

6 November 2002

(118 points total)

I. Single-Answer Multiple Choice (2 points each): Circle the **one** solution that answers each question or completes each sentence.

1. Concerns about conventional agriculture by some people include
 - a. removal of soil by erosion.
 - b. an increase in the number of small family farms.
 - c. pollution of surface and ground waters with agricultural chemicals and sediment.
 - d. all of the above.
 - e. both a and c.

2. Organic compounds vary greatly in their rate of decomposition. Which of the following organic compounds are listed correctly in order from the most rapidly decomposed to the most slowly decomposed?
 - a. Sugars > fats and waxes > cellulose > lignins.
 - b. sugars > hemicellulose > cellulose > lignins.
 - c. Fats and waxes > hemicellulose > simple proteins.
 - d. All of the above.
 - e. Both b and c.

3. The conversion of an element or compound from the inorganic to the organic form in microbial or plant tissues is called
 - a. fixation.
 - b. denitrification.
 - c. mineralization.
 - d. immobilization.
 - e. decomposition.

4. The role of a septic system is to
 - a. aerate wastewater.
 - b. treat and dispose of wastewater .
 - c. recycle drinking water.
 - d. decontaminate industrial wastes.

5. A septic system is composed of a
 - a. a settling tank connected to a trench in the soil.
 - b. a trench connected to a digestion tube.
 - c. a digestion tank with the final outlet to a water course.
 - d. a pipeline through the soil.

6. The order in which water proceeds through a septic system is
- filtration by soil, digestion, settling
 - digestion, filtration by soil, settling.
 - settling, digestion, filtration by soil.
 - settling in soil, digestion, filtration.
7. Which of the following has the lowest C/N ratio?
- Alfalfa
 - Straw
 - Humus
 - Actinomycetes
8. ____ can fix nitrogen.
- Bacteria
 - Earthworms
 - Fungi
 - All of the above
 - Both a and b
9. A good septic system will remove
- heavy metals, household chemicals, pathogens, and organic matter.
 - heavy metals, pathogens, nitrogen, and organic matter.
 - heavy metals, pathogens, nitrogen, and phosphorus.
 - pathogens, nitrogen, phosphorus, and organic matter .
10. Benefits of adding materials that have been composted versus the same materials in their original “raw” form is that the composted materials
- already have had their C/N ratio raised.
 - weigh less.
 - have similar effects to that of adding humus.
 - all of the above.
 - both b and c.
11. Actinomycetes
- aid in the development of good soil structure.
 - can produce many useful antibiotics.
 - can fix nitrogen.
 - all of the above.
 - both b and c.
12. Organic agriculture
- considers the soil as one of the major management components of the farm system.

- b. can have higher net returns in particular enterprises than conventional agriculture.
 - c. uses organically certified fertilizers and pesticides.
 - d. all of the above.
 - e. both a and b.
13. Soil microorganisms have many beneficial effects on soils and plants that include
- a. soil aggregate stabilization.
 - b. antagonistic action against plant pathogens.
 - c. humus formation.
 - d. all of the above.
 - e. both b and c.
14. Sustainable agriculture is
- a. a concept of what a healthy farming system can be.
 - b. another name for organic and integrated farming.
 - c. only for large farms.
 - d. the same thing as conventional agriculture.
 - e. none of the above.
15. For a farm to be sustainable it must be
- a. socially just.
 - b. economically profitable.
 - c. environmental sound.
 - d. all of the above
 - e. both a and b.
16. What soil properties do we need for an efficient septic system?
- a. A sandy texture and a well-compacted structure.
 - b. a sandy texture and good structure.
 - c. a silty clay texture and good structure.
 - d. a gravelly texture and structure is not so important.
17. In the sustainability study of the three apple production systems in the Yakima Valley, which system generally had sweeter and firmer apples?
- a. The organic
 - b. The conventional
 - c. The integrated
 - d. All systems were equal.
18. In the study with the three apple production systems, which of the following parameters was not examined in the study?
- a. Energy efficiency
 - b. Economic breakeven points

- c. Apple size
 - d. Soil quality
 - e. None of the above
19. To be classified as a conservation tillage practice, a system must leave at least ____ of the soil surface covered with plant residues.
- a. 20%
 - b. 30%
 - c. 40%
 - d. 50%
20. When installing a traditional septic system, it is best to choose an area of soil
- a. at least a foot in depth.
 - b. at least four feet in depth.
 - c. at least seven feet in depth.
 - d. of any depth but sandy loam texture.
21. In my study with the three apple production systems,
- a. horticultural performance included more than just measuring total yield.
 - b. the apples were "Red Delicious".
 - c. taste tests of apples were conducted.
 - d. all of the above.
 - e. both a and c.
22. Which of the following has the greatest amount of carbon storage on Earth?
- a. Vegetation
 - b. Atmosphere
 - c. Soil
 - d. Vegetation and atmosphere together
23. The nutrient most often limiting the decomposition of organic matter added to soils is
- a. nitrogen.
 - b. phosphorus.
 - c. calcium.
 - d. carbon.
24. Of the following, which are the smallest in size?
- a. Bacteria
 - b. Actinomycetes
 - c. Fungi
 - d. Algae

II. Multiple-Answer Multiple Choice (1 point for each answer): Each problem set below consists of one problem with four possible answers. At least one answer listed is correct but two, three, or four of the answers may be correct. Mark “T” (for true) for each answer that solves the problem correctly and “F” (for false) for each answer that is incorrect.

