Soils 101 **Exam #1** Name_____

10 February 2009 (136 points total) Student ID#_____

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

1. Soil texture

   a. is the proportion of sand, silt, and clay.
   b. affects soil water storage.
   c. affects nutrient storage capacity.
   d. **all of the above**
   e. both b and c.

2. Optimum soil pH for nutrient availability to plants is

   a. **6 to 7**.
   b. 4 to 5.
   c. alkaline conditions.
   d. 6 to 8
   e. 5 to 8

3. Concerning macronutrients and micronutrients,

   a. phosphorus is a macronutrient.
   b. macronutrients are needed in larger quantities than micronutrients.
   c. micronutrients are just as essential as macronutrients.
   d. **all of the above**.
   e. both b and c.

4. Compared to chemical (inorganic) fertilizers, organic fertilizers

   a. generally have lower nutrient contents per unit weight than do chemical fertilizers.
   b. generally contribute more organic matter to the soil.
   c. generally must be decomposed to inorganic nutrient ions before nutrient absorption can take place by plants.
   d. **all of the above**.
   e. both a and c.

5. From the film *Life in the Soil*, we discovered that it takes ____ years for 1 centimeter of soil to form.

   a. 3
   b. **300**
   c. 3 million

6. In the film *Life in the Soil*, we saw that a farmer could reduce the risk of crop disease by

   a. rotating crops.
   b. repeatedly growing the same crops.
   c. performing mixed cultivation or intercropping.
   d. **both a and c.**
   e. none of the above.

7. A soil layer that has granular structure generally has ____ permeability.

a. **rapid**
b. moderate
c. slow

8. Biodynamic agriculture

a. requires stricter certification guidelines than does organic agriculture.
b. includes planting by the moon and other planets.
c. includes using fertilizers.
d. **all of the above**.
e. both a and b.

9. In the sustainability study of the three apple production systems in the Yakima Valley, which system significantly had the highest cumulative yields?

a. The organic
b. The conventional
c. The integrated
d. **All three systems had similar cumulative yields**.
e. Both b and c.

10. The food taste tests or sensory evaluations that we do in class are not truly scientific because we have not ensured that the foods we are testing

a. were grown in similar soil types.
b. were of the same variety and, if necessary, grown on the same rootstock.
c. were grown under similar environmental conditions.
d. **all of the above**.
e. both a and b.

11. On a hillside in the Palouse area, a garden will likely perform best if planted on a(n) ____ exposure.

a. northern
b. southern
c. western
d. eastern

12. All other conditions being equal, a soil with which of the following textures has the lowest total water storage?

a. Loam
b. **Loamy sand**
c. Clay
d. Clay loam

13. Which layer is a zone of maximum accumulation?

a. A
b. **B**
c. D
d. E

14. Biodynamic farming includes the use of

a. compost.
b. animals on the farm.
c. 8 preparations.
d. **all of the above**.
e. both a and b.

15. Which of the following is a common practice in organic farming systems?

a. Use of compost
b. Use of modern technologies
c. Use of fertilizers
d. **All of the above**
e. Both a and b

16. Green manure crops

a. are often legumes.
b. are incorporated into soil for nutrient release.
c. tend to build soil organic matter.
d. **all of the above**.
e. both a and b

17. In planning an organic garden, resources you need to consider include

a. land.
b. climate.
c. fencing and equipment.
d. **all of the above**.
e. both b and c.

18. In the study with the three apple production systems,

a. energy efficiency of each system was compared.
b. environmental impact of pesticides was calculated.
c. apple size and firmness were evaluated.
d. **all of the above**.
e. both a and b.

19. For a farm to be sustainable, it must be

a. environmentally sound.
b. economically profitable.
c. socially just.
d. **all of the above**.
e. both a and b.

20. A soil that feels sticky, forms a good ribbon, and has slight gritiness and smoothness is likely a

a. sandy loam.
b. silt loam.
c. **clay loam.**

21. In what order are the master soil horizons usually seen?

a. A, B, C, E, C, R
b. A, B, C, D, E, R
c. O, A, C, E, B, R
d . **O, A, E, B, C, R**

22. Organic farming systems

a. consider the soil as one of the major management components of the farm system.
b. more often have higher crop yields than low-input conventional farming systems in developing countries.
c. generally have higher crop yields than conventional farming systems in developed countries.
d. all of the above.
e. **both a and b**.

23. Soil properties that can be examined in the field to get an idea of what kind of soil one has include

a. texture.
b. the types of horizons.
c. structure.
d. **all of the above**.
e. both a and b.

24. Under the National Organic Program, some synthetic materials are allowed which include

a. cow manure.
b. the herbicide, glyphosate (Roundup).
c. **pheromones**.
d. all of the above.
e. both b and c.

25. The WSDA Organic Food Program

a. can certify producers outside Washington State.
b. is accredited by the National Organic Program.
c. was certifying organic farmers even before the National Organic Program existed.
d. **all of the above**.
e. both b and c.

26. The National Organic Program

a. **has recordkeeping requirements for organic farmers**.
b. allows GM foods.
c. permits the irradiation of food.
d. all of the above.
e. both a and b.

