

Registration Form

**Onsite 202 - CEU Training Course \$300.00**  
**48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL \$50.00**

Start and Finish Dates: \_\_\_\_\_  
*You will have 90 days from this date in order to complete this course*

List number of hours worked on assignment must match State Requirement. \_\_\_\_\_

Name \_\_\_\_\_ Signature \_\_\_\_\_  
*I have read and understood the disclaimer notice on page 2. Digitally sign XXX*

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**Please circle/check which certification you are applying the course CEU's.**  
Wastewater Collection \_\_\_\_\_ Wastewater Treatment \_\_\_\_\_ Onsite Installer \_\_\_\_\_  
Other \_\_\_\_\_ Oregon CCB (\$50 additional fee) \_\_\_\_\_

Technical Learning College TLC PO Box 3060, Chino Valley, AZ 86323  
Toll Free (866) 557-1746 Fax (928) 272-0747 [info@tlch2o.com](mailto:info@tlch2o.com)

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## **AFFIDAVIT OF EXAM COMPLETION**

I affirm that I personally completed the entire text of the course. I also affirm that I completed the exam without assistance from any outside source. I understand that it is my responsibility to file or maintain my certificate of completion as required by the state or by the designation organization.

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In order to maintain the integrity of our courses we do not distribute test scores, percentages or questions missed. Our exams are based upon pass/fail criteria with the benchmark for successful completion set at 70%. Once you pass the exam, your record will reflect a successful completion and a certificate will be issued to you.

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# Onsite 202 Answer Key

Name \_\_\_\_\_ Phone \_\_\_\_\_

*Did you check with your State agency to ensure this course is accepted for credit?  
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*You are responsible to ensure that TLC receives the Assignment and Registration Key.  
Please call us to ensure that we received it.*

***Please circle, underline, bold or X only one correct answer***

Please Circle, Bold, Underline or X, one answer per question. A **felt tipped pen** works best.

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**Please Sign that you understand and will abide with TLC's Rules.**

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**Signature**

***Please write down any questions you were not able to find the answers or that have errors.***

Please e-mail or fax this survey along with your final exam

**ONSITE 202 CEU TRAINING COURSE  
CUSTOMER SERVICE RESPONSE CARD**

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E-MAIL \_\_\_\_\_ PHONE \_\_\_\_\_

PLEASE COMPLETE THIS FORM BY CIRCLING THE NUMBER OF THE APPROPRIATE ANSWER IN THE AREA BELOW.

Please rate the difficulty of your course.

Very Easy    0    1    2    3    4    5    Very Difficult

Please rate the difficulty of the testing process.

Very Easy    0    1    2    3    4    5    Very Difficult

Please rate the subject matter on the exam to your actual field or work.

Very Similar    0    1    2    3    4    5    Very Different

How did you hear about this Course? \_\_\_\_\_

What would you do to improve the Course? \_\_\_\_\_

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How was your customer service?

Poor \_\_\_\_\_ Fair \_\_\_\_\_ Average \_\_\_\_\_ Good \_\_\_\_\_ Great \_\_\_\_\_

Any other concerns or comments.

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*This course contains general EPA's CWA federal rule requirements. Please be aware that each state implements septic / wastewater / safety / environmental / building regulations that may be more stringent than EPA's regulations. Check with your state environmental/health agency for more information. These rules change frequently and are often difficult to interpret and follow. Be careful to not be in non-compliance and do not follow this course for proper compliance.*

## **When Finished with Your Assignment...**

### **REQUIRED DOCUMENTS**

Please scan the **Registration Page, Answer Key, Survey and Driver's License** and email these documents to [info@TLCH2O.com](mailto:info@TLCH2O.com).

### **IPhone Scanning Instructions**

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### **Rush Grading Service**

If you need this assignment graded and the results mailed to you within a 48-hour period, prepare to pay an additional rush service handling fee of \$50.00. This fee may not cover postage costs. If you need this service, simply write RUSH on the top of your Registration Form. We will place you in the front of the grading and processing line. *Thank you...*



## Onsite 202 CEU Training Assignment

You will have 90 days from the start of this assignment to finish it. Only one answer per question. Please utilize the Answer Key. Please fax or e-mail your completed answer key and registration form to TLC.

You are expected to circle or mark the correct answer on the enclosed answer key. Please include your name and address on your exam. The answer key is in the front. There are no intentional trick questions. (s) means the answer may be plural or singular in nature.

You can e-mail or fax your Answer Key along with the Registration Form to TLC.

***Please write down any questions you were not able to find the answers or that have errors.***

### Basic Wastewater Treatment Processes

1. In the wastewater treatment process, particles with which of the following terms, float to the top of water and can be removed?
- A. Inorganic material      C. Entrapped air  
B. Activated Sludge      D. None of the Above

### Biological

2. Which of the following wastewater terms means a suspended growth process for removing organic matter from sewage by saturating it with air and microorganisms that can break down the organic matter?
- A. Biosolid(s)      C. Activated Sludge  
B. Organic material      D. None of the Above
3. Masses of microorganisms grow and rapidly metabolized organic pollutants because of the addition of which term to wastewater?
- A. MLVSS      C. Oxygen  
B. Carbon dioxide      D. None of the Above

### Organic Matter

4. One of the measurements used to assess overall wastewater strength, the amount of oxygen organisms needed to break down wastes in wastewater is referred to as?
- A. BOD      C. COD  
B. MLSS      D. None of the Above
5. Some organic compounds are more stable than others are and cannot be quickly broken down by organisms; this is true of \_\_\_\_\_ developed for agriculture and industry.
- A. Most inorganic substances      C. Organic material(s)  
B. Many synthetic organic compounds      D. None of the Above
6. Two toxic \_\_\_\_\_ like benzene and toluene are found in some solvents, pesticides, and other products.
- A. Nutrients from wastewater      C. Organic compounds  
B. Inorganic materials      D. None of the Above

**(s) means the answer may be plural or singular in nature.**

### Oil and Grease

7. Which of the following wastewater terms also adds to the septic tank scum layer, causing more frequent tank pumping to be required?

- A. Nutrients from wastewater
- B. Inorganic materials
- C. Excessive grease
- D. None of the Above

8. Which of the following wastewater terms used for motors and industry are considered hazardous waste and should be collected and disposed of separately from wastewater?

