cold, dry environments?
   - ☐ a. N and S because they are required the earliest in plant growth
   - ☐ b. N because water is lacking to provide mass flow transport of N towards the root
   - ☐ c. P because diffusion is slow under cold, dry conditions, so a shorter distance to diffuse is better
   - ☐ d. P because mycorrhizal fungi do not live in cold, dry soil

3. Which process is most important for roots to access mobile nutrients?
   - ☐ a. root interception
   - ☐ b. mass flow
   - ☐ c. diffusion
   - ☐ d. association with rhizobia

4. Why are N, P, K and S called macronutrients?
   - ☐ a. They are the main nutrients provided by fertilizers.
   - ☐ b. They make up 95% percent of the plant biomass.
   - ☐ c. They are large molecules.
   - ☐ d. Because they, along with Ca and Mg, are required by plants in relatively large amounts.

5. Why is it important to know the form that each nutrient is taken up by plants?
   - ☐ a. It helps calculate fertilizer rates.
   - ☐ b. It helps us understand what controls the movement of that nutrient in soil.
   - ☐ c. It's useful in determining timing of fertilizer application.
   - ☐ d. It explains why the micronutrients are needed in only small amounts.

6. Which portion of the root most easily takes up nutrients?
   - ☐ a. the upper part, next to the ground
   - ☐ b. the middle maturation zone
   - ☐ c. the elongation zone
   - ☐ d. the root cap

7. If the upper, young leaves are showing a nutrient deficiency, which type of nutrient is most likely deficient?
   - ☐ a. those immobile in the plant
   - ☐ b. those immobile in the soil
   - ☐ c. those mobile in the plant
   - ☐ d. those mobile in the soil

8. A soil survey shows that a soil has 60% clay, 30% silt and 10% sand. What does this tell you about the soil?
   - ☐ a. It is classified as a clay and likely has a higher CEC than loam.
   - ☐ b. It is classified as a clay loam, and likely has a higher CEC than clay.
   - ☐ c. It is classified as a silty clay, with much better water drainage than a clay.
   - ☐ d. It is classified as a clay and has a lower CEC than loam.

9. What fraction of the soil has the highest amount of CEC per pound?
   - ☐ a. clay
   - ☐ b. organic matter
   - ☐ c. sand
   - ☐ d. silt

10. Within the range of pH 5.5 to 9, phosphorus is least available at what pH?
   - ☐ a. 5.5
   - ☐ b. 6.5
   - ☐ c. 7.5
   - ☐ d. 8.5

11. Plants can only directly use nutrients that are in the soil solution, but exchangeable nutrients are used to estimate plant availability. Why?
   - ☐ a. It's easier to measure exchangeable nutrients than soluble nutrients.
   - ☐ b. It's cheaper to measure exchangeable nutrients than soluble nutrients.
   - ☐ c. The root prefers exchangeable over soluble nutrients.
   - ☐ d. They are only weakly bonded and can easily leave the surface as solution concentrations decrease.

12. Which of the following nutrients would likely get flushed or leached out of the surface soil the fastest after a large rainstorm?
   - ☐ a. Ca^{+2}
   - ☐ b. HPO_4^{-2}
   - ☐ c. K^{+}
   - ☐ d. NO_3^{-}

13. In Figure 7, decreased pH caused the number of negative charges (proportional to the CEC) on the clay particle to drop by a factor of 2 (from 10 to 5). How else does the same change in soil pH affect the charge on the illustrated clay or SOM particles?

- [ ] a. For each loss of a negative charge there is an equal increase in positive charge.
- [ ] b. The change in CEC is the same on the SOM as the clay particle.
- [ ] c. The change in CEC is larger on the SOM than on the clay particle.
- [ ] d. The change in CEC is smaller on the SOM than on the clay particle.

14. The base-cation saturation ratio method to determine soil amendment requirements may lead to inappropriate fertilization suggestions because:
    - [ ] a. soil nutrient imbalances are not a concern for plant productivity
    - [ ] b. adjusting soil pH if needed and feasible does little to improve crop productivity
    - [ ] c. the ratio of Ca:Mg:K is less important than the actual amount of available Ca, Mg and K
    - [ ] d. soils with high CEC will always supply enough nutrients regardless of the base cation ratio

15. If N is insufficient in a year with higher than predicted yields, why should in-season N for yield be provided by early tillering of wheat?
    - [ ] a. Because N uptake by the plants is slower and later than P and K uptake.
    - [ ] b. Because biomass production closely parallels N uptake, that is, when plants are 20% mature (late tillering), they have only taken up 20% of the N they will need.
    - [ ] c. Because by mid-tillering the plant should already have 40% of its total N uptake, and it takes time for fertilizer N to become available.
    - [ ] d. Because there is no lag time between when N fertilizer is applied and taken up by the plant.