27. _____ are bacteria that infest roots of legume plants forming root nodules.

a. Mycorrhizae
b. **Rhizobia**
c. Nitrobacter

28. No-till farming

a. leaves more residue on the soil surface than conventional tillage systems.
b. generally has lower energy inputs than conventional tillage.
c. helps reduce greenhouse gases compared to conventional farming.
d. **all of the above**.
e. both a and c.

29. Sustainable agriculture is

a. a step backward.
b. another name for organic farming.
c. only for small farms.
d. the same thing as alternative agriculture.
e. **none of the above**.

30. For a farm to be sustainable it must be

a. socially just.
b. economically profitable.
c. environmentally safe.
d. **all of the above**
e. both b and c.

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.

31-34. Continual additions of organic matter to the soil

____31. **increase soil fertility**.

____32. **generally improve soil structure**.

____33. **affects water infiltration rates**.

____34. can alter soil texture after five years.

35-38. In the film *Life in the Soil*, we saw the following soil organisms:

____35. **bacteria**.

____36. **beetles**.

____37. **fungi.**

____38. **earthworms**.

39-42. Labeling categories under the National Organic Program include

____ 39. **100% Organic**.

____ 40. **Organic (95-100% organic ingredients).**

____ 41. Made With Organic Ingredients (at least 50%).

____ 42. Products With Less Than 50% Organic Ingredients

43-46. Concerning farming systems,

____43. **integrated farmers can use synthetic chemical fertilizers**.

____44. **low-input farming reduces inputs from off the farm**.

____45. **no-till is a practice in which a crop is planted directly into a seedbed not tilled since harvest of the previous crop**.

____46. **natural systems agriculture is centered on growing perennial grain crops**.

47-50. In the study with the three apple production systems,

____ 47. organic apples were usually as big or bigger than conventional apples.

____ 48. **the conventional system generally received the lowest annual soil quality index ratings**.

____ 49. **the organic system was the most energy efficient**.

____ 50. the conventional system was more sustainable than the integrated system.

51-54. From the film *Life in the Soil*, we learned that

____51. the film took place in China.

____52. **adding organic matter helps build the soil**.

____53. **fungi eat fungi and nematodes**.

____54. **the pathogenic fungi, *Fusarium*, can be controlled by mixed cultivation (growing two or more crops together at the same time).**

55-58. Concerning soil fertility and plant nutrition,

____55. **soil fertility is the capacity of the soil to supply nutrients for maximum plant growth.**

____56. **there are at least 16 essential elements for plant growth.**

____57. **a small proportion of some nutrients can be taken up by plants in organic forms**.

____58. **N, P, and K are considered the three primary fertilizer nutrients for plants**.

59-62. Concerning fertilizers,

____59. when adding organic fertilizers, the nitrogen is immediately available to the plants.

____60. organic and inorganic fertilizers have similar effects on soil quality.

____61. **either organic or inorganic fertilizers can be used to continually grow and harvest healthy crops on the same ground year after year**.

____62. **inorganic fertilizers are chemical compounds containing readily available plant nutrients.**

63-66. Advantages of adding compost vs. synthetic fertilizers to your garden soil include

____ 63. **its ability to increase the nutrient storage capacity of the soil by increasing the organic matter content of the soil.**

____ 64. **its ability to improve soil structure**.

____ 65. **its ability to increase the water storage capacity of the soil.**

____ 66. its ability to alter soil texture.

67-70. Mycorrhiza

____67. fixes nitrogen.

____68. **is a fungus-root association**.

____69. is bacteria that beneficially infect roots.

____70. **benefits the host plants**.

71-74. Soil microorganisms have many beneficial effects on soils and plants that include

____71. **soil aggregate stabilization**.

____72. **antagonistic action against plant pathogens**.

____73. **humus formation**.

____74. **nutrient cycling**.

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

75. We have had one taste tests in class. The foods that we taste compared were _____ . **carrots**

76. If a grower decides to organically certify her conventional peach orchard, the transition period to become fully certified organic in the United States is ____ years. **3**

77. A planned sequence of various crops growing in a regularly recurring succession over the years on one field is called _____, which increases biodiversity and helps control weeds and pests on a farmer's field. **crop rotation**

78. Preparation 500 is used in biodynamics and comes from fermented cow manure packed in a _____ . **cow horn**

79. Growing-season extension tools for gardens include hoophouses, _____ , and _____ . **plastic covers for crops, fabric row cover, greenhouse, tubes of water around potted plants, cold frames**

80. Examination of a vertical section of a soil in the field shows the presence of more or less distinct horizontal layers. Such a section is called a _____ . **soil profile**

81. In agriculture, the _____ is the period of consecutive days between the last and first frost of each year when crops can be grown. **growing season**

82. Soil _____ is the arrangement of soil particles into compound clusters. **structure**

83. If you have a backyard soil that is of poor quality for a garden, one solution is to grow your garden in _____ . **raised beds**

84. Nitrogen fixation is the conversion of _____ to forms of nitrogen utilizable in biological processes. **Gaseous or atmospheric nitrogen or N_2**

85. The nutrient most commonly deficient in plants and most often needed as a fertilizer is _____ . **nitrogen or N**

86. The zone that surrounds the roots of plants is called the _____ . **rhizosphere**

87. Two structureless grades that soils can have are _____ and _____ . **single-grained; massive**

88. A soil _____ is a layer of soil differing in properties and characteristics from adjacent layers below or above. **horizon**