- A. Nitrogen and phosphorus
- B. Inorganic substances
- C. Petroleum-based waste oil(s)
- D. None of the Above

9. When large amounts of oils and greases are discharged, these increase \_\_\_\_\_ and they may float to the surface and harden, causing aesthetically unpleasing conditions.

- A. BOD
- B. COD
- C. Petroleum-based waste oil(s)
- D. None of the Above

10. Fatty organic materials from animals, vegetables, and petroleum are quickly broken down by bacteria and can cause pollution in receiving environments.

- A. True
- B. False

### Inorganics

11. According to the text, heavy metals can be discharged with many types of industrial wastewaters are easy to remove by conventional treatment methods.

- A. True
- B. False

### Nutrients

12. Which of the following wastewater terms are essential to living organisms and are the chief nutrients present in natural water?

- A. Oxygen
- B. Carbon dioxide
- C. Carbon, nitrogen, and phosphorus
- D. Answers A,B and C

13. An excess of nutrients over-stimulates the growth of water plants, the result causes unsightly conditions, interferes with drinking water treatment processes, and causes unpleasant and disagreeable tastes and odors in drinking water.

- A. True
- B. False

14. Primarily \_\_\_\_\_ but occasionally nitrogen, causes nutrient enrichment which results in excessive growth of algae.

- A. Phosphorus
- B. Nitrifying Bacteria
- C. Ammonia
- D. Calcium Hydroxide

### Inorganic and Synthetic Organic Chemicals

15. Inorganic and Synthetic Organic Chemicals can cause \_\_\_\_\_ problems, and many are not effectively removed by conventional wastewater treatment.

- A. Toxic
- B. Ecology
- C. Excessive growth of aerobic bacteria
- D. Taste and odor

**(s) means the answer may be plural or singular in nature.**

## ONSITE SEWAGE FACILITIES (OSSF) ONSITE SYSTEMS SECTION

16. Onsite sewage treatment systems supply septic system owners with \_\_\_\_\_ to keep their septic systems functioning properly.

- A. The tank effluent
- B. Best management practices
- C. Primary and secondary treatment
- D. None of the above

17. These practices are really about recycling water: cleaning wastewater and returning safe water to the water cycle. If a septic system is not functioning properly, clean water is not returned to our \_\_\_\_\_.

- A. Groundwater system(s)
- B. Septic system
- C. Collection system
- D. None of the above

18. Our goal as onsite operators is to ensure that wastewater is properly treated while protecting human and environmental health in a \_\_\_\_\_.

- A. Onsite sewage manner
- B. Enhanced organic matter removal manner
- C. Cost-effective manner
- D. None of the above

### Onsite Sewage Facilities (OSSF)

19. Onsite/decentralized wastewater treatment systems, commonly called septic system(s), treat sewage from homes and businesses that are not connected to a \_\_\_\_\_.

- A. Decentralized sewer system(s)
- B. Municipal wastewater treatment
- C. Centralized wastewater treatment plant
- D. None of the above

20. Which of the following include individual onsite septic systems, cluster systems, and alternative wastewater treatment technologies like constructed wetlands, recirculating sand filters, mound systems, and ozone disinfection systems?

- A. Decentralized treatment systems
- B. Municipal wastewater treatment
- C. Centralized wastewater treatment plant
- D. None of the above

21. A septic tank and drainfield combination is the oldest and most common type of OSSF, although newer aerobic and biofilter units exist which represent scaled down versions of \_\_\_\_\_.

- A. Groundwater system(s)
- B. Municipal sewage treatments
- C. Collection system
- D. None of the above

22. OSSFs account for approximately \_\_\_\_\_ % of all domestic wastewater treatment in the United States.

- A. 25
- B. 15
- C. 50
- D. None of the above

23. Acknowledgement of the impacts of onsite systems on ground water and \_\_\_\_\_ (e.g., nitrate and bacteria contamination, nutrient inputs to surface waters) has increased interest in optimizing the systems' performance.

- A. Surface water quality
- B. Clustered wastewater system
- C. Water quality of receiving waters
- D. None of the above

24. Most current onsite regulatory programs focus on \_\_\_\_\_.

- A. Septic system(s)
- B. Permitting and installation
- C. Onsite wastewater management program(s)
- D. None of the above

25. Which of the following requires rigorous planning, design, installation, operation, maintenance, monitoring, and controls?
- A. Effective management
  - B. Water quality of receiving waters
  - C. Effective management of onsite systems
  - D. None of the above

### Types of Sewer Systems

26. Centralized sewer systems are generally broken out into three different categories: sanitary sewers, storm sewers, and \_\_\_\_\_.
- A. Septic system(s)
  - B. Combined sewers
  - C. Onsite wastewater management program(s)
  - D. None of the above
27. Which of the following are designed to quickly get rainwater off the streets during rain events?
- A. Septic system(s)
  - B. Combined sewers
  - C. Storm sewers
  - D. None of the above
28. Most \_\_\_\_\_ do not connect with a treatment plant, but instead drain directly into nearby rivers, lakes, or oceans.
- A. Septic system(s)
  - B. Combined sewers
  - C. Storm sewers
  - D. None of the above
29. Leaking, overflowing, and insufficient \_\_\_\_\_ can release untreated wastewater into receiving waters.
- A. Wastewater collection systems
  - B. Combined sewers
  - C. Storm sewers
  - D. None of the above

### Key Terms

30. Which of following means a sewage treatment plant that incorporates a means of introducing air and oxygen into the sewage to provide aerobic biochemical stabilization during a detention period?
- A. Alternative System
  - B. Aerobic System
  - C. Aerobic Sewage Treatment Facility
  - D. None of the above
31. Which of following means an alternative system that incorporates a septic tank or other treatment facility, an aerobic sewage treatment facility, and an absorption facility to provide treatment before dispersal?
- A. Alternative System
  - B. Aerobic System
  - C. Aerobic Sewage Treatment Facility
  - D. None of the above
32. Which of following means any onsite wastewater treatment system DEQ or the Commission approves for use in lieu of the standard subsurface system?
- A. Alternative System
  - B. Aerobic System
  - C. Aerobic Sewage Treatment Facility
  - D. None of the above
33. Which of following means may include anaerobic processes as part of the treatment system?
- A. Alternative System
  - B. Aerobic System
  - C. Aerobic Sewage Treatment Facility
  - D. None of the above

### Onsite Treatment Processes Options

34. The high cost of \_\_\_\_\_ and the advances made in individual and cluster (decentralized) system technologies have expanded the array of available treatment options and supported development of a more tailored approach to wastewater management services.

