1) What is one reason why agroecosystems are capable of attaining higher levels of net primary production than found in natural forest ecosystems?

"Farmers generally ensure that plants are provided with high levels of mineral nutrition, while natural ecosystems must rely on minerals coming from a) the weathering of rock, b) atmospheric deposition, c) fixation of atmospheric nitrogen, and d) decomposition."

2) What physiological mechanism of the maize plant is responsible for it ascending to such an important prominence in American agriculture? Please explain.

"Maize is able to undergo C4 photosynthesis, in which the plant utilizes stored reserves of carbon dioxide to photosynthesize under hot, dry conditions. Under these conditions, normal C3-type plants stop photosynthesizing in order to conserve water."

3) Which stages of ecological succession are represented in most agroecosystems?

"Most agroecosystems are typified by early successional stages."

4) How are nutrient cycles and resource flows in agroecosystems similar to those in natural ecosystems? How are they different?

"Similarities: both use the energy of sunlight to fix carbon from the atmosphere into living tissue; both involve natural mineral cycles to a greater or lesser extent. Differences: in natural ecosystems, recycling of minerals previously used by organisms is the most important source of nutrition, while in agroecosystems exogenous minerals are added, sometimes in large amounts, to compensate for that which leaves the ecosystem as the harvested crop."

5) How do nutrient cycles and resource flows in conventional agroecosystems differ from those in organic agroecosystems?

"Conventional: relies heavily on additions of chemical fertilizers, some of which are produced using fossil fuels. Organic: tries to mimic the nutrient cycles of natural ecosystems as much as possible by conserving minerals, adding organic wastes and rock powders, and using crop rotations that maximize atmospheric nitrogen fixation."

6) Why does the ability of a plant to produce a woody stem represent an evolutionary innovation? What is the advantage of producing a woody stem compared to producing an herbaceous stem?

"The presence of a woody stem, which evolved after herbaceous stems, means that in the spring growth will commence from above ground stems rather than having to start growth from below the surface of the soil."

7) Why does the ability of a plant to attract insect pollinators represent an evolutionary innovation? What is the advantage of employing insect pollinators compared to employing wind pollination?

"Using wind to transfer pollen is not very efficient. It has been estimated that only about 1 in 10,000 wind-dispersed pollen grains results in successful mating. In contrast, insect pollination ensures a much greater pollination success rate because the insect is motivated by finding a reward offered by the plants whose pollen it’s carrying."
8) What are the differences among the following plants: annuals, biennials, and perennials?

   Annual has a lifecycle that lasts one growing season.
   Biennial has a lifecycle that last two growing seasons, with the first season devoted to vegetative growth, and the second season devoted to reproduction.
   Perennial has a lifecycle that may last many growing seasons.

9) Is it possible to have a woody annual or woody biennial? Please explain.

   No, only perennials are capable of producing wood.

10) What is the difference between a taproot, fibrous, and prop root systems?

   A taproot system involves a large, deep central root that anchors the plant.
   A fibrous root system features many, dispersed smaller diameter roots.
   Prop roots are roots that grow down from above-ground stems to provide increased lateral support for stems as they grow increasingly taller and top heavy.

11) Why are legumes important to agroecosystems, particularly organic agroecosystems?

   Because of their ability to form symbiotic associations with nitrogen-fixing bacteria, legumes are able to utilize atmospheric nitrogen.

12) What is meant by the phrase “All flesh is grass?”

   Since the only way that atmospheric carbon can enter living biomass is through photosynthesis, all of the carbon in animals, regardless if they are herbivores or carnivores, originally came from plants.

13) How and why are cover crops used in agroecosystems, particularly organic agroecosystems?

   Cover crops are used in crop rotations to a) conserve soil minerals by increasing soil organic matter, b) encourage atmospheric nitrogen fixation, and c) discourage growth of weeds and other crop pests.

14) What are advantages and disadvantages of controlling weeds using herbicide? Using tillage? Using permanent mulch?

   Herbicide: Advantage is low cost; Disadvantage is chemical contamination of soil and ground water.
   Tillage: Advantage is good control of weed seed population; Disadvantage is compaction of soil.
   Permanent mulch: Advantage are that mulch adds nutrients and organic matter as well as controlling weeds; Disadvantages are high cost and mulch adding to weed seed population.

15) Is the diversity of crop plant families representative of the diversity of the Plant Kingdom in general? Please explain.

   The diversity of the Plant kingdom is very under-represented in crop plants. The vast majority of crop plants represent only about a dozen or so of the more than two hundred plants families known to exist.

16) How well are native plants represented in most agroecosystems? Please explain.

   The only native plants grown in North American agroecosystems include sunflower, maize, beans, and squash.