25-28. In study with the three apple production systems,

- 25. all three systems received similar soil quality index ratings.
- 26. the price premium to the farmer for organic apples was 50% more than for conventional apples.
- 27. the integrated system had the second lowest potentially negative environmental impact.
- 28. the integrated system used both synthetic fertilizers and compost.

29-32. The cross-slot drill

- 29. directly plants its seed into an inverted T-shaped opening which gives high seedling emergence.
- 30. compared to conventional tillage has been shown in the Midwest to have lower yields.
- 31. could not work in developing countries where animals, instead of machinery, are used for pulling farm equipment.
- 32. can plant seed and fertilizer pellets into the slot at the same time.

33-36. Concerning soil organisms,

- 33. algae are classified in the Monera Kingdom.
- 34. bacteria are not significant in decomposing soil organic matter.
- 35. fungi can cause plant diseases.
- 36. nematodes are small segmented worms.

37-40. Alternative farming systems

- 37. include organic and integrated farming systems.
- 38. include conventional farming systems.
- 39. exclude the use of synthetic fertilizers and pesticides.
- 40. include no-till systems.

41-44. From the film “Life in the Soil”, we learned that

- 41. the film took place in China.
- 42. soil microorganisms compete with each other.
- 43. fungi eat fungi and nematodes.

___ 44. the pathogenic fungi, *Fusarium*, can be controlled by mixed cultivation (growing two or more crops together at the same time).

45-48. In the removal of pathogens in septic systems,

___ 45. clay minerals bind bacteria to their surface and slow their progress through soil.

___ 46. it is important to have high levels of organic matter to trap viruses.

___ 47. protozoa and helminthes are easily caught in the soil.

___ 48. pathogens are destroyed through competition and predation by soil organisms.

49-52. Earthworms

___ 49. eat the tissues of living plants.

___ 50. excrete small granular aggregates called casts.

___ 51. prefer sandy soils.

___ 52. generally have a favorable effect on soil productivity.

53-56. The narrower or smaller the C/N ratio of a freshly added organic residue to the soil,

___ 53. the longer the nitrate depression period.

___ 54. the faster the suitable planting time for the farmer.

___ 55. the slower the decay rate of the organic residue.

___ 56. the lower the N content relative to the C content in the residue.

57-60. Concerning alternative and conventional farming systems,

___ 57. integrated farming is a blend of organic and conventional farming practices.

___ 58. no-till directly drills the seed in the residue of the previous crop.

___ 59. low-input systems reduce the use of materials from outside the farm.

___ 60. conventional farming relies on synthetic chemical fertilizers and pesticides.

61-64. Soil organic matter

___ 61. as it decomposes may release substances that have as yet unidentified effects on plants.

___ 62. acts as a chelate helping to increase micronutrient availability to plants.

___ 63. must be in the soil at a concentration of about 3% for good plant growth.

___ 64. decreases the cation exchange capacity of soils.

65-68. Concerning soil organisms,

___ 65. algae are capable of performing photosynthesis.

___ 66. fungi have mycelia, a vegetative mass of hyphae.

___ 67. soil fungi generally can tolerate acid soils.

___ 68. the soil directly surrounding the roots of plants is called the rhizobium.

- 69-72. In my study with the two adjacent organic and conventional farms in the Palouse, I found
- ___ 69. erosion rates to be less on the organic farm.
 - ___ 70. wheat yields per acre on the organic farm to be equal to yields on the conventional farm.
 - ___ 71. organic matter to be higher on the organic farm.
 - ___ 72. topsoil thickness to be about 6 inches greater on the organic farm.

73-76. No-till farming

- ___ 73. generally requires more expertise than conventional tillage farming.
- ___ 74. can have greater pest problems than conventional tillage systems.
- ___ 75. generally has higher energy inputs than conventional tillage.
- ___ 76. is practiced by a higher proportion of farmers in the Midwest than in the Palouse.

III. Fill-Ins (2 points for each space): Fill-in each space below with the correct word or words.

- 77. _____ is the more or less stable fraction of the soil organic matter remaining after the major portions of added plant and animal residues have decomposed. Humus
- 78. _____ is the conversion of gaseous nitrogen (N₂) to organic nitrogen utilizable in biological processes. Nitrogen fixation
- 79. When organic matter decomposes, it contributes _____ to the atmosphere, which can aid in the greenhouse effect. Carbon dioxide
- 80. _____ is an association between fungi and plant roots which is usually symbiotic. Mycorrhiza
- 81. A symbiotic association between a fungus and an algae is called a _____. lichen
- 82. The name of the landfill in New York City that just closed down (except for the debris from the New York Trade Center Towers) is _____. States that accept garbage from New York as well as other places are Virginia and _____. Fresh Kills; Pennsylvania
- 83. The bacteria of the genus _____ live symbiotically in the roots of legumes. Rhizobia
- 84. The total amount of living organisms in a volume of soil is called _____. biomass