- A. Sewage
- B. Collection system
- C. Centralized wastewater treatment plants
- D. None of the above

### Key Considerations

35. Wastewater flow and strength, site and local infrastructure conditions, and performance requirements for the \_\_\_\_\_ are all key considerations in deciding what type of wastewater collection and treatment system is needed and how it should be designed.

- A. Dispersed or discharged effluent
- B. Septic system
- C. Centralized wastewater treatment
- D. None of the above

36. Onsite systems treat wastewater and disperse it on the property where it is generated.

- A. True
- B. False

37. When functioning properly, onsite systems prevent human contact with sewage, and prevent contamination of surface and groundwater.

- A. True
- B. False

38. Factors that affect the proper functioning of onsite systems include the site and soil conditions, design, installation, operation and maintenance.

- A. True
- B. False

### Basic Onsite Treatment Processes

39. Which of the following are designed to accomplish the same thing—the treatment of wastewater—but how this is accomplished is based on the type of treatment technology used?

- A. Individual and clustered wastewater systems
- B. Centralized system(s)
- C. Water system(s)
- D. None of the above

### Primary Treatment

40. Physical treatment processes involving capture of solids and fats/oils/grease in an enclosed vessel, typically by settling and flotation, such as provided in a septic tank or grease interceptor tank. This process also includes trapping of solids via \_\_\_\_\_ or screens prior to discharge of the tank effluent.

- A. Conventional system(s)
- B. The tank effluent
- C. Septic tank effluent filters
- D. None of the above

### Secondary Treatment

41. Which of the following is designed to remove organic matter, mostly through digestion and decomposition, often aided by introduction of or exposure to atmospheric oxygen?

- A. Wastewater
- B. Onsite sewage treatment
- C. Biological and chemical processes
- D. None of the above

## Key Septic Terms

Identify the missing term.

42. Means any onsite wastewater treatment system DEQ or the Commission approves for use in lieu of the standard subsurface system.

- A. Alternative System
- B. Cesspool
- C. Effective Seepage Area
- D. None of the above

43. Means the distribution of effluent to a set of absorption trenches in which each trench receives effluent in equivalent or proportional volumes.

- A. Equal Distribution
- B. Holding Tank System
- C. Intermittent Sand Filter
- D. None of the above

44. Means a structure used for disposal of human waste without the aid of water. It consists of a shelter built above a pit or vault in the ground into which human waste falls.

- A. Septic pool
- B. Messpool
- C. Privy
- D. None of the above

45. Means a lined pit that receives raw sewage, allows separation of solids and liquids, retains the solids, and allows liquids to seep into the surrounding soil through perforations in the lining.

- A. Black Waste
- B. Cesspool
- C. Swamp
- D. None of the above

46. Means the sidewall area within an absorption trench or a seepage trench from the bottom of the trench to a level 2 inches above the distribution pipes, the sidewall area of any cesspool, seepage pit, unsealed earth pit privy, graywater waste absorption sump seepage chamber, or trench with drain media substitute, or the bottom area of a pressurized soil absorption facility installed in soil.

- A. Alternative System
- B. Cesspool
- C. Effective Seepage Area
- D. None of the above

47. Means a conventional sand filter.

- A. Fast sand filter
- B. Slow sand filter
- C. Intermittent Sand Filter
- D. None of the above

48. Means an alternative system consisting of the combination of a holding tank, service riser, and level indicator (alarm), designed to receive and store sewage for intermittent removal for treatment at another location.

- A. Septic tank
- B. Holding Tank System
- C. Intermittent septic tank
- D. None of the above

49. The absence of dissolved molecular oxygen.

- A. Black Waste
- B. Aerobic
- C. Anaerobic
- D. None of the above

50. Means human body wastes including feces, urine, other substances of body origin, and toilet paper.

- A. Black Waste
- B. Cesspool
- C. Grey water
- D. None of the above

51. Means the wastewater treatment that takes place prior to discharging to any component of an onsite wastewater treatment system, including but not limited to pH adjustment, oil and grease removal, BOD5 and TSS reduction, screening, and detoxification.
- A. Pretreatment                      C. Post-treatment  
B. Holding Tank System      D. None of the above

**Septic System Basics Described**

52. Most tanks are split into two compartments and have pipe baffles and an outlet filter to ensure the \_\_\_\_\_ stay in the tank.
- A. Solids      C. Biologic process  
B. Liquids      D. None of the above

53. The \_\_\_\_\_ process begins in the tank where the effluent separates into layers and begins the process of decomposition.
- A. Physical                      C. Biologic  
B. Natural                      D. None of the above

54. Bacteria, which are naturally present in all septic systems, begin to digest the solids that have settled to the bottom of the tank, transforming a large percentage of these solids into liquids and \_\_\_\_\_.
- A. Solids                      C. Gases  
B. Liquids                      D. None of the above

55. When \_\_\_\_\_ within the tank rise to the level of the outflow pipe, they enter the next part of the treatment system (pre-treatment device, distribution box, pump chamber, etc., depending on the type of system).
- A. Solids                      C. Gases  
B. Liquids                      D. None of the above

56. Final treatment of the effluent always occurs in the soil where additional microbes break down the waste and the “clean” water is put back into the ground thereby recharging the aquifers.
- A. True      B. False

57. Wastewater contains several undesirable pollutants.
- A. True      B. False

58. Pathogens such as viruses or bacteria cannot enter drinking water supplies creating a potential health hazard.
- A. True      B. False

59. Nutrients and organic matter entering waterways can lead to tremendous death of aquatic microorganisms.
- A. True      B. False

60. Metabolic activity of microbes can increase oxygen levels in the water causing aquatic life to thrive.
- A. True      B. False

61. Septic system regulations attempt to reduce the chance of pollutants from having a positive impact on people and animals.
- A. True      B. False

**Types of Systems – General**

62. Standard gravity systems require \_\_\_\_\_ feet of "good" soil under the trenches while pressure distribution systems only require \_\_\_\_\_ feet.

- A. 3 & 3    C. 3 & 2
- B. 2 & 3    D. None of the above

63. Advanced Treatment systems are more complicated and treat the wastewater to a fairly high level before allowing it to reach the soil. Because of this treatment, they can be used where there is only \_\_\_\_\_ foot of "good" dirt beneath the trench bottom.

- A. 1            C. 3
- B. 2            D. None of the above

**Conventional Septic Systems typically have three Main Components.**

64. Which of the following separates the solids from the liquids, and serves a storage area for the solids to decompose and if properly maintained will decompose the solids faster than they build up?

- A. A gravity system            C. A pressure distribution system
- B. A septic tank                D. None of the above

65. Which of the following allows the separated water to drain out of the system and to absorb into the leach field?

- A. A gravity system            C. A pressure distribution system
- B. A drain field                D. None of the above

66. Which of the following is the final treatment area for the effluent water to be treated; microorganisms in the soil will treat the drain water before it percolates out of the system?

- A. A gravity system            C. Soil
- B. A drain tank                D. None of the above

67. If installed properly, the \_\_\_\_\_ is environmentally safe, long lasting and almost maintenance free. This is why septic system design is so important.

- A. Conventional system            C. A pressure distribution system
- B. Septic system design            D. None of the above

**Pressure Distribution**

68. Pressure distribution systems are usually required when there is less than optimal soil depth available for complete treatment of the effluent by \_\_\_\_\_.

- A. A gravity system            C. A pressure distribution system
- B. Septic system design            D. None of the above

69. A minimum of \_\_\_\_\_ feet of properly drained soil is required under the trenches.

- A. Three            C. Five
- B. Two             D. None of the above

70. Which of the following are normally the same as a standard gravity system, but the method by which the effluent is distributed to the soil is different?

- A. A gravity system            C. A pressure distribution system
- B. The tank and drainfield size    D. None of the above



71. A pump is used to pressurize the effluent into a small underground pvc pipe which transports it to the \_\_\_\_\_.

- A. A gravity system
- B. Septic system design
- C. Drainfield
- D. None of the above

72. Unlike a standard gravity system, \_\_\_\_\_ wets the entire length of the trench each time the pump turns on. This allows the effluent to be spread over a larger area and receive better treatment from the soil.

- A. A gravity system
- B. Septic system design
- C. A pressure distribution system
- D. None of the above

### Conventional Septic Systems

73. Which of the following are the most commonly used wastewater treatment technologies, combining primary and secondary treatment?

- A. The tank effluent
- B. The quantity of contaminants
- C. Conventional treatment systems
- D. None of the above

74. Conventional treatment systems are the least expensive in terms of total cost but require specific conditions (e.g., at least \_\_\_\_\_ inches of unsaturated soil) and maintenance to perform adequately.

- A. 12-24
- B. 24-36
- C. 12-36
- D. None of the above

75. A conventional wastewater treatment system consists of a septic tank and \_\_\_\_\_ that allows primary treatment effluent to infiltrate into unsaturated soil.

- A. A gravity system
- B. A soil absorption field
- C. Volumes of treated wastewater
- D. None of the above

76. Flow through the system usually occurs via gravity but can be aided by a pump, if necessary, operated by \_\_\_\_\_.

- A. A gravity system
- B. A float switch or timer
- C. A pressure distribution system
- D. None of the above

77. The conventional system has two principal parts—the tank and soil absorption field. The septic tank treats \_\_\_\_\_ by allowing floatable materials (e.g., fats, oils, grease) to rise to the surface, forming a scum layer, and the heavier solids to sink to the bottom, creating a layer of sludge.

- A. The tank effluent
- B. The soil absorption system
- C. Wastewater
- D. None of the above

78. \_\_\_\_\_ is similar to that of primary sedimentation in larger treatment facilities, except that it is generally devoid of oxygen (i.e., anaerobic).

- A. The tank effluent
- B. The soil absorption system
- C. Wastewater
- D. None of the above

79. \_\_\_\_\_ facilitates aerobic treatment and filtration of the remaining contaminants.

- A. The tank effluent
- B. The soil absorption system
- C. Effluent to the entire drainfield
- D. None of the above

80. Subsurface discharge of effluent to the soil can be configured to optimize treatment via pressurized time-dosing of preset volumes of treated wastewater, which facilitates oxygenation of the soil matrix between doses, promotes film flow of wastewater over soil particles, and ensures a uniform and consistent application of \_\_\_\_\_.

- A. The tank effluent
- B. The soil absorption system
- C. Effluent to the entire drainfield
- D. None of the above

### Basic Onsite Wastewater Treatment Systems and Components

81. Building sewers and other sewer lines: watertight pipes, which deliver waste by \_\_\_\_\_ from a building to the onsite system or carry effluent by gravity from sewage tanks to other system components.

- A. Gravity
- B. Pressure manifolds
- C. Lateral trenches
- D. None of the above

### Septic Tanks

82. The septic tank's function is to separate solids from liquid, digest organic matter, store liquids through a period of detention and allow the \_\_\_\_\_ to discharge to other components of an onsite system.

- A. Biological processes
- B. Clarified liquids
- C. Organic matter
- D. None of the above

83. Which of the following are stored and periodically need to be pumped out and hauled to a point for further treatment?

- A. Gases
- B. Liquids
- C. Solids
- D. None of the above

### Septic/Sewage Tank Removal

84. \_\_\_\_\_ need to be properly abandoned to prevent them from becoming a safety hazard.

- A. Unused sewage tanks
- B. Pressure manifolds
- C. Lateral trenches
- D. None of the above

### Septic Treatment

85. A septic tank removes many of the settleable solids, oils, greases, and floating debris in the raw wastewater, achieving \_\_\_\_\_ percent removal.

- A. 50 to 80
- B. 60 to 80
- C. 60 to 90
- D. None of the above

86. Which of the following removed are stored in sludge and scum layers, where they undergo liquefaction?

- A. Gases
- B. Liquids
- C. Solids
- D. None of the above

87. During liquefaction, the first step in the digestion process, acid forming bacteria partially digest the solids by hydrolyzing the proteins and converting them to \_\_\_\_\_, most of which are dissolved in the water phase.

- A. Organic suspended solid(s)
- B. Volatile fatty acid(s)
- C. BOD
- D. None of the above

88. Gases that form from the microbial action in the tank rise in the wastewater column. The rising gas bubbles disturb the \_\_\_\_\_, which can reduce the settling efficiency of the tank.  
 A. Organic suspended solid(s) C. Quiescent wastewater column  
 B. Volatile fatty acid(s) D. None of the above
89. Gases dislodge \_\_\_\_\_ in the sludge blanket so they can escape in the water column.  
 A. Organic suspended solid(s) C. BOD  
 B. Colloidal particles D. None of the above
90. At the same time, gases can carry active anaerobic and facultative microorganisms that might help to treat \_\_\_\_\_ present in the wastewater column.  
 A. Organic suspended solid(s) C. Colloidal and dissolved solids  
 B. Volatile fatty acid(s) D. None of the above
91. Septic tank effluent varies naturally in quality depending on the characteristics of \_\_\_\_\_ and condition of the tank.  
 A. Organic suspended solid(s) C. The wastewater  
 B. Volatile fatty acid(s) D. None of the above
92. Typical septic tank BOD removal efficiencies are \_\_\_\_\_ percent.  
 A. 50 to 80 C. 60 to 90  
 B. 30 to 50 D. None of the above

**Typical SWIS Performance**

93. Results from numerous studies have shown that septic tanks (SWISs) achieve high removal rates of many pollutants of concerns with the notable exception of \_\_\_\_\_.  
 A. Nitrogen C. Phosphorous and metals  
 B. Nitrate(s) D. None of the above
94. Biochemical oxygen demand (BOD), suspended solids, fecal bacteria indicators and surfactants are effectively removed within \_\_\_\_\_ feet of unsaturated, aerobic soil.  
 A. 2-5 C. 2-6  
 B. 1-4 D. None of the above
95. Which of the following and metals are removed by adsorption, ion exchange and precipitation?  
 A. Nitrogen C. Phosphorous  
 B. Nitrate(s) D. None of the above
96. The retention capacity of the soil is finite and will vary with different types of soil mineralogy, \_\_\_\_\_, Redox potential and cation exchange capacity.  
 A. Nitrogen C. pH  
 B. Nitrate(s) D. None of the above
97. Fine textured soils, low hydraulic loadings, aerobic subsoils and high temperatures favor destruction of viruses and toxic organics. The most significant documented threat to our groundwater supply from SWISs are \_\_\_\_\_.  
 A. Nitrogen C. Phosphorous and metals  
 B. Nitrate(s) D. None of the above

### Septic Pretreatment Components

98. Which of the following remove many of the contaminants from the wastewater to prepare the effluent for final treatment and dispersal into the environment? The level of treatment is selected to match the receiving environment and the intended use.

- A. Pretreatment components
- B. Advanced systems
- C. Gravity flow systems
- D. None of the above

99. Which of the following is reduced to a level the soil can accept and treat? Many options exist for treatment prior to release into the receiving environment.

- A. Advanced system(s)
- B. Septic tank effluent
- C. The quantity of contaminants
- D. None of the above

100. Which of the following include septic tanks, trash tanks, and processing tanks, while aerobic treatment units, media filters, and constructed wetlands are considered advanced pretreatment components?

- A. Wastewater pretreatment components
- B. Gravity flow systems
- C. Final treatment and dispersal components
- D. None of the above

101. Which of the following provide the final removal of contaminants and distribute the effluent for dispersal back into the environment? Several options are available for distributing wastewater in soil.

- A. Wastewater pretreatment components
- B. Gravity flow systems
- C. Final treatment and dispersal components
- D. None of the above

102. Which of the following are the most widely used dispersal systems? These systems will continue to be used in areas where the soil separation distances can be met, primarily because they are the least expensive alternative and require the least amount of operation and maintenance.

- A. Wastewater pretreatment components
- B. Gravity flow systems
- C. Final treatment and dispersal components
- D. None of the above

103. Which of the following overcome a variety of site limitations?

- A. Advanced system(s)
- B. Pressurized distribution methods
- C. Final treatment and dispersal components
- D. None of the above

### Submerged-Flow Wetland or Vegetative Submerged-Bed (VSB)

104. Which of the following are also called submerged-flow wetlands? This system type treats septic tank effluent by horizontal flow through a lined bed of unmulched gravel planted with wetland species. The plants fill in spaces between the rocks and provide aesthetic appeal.

- A. Unsaturated soil
- B. Media filter(s)
- C. Vegetative submerged bed(s)
- D. None of the above

105. Which of the following are extremely passive and require little management in producing a good quality effluent (typically BOD and TSS of less than 30 mg/L)?

- A. Cluster system(s)
- B. Treatment facilities
- C. Wetland system(s)
- D. None of the above

106. Effluent is further treated when discharged to \_\_\_\_\_ following flow through the wetland cell(s).

- A. Unsaturated soil
- B. Media filter(s)
- C. Vegetative submerged bed(s)
- D. None of the above

### Cluster System Applications

107. A cluster system is designed to collect wastewater from \_\_\_\_\_ homes.
- A. Three to fifty                      C. Two to several hundred  
B. Two to one hundred    D. None of the above

### Septic System Failures

108. Which of the following failures are a major source of groundwater pollution?
- A. Soil dispersal system    C. Individual and clustered systems  
B. Septic system              D. None of the above

109. Layers of soil act as a natural filter, removing microbes and other particles as water seeps through. Improperly treated water can carry \_\_\_\_\_ that can cause gastroenteritis, fever, common cold, respiratory infections and hepatitis.
- A. All sewage                      C. Waterborne pollution  
B. Bacteria and viruses    D. None of the above

110. Which of the following are effective, cost efficient, and easy to maintain?
- A. Septic tank effluent pump (STEP)                      C. Septic systems  
B. Individual and clustered systems                      D. None of the above

111. Failing systems are a major source of groundwater pollution, cause \_\_\_\_\_, such as dysentery and hepatitis, and are expensive for homeowners to replace. There are many different types of wastewater collection and treatment technologies.
- A. Aerobic microsite(s)                      C. Chemical diseases  
B. Waterborne illnesses                      D. None of the above

112. Which of the following for clustered facilities can work by gravity or operate via vacuum or pressure pump?
- A. Septic system(s)                      C. Collection systems  
B. Cluster system(s)                      D. None of the above

### Advanced (Tertiary) Systems Introduction

113. Advanced systems can be designed and built on-site or can consist of prefabricated units designed to overcome some site and soil limitations including:

When the aerated (unsaturated) soil depth below the infiltrative surface in the drainfield is less than the minimum required, advanced treatment processes or components (e.g., \_\_\_\_\_) can be added to increase pollutant removal prior to soil discharge.

- A. Fixed film treatment units                      C. Infiltrative surface  
B. Septic tank effluent                      D. None of the above

114. In environmentally sensitive areas, \_\_\_\_\_ can be used to meet effluent standards for oxygen-demanding wastes, bacteria, nitrogen, and phosphorus.
- A. Gravity flow systems                      C. Advanced systems  
B. Septic tank effluent                      D. None of the above

115. If a soil dispersal area malfunctions hydraulically due to a buildup of the biomat (inorganic, organic, and/or bacterial slime) at the infiltrative surface, it may be restored, and treatment may be enhanced, by improving \_\_\_\_\_ through timed dosing of septic tank effluent to the dispersal field.
- A. Soil oxidation                      C. Infiltrative surface  
B. Septic tank effluent                      D. None of the above

116. \_\_\_\_\_ allows the soil to drain between doses, improving soil oxygen transfer.  
 A. The dose/rest cycle    C. Infiltrative surface  
 B. Septic tank effluent    D. None of the above
117. Wastewater with high organic strength (e.g., from a restaurant) can employ \_\_\_\_\_ to improve aeration, biological decomposition, and treatment of organic wastes.  
 A. Gravity flow systems    C. Advanced treatment units/processes  
 B. Septic tank effluent    D. None of the above
118. Which of the following provide timed dosing of septic tank or treatment unit effluent to the soil can sometimes be used where soil infiltration areas are limited, except in cases of high-clay content soils?  
 A. Advanced system(s)    C. Pressurized distribution methods  
 B. The dose/rest cycle    D. None of the above
119. Advanced systems employ \_\_\_\_\_ and can reduce bacteria and nutrient loading to groundwater by applying wastewater high in the soil profile, improving bacteria predation and uptake of nutrients by plants and providing a carbon source for denitrification.  
 A. Nutrient loading    C. Pressure drip dispersal of the effluent  
 B. Modified dispersal area    D. None of the above

**Advanced Onsite Wastewater Treatment Systems and Components**  
**Elevated (Mound or At-Grade) Systems**

120. This system type includes \_\_\_\_\_ to provide primary (and sometimes secondary) treatment prior to discharging the effluent to a modified drainfield.  
 A. Pressure distribution    C. A septic tank or prefabricated treatment unit  
 B. Septic system    D. None of the above
121. Effluent flows from the tank or treatment unit to a pump tank and periodically dosed to the \_\_\_\_\_, which is typically constructed of a layer of clean, uniformly graded sand on a plowed or roughened natural soil surface.  
 A. Above-grade systems    C. Modified dispersal area  
 B. Clay dispersal field    D. None of the above
122. The tank effluent is uniformly dosed onto the \_\_\_\_\_ within the mound, which may be 1-4 ft. above the natural grade. Sand within the mound compensates for shallow unsaturated soil conditions below the natural grade.  
 A. Media filter(s)    C. Infiltrative surface  
 B. ATU(s)    D. None of the above

**Mound Systems**

123. Mound systems are appropriate for areas with a high water table or shallow, fractured bedrock. After treatment through the \_\_\_\_\_, the effluent percolates directly into the soil under the mound.  
 A. Effluent dispersal piping    C. Sand  
 B. Aerobic treatment units (ATUs)    D. None of the above
124. \_\_\_\_\_ feature effluent dispersal piping placed at natural grade, with the mound consisting mostly of cover soil for the piping.  
 A. At-grade systems    C. Effluent flows from the tank  
 B. Aerobic treatment units (ATUs)    D. None of the above

125. The mound should have inspection ports, so wastewater distribution across the infiltration area can be monitored. \_\_\_\_\_ should have cleanouts so they can be flushed at least twice a year.
- A. Media filter(s) C. Distribution lines  
B. ATU(s) D. None of the above

### **Aerobic Treatment Units**

126. \_\_\_\_\_) consist of prefabricated units featuring consecutive or compartmentalized tanks, pumps, blowers, and internal piping, and are designed to treat wastewater via suspended or attached growth decomposition in an oxygen rich environment.

- A. Effluent dispersal piping C. Effluent flows from the tank  
B. Aerobic treatment units (ATUs) D. None of the above

127. When \_\_\_\_\_ is supplied, the rate of microbial activity and related treatment processes accelerates.

- A. Nitrogen C. Hydrogen  
B. Oxygen D. None of the above

128. Three processes are involved in most \_\_\_\_\_: physical separation (mostly settling), aerobic treatment (aeration and mixing), and clarification (final settling).

- A. Media filter(s) C. Aerobic systems  
B. Anaerobic systems D. None of the above

129. \_\_\_\_\_ vary in design and can consist of simple activated sludge variations, sequencing batch reactors, trickling filters, and combinations of two or more of these unit processes.

- A. Media filter(s) C. Septic tank effluent  
B. ATU(s) D. None of the above

### **Media Filters**

130. \_\_\_\_\_ can be applied to a layer of sand or gravel, a tank containing peat or plastic media, or compartments of hanging textile or other material to improve oxygen access and enhance biochemical treatment processes.

- A. Media filter(s) C. Septic tank effluent  
B. ATU(s) D. None of the above

131. A number of these so-called " \_\_\_\_\_ " are available to treat wastewater.

- A. Media filter(s) C. Septic tank effluent  
B. ATU(s) D. None of the above

132. Sand is the most commonly used \_\_\_\_\_, but clean gravel, crushed glass, textile strips, peat, and tire crumbs are also used, depending on site restrictions and state/local regulations.

- A. Media C. Soil dispersal field  
B. Septic tank effluent D. None of the above

133. In single-pass or intermittent filter (ISF) design, \_\_\_\_\_ is pump-dosed uniformly onto the media at regular intervals 12 to 48 times per day.

- A. Media C. Sand  
B. Septic tank effluent D. None of the above

134. As the effluent trickles through the \_\_\_\_\_, suspended and some colloidal particles are filtered, and bacteria growing on the media aerobically treat organic wastewater.

- A. Media
- B. Septic tank effluent
- C. Sand
- D. None of the above

135. Effluent that percolates through the media bed is discharged to the \_\_\_\_\_.

- A. Septic tank effluent
- B. Soil dispersal field
- C. Aerobic treatment units (ATUs)
- D. None of the above

## ONSITE OPERATION AND MAINTENANCE SECTION

### System Operation and Maintenance Requirements

136. When \_\_\_\_\_ exist, adjustments to the upstream treatment train may be needed to reduce biochemical oxygen demand, total suspended solids, bacteria levels, nutrients, or other pollutants.

- A. Groundwater pollution
- B. Hydraulic successes
- C. Soil limitations
- D. None of the above

137. Adjustments could involve reducing \_\_\_\_\_ at the source (e.g., better plate and pot scraping prior to dishwashing in restaurant kitchens, adding grease trap tanks, etc.), applying the effluent at lower soil loading rates, or inserting a fixed film or suspended growth treatment unit between the septic tank and drainfield.

- A. Septic system maintenance
- B. Failure(s)
- C. Pollutant inputs
- D. None of the above

### Septic System Failures

138. Septic system failures are a major source of \_\_\_\_\_.

- A. Groundwater pollution
- B. Hydraulic failures
- C. Failure(s)
- D. None of the above

139. \_\_\_\_\_ is like automobile maintenance; a little effort on a regular basis can save you a lot of money and significantly prolong the life of the system.

- A. Septic system maintenance
- B. Failure(s)
- C. Suspended growth treatment unit
- D. None of the above

140. Some soil-based systems (those with a drain field) are installed at sites with inadequate or inappropriate soils, excessive slopes, or high ground water tables. These conditions can cause hydraulic failures and \_\_\_\_\_.

- A. Groundwater purification
- B. Contamination of nearby water sources
- C. Upstream treatment train
- D. None of the above

141. Failure to perform routine maintenance, such as pumping the septic tank generally at least every \_\_\_\_\_ years, can cause solids in the tank to migrate into the drain field and clog the system.

- A. 1 to 2
- B. 3 to 5
- C. 3 to 4
- D. None of the above



### Regular Maintenance

142. Verification of \_\_\_\_\_ contracts, operator expertise, and reporting requirements for system maintenance such as tank pumping and repairs should be included in the approval process.
- A. Drainage features
  - B. Installation specifications
  - C. System maintenance
  - D. None of the above

### These records should reflect:

143. If properly designed, installed, and maintained, a septic system can effectively treat household wastewater for up to \_\_\_\_\_ years or more. Look to see if the house has a system that is near the end of its life-span.
- A. 500
  - B. 130
  - C. 20
  - D. None of the above

144. Size is important because graywater (laundry water, sink water) and blackwater (toilet water) need to be retained in the tank for at least a \_\_\_\_\_ to allow solids to separate from the liquids and begin breaking down. If wastewater is pushed through without proper settling, the solids can clog the drainfield, stressing and possibly damaging the system.
- A. Day or more
  - B. 12 hours or more
  - C. Week or more
  - D. None of the above

### Individual Wastewater Systems

145. Individual treatment systems collect, treat, and disperse wastewater from \_\_\_\_\_ and are associated with low-density communities and developments, such as rural residential and small commercial developments.
- A. Type of system
  - B. Subsurface dispersal system
  - C. An individual property
  - D. None of the above

146. Individual systems generally consist of one or more treatment devices (e.g., septic tank, fixed film treatment unit) and \_\_\_\_\_.
- A. Type of system
  - B. A subsurface dispersal system
  - C. Low-density communities and developments
  - D. None of the above

147. The \_\_\_\_\_ of an individual system can vary greatly depending on the type of system.
- A. Type of system
  - B. Subsurface dispersal system
  - C. Operation and maintenance requirements
  - D. None of the above

148. Mechanical systems, such as activated sludge-based units, require servicing three to four times a year, while conventional systems need service or pumping every \_\_\_\_\_ years, depending on occupancy and use.
- A. 1 to 5
  - B. 3 to 5
  - C. 5 to 10
  - D. None of the above

### Septic System Evaluation Guideline

#### Enhanced Treatment Systems

149. \_\_\_\_\_ have proven to be effective in situations where conventional systems are not appropriate.
- A. Treatment performance
  - B. Several wastewater alternative technologies
  - C. Wastewater treatment system(s)
  - D. None of the above

### Enhanced Wastewater Treatment

150. Advanced or innovative technologies provide a \_\_\_\_\_ beyond conventional systems. Generally, these systems have mechanical or moving parts that require periodic operation and maintenance, inspections, and eventual replacement.

- A. Clustered system(s)
- C. Higher level of treatment
- B. O&M requirement(s)
- D. None of the above

151. Enhanced wastewater treatment systems are more complex than \_\_\_\_\_ and require greater oversight to keep all aspects of the treatment process in balance.

- A. Treatment performance
- C. Conventional systems
- B. O&M requirement(s)
- D. None of the above

### Perforated Pipe

152. Perforated pipe is laid in the bottom of upslope trenches excavated into the restrictive horizon. A durable, porous medium is placed around the piping and up to a level above the estimated \_\_\_\_\_.

- A. Low-saturated zone
- C. Seasonally high-saturated zone
- B. An outfall for the drain
- D. None of the above

153. The porous medium intercepts the ground water and conveys it to the drainage pipe. To provide an outfall for the drain, one or both ends of the pipe are extended downslope to a point where it intercepts \_\_\_\_\_.

- A. The ground surface
- C. Drainage enhancements
- B. An outfall for the drain
- D. None of the above

154. When drainage enhancements are used, the \_\_\_\_\_ must be carefully evaluated to protect local water quality.

- A. Outlet and boundary conditions
- C. Drainage enhancements
- B. An outfall for the drain
- D. None of the above

155. \_\_\_\_\_ should avoid capture of the SWIS percolate plume and ground water infiltrating from below the SWIS or near the end of the drain.

- A. SWIS
- C. The drain
- B. Outlet locations
- D. None of the above

156. A separation distance between the \_\_\_\_\_ that is sufficient to prevent percolate from the SWIS from entering the drain should be maintained.

- A. SWIS and the drain
- C. Plume and ground water
- B. Outlet locations
- D. None of the above

157. The \_\_\_\_\_ between the bottom of the SWIS and the drain and soil permeability characteristics should determine this distance.

- A. SWIS
- C. Vertical distance
- B. Outlet locations
- D. None of the above

158. As the vertical distance increases and the \_\_\_\_\_ decreases, the necessary separation distance increases.

- A. SWIS
- C. Plume and ground water
- B. Permeability
- D. None of the above

159. A \_\_\_\_\_-foot separation is used for most applications.

- A. 2
- B. 10
- C. 4
- D. None of the above

160. If both ends of the drain cannot be extended to the ground surface, the upslope end should be extended some distance along the surface contour beyond the \_\_\_\_\_.

- A. End of the SWIS
- B. Outlet locations
- C. Plume and ground water
- D. None of the above

161. If not done, ground water that seeps around the \_\_\_\_\_ can render the drain ineffective.

- A. End of the drain
- B. Outlet locations
- C. Plume and ground water
- D. None of the above

162. Similar cautions should be observed when designing and locating \_\_\_\_\_ for commercial systems on flat sites.

- A. SWIS
- B. Outlet locations
- C. Plume and ground water
- D. None of the above

163. The design of a curtain drain is based on the permeability of the soil in the \_\_\_\_\_, the size of the area upslope of the SWIS that contributes water to the saturated zone, the gradient of the drainage pipe, and a suitable outlet configuration.

- A. Saturated zone
- B. Outlet locations
- C. Plume and ground water
- D. None of the above

164. If the saturated hydraulic conductivity is low and the drainable porosity (the percentage of pore space drained when the soil is at field capacity) is small, even \_\_\_\_\_ might have limited effect on soil wetness conditions.

- A. SWIS
- B. Outlet locations
- C. Effectively designed curtain drains
- D. None of the above

### Inspections and Maintenance Requirements

165. A four-bedroom home might have a daily flow of 480 gallons per day (assuming 120 gallons per bedroom per day). In a 1,000-gallon tank, this provides \_\_\_\_\_ days for solids to settle.

- A. 2
- B. 3
- C. 4
- D. None of the above

166. Nevertheless, as the solids build up, there is less room in the tank for the liquid and thus less settling time. The accepted maximum level of solids in the tank is \_\_\_\_\_ of the liquid depth. Any more than this and the tank is overdue for pumping. Having these solids removed, is a critical component of how well the septic system, as a whole, will function.

- A. 1/2
- B. 1/3
- C. 1/4
- D. None of the above

### SWIS Designs

167. There are several different designs for \_\_\_\_\_. They include trenches, beds, seepage pits, at grade systems, and mounds.

- A. Seepage pits
- B. SWISs
- C. Secondary infiltrative surface
- D. None of the above

168. SWIS applications differ in their geometry and location in the \_\_\_\_\_.

- A. Sidewall infiltration
- B. Soil profile
- C. Infiltration surface(s)
- D. None of the above

169. \_\_\_\_\_ have a large length-to-width ratio, while beds have a wide, rectangular or square geometry.

- A. Seepage pits
- B. Infiltration surface
- C. Trenches
- D. None of the above

170. \_\_\_\_\_ are deep, circular excavations that rely almost completely on sidewall infiltration.

- A. Sidewall infiltration
- B. Seepage pits
- C. Infiltration surface(s)
- D. None of the above

171. \_\_\_\_\_ are no longer permitted in many jurisdictions because their depth and relatively small horizontal profile create a greater point-source pollutant loading potential to ground water than other geometries. Because of these shortcomings, seepage pits are not recommended in this manual.

- A. Seepage pits
- B. Infiltration surface
- C. Secondary infiltrative surface
- D. None of the above

172. Infiltration surfaces may be created in natural soil or imported fill material. Most traditional systems are constructed below \_\_\_\_\_.

- A. Ground surface in natural soil
- B. Soil profile
- C. Infiltration surface(s)
- D. None of the above

173. In some instances, \_\_\_\_\_ above a more permeable horizon may be removed and the excavation filled with suitable porous material in which to construct the infiltration surface.

- A. A restrictive horizon
- B. Infiltration surface
- C. Secondary infiltrative surface
- D. None of the above

174. \_\_\_\_\_ may be constructed at the ground surface ("at-grades") or elevated in imported fill material above the natural soil surface ("mounds").

- A. Sidewall infiltration
- B. Soil profile
- C. Infiltration surface(s)
- D. None of the above

175. An important difference between infiltration surfaces constructed in natural soil and those constructed in fill material is that a secondary infiltrative surface (which must be considered in design) is created at the \_\_\_\_\_.

- A. Fill/natural soil interface
- B. Infiltration surface
- C. Secondary infiltrative surface
- D. None of the above

### **Maintenance Inspections**

176. Maintenance inspections are gaining appeal as a management tool to assess the condition of systems and determine pumping or \_\_\_\_\_.

- A. Other O&M needs
- B. Advances in technology
- C. Alternative and enhanced wastewater technologies
- D. None of the above

177. Some local agencies have adopted a sewage management program that requires the annual inspection of systems with newly issued or modified permits and proof of \_\_\_\_\_ for all systems (old and new).

- A. Septic tank pumping
- B. Advances in technology
- C. Operation and maintenance inspection programs
- D. None of the above

178. \_\_\_\_\_ are usually coupled with a mandatory septic tank pumping program. The local agency notifies the system owner when pumping is due. Verification of pumping is provided to the regulating agency.

- A. Septic tank pumping
- B. Advances in technology
- C. Operation and maintenance inspection programs
- D. None of the above

179. Typical pumping requirements vary from three to five years or more based on the \_\_\_\_\_ and individual household wastewater characteristics.

- A. Typical pumping requirement(s)
- B. Enhanced system(s)
- C. Daily sewage flow
- D. None of the above

180. Alternative and \_\_\_\_\_ require additional maintenance and/or ongoing attention. In states and communities where these systems are authorized, performance inspections are mandated in the state code or in the system's operating permit.

- A. O&M needs
- B. Advances in technology
- C. Enhanced wastewater technologies
- D. None of the above

### **Maintenance of Systems**

181. A key part of \_\_\_\_\_ is to track the maintenance of systems. The only way to ensure that maintenance contracts are kept in effect and that systems are monitored when required is for the management entity or regulatory authority to have a structured reporting program.

- A. An O&M program
- B. Advances in technology
- C. Alternative and enhanced wastewater technologies
- D. None of the above

182. Service providers should report maintenance events and any lapses in maintenance contracts to the management or regulatory authority. This information should be managed in a database to monitor \_\_\_\_\_ and provide a system of accountability.

- A. Typical pumping requirement(s)
- B. Enhanced system(s)
- C. O&M activities
- D. None of the above

### **Standard Leach Field Septic System Inspection**

183. As the septic system is used, there is an accumulation of solids in the tank, which is sometime referred to as \_\_\_\_\_.

- A. Slime
- B. Sludge
- C. Long-term biochemical oxygen demand
- D. None of the above

184. The septic tank removes solids by holding wastewater in the tank for at least 24 hours, allowing the \_\_\_\_\_ to settle and \_\_\_\_\_ to rise to the top. This is accomplished by a series of baffles inside the tank.

- A. Scum - Solids
- B. Sludge - Scum
- C. Solids - Scum
- D. None of the above

185. Up to \_\_\_\_\_ % of the solids retained in the tank will decompose over time.

- A. 25
- B. 50
- C. 40
- D. None of the above

186. Effluent water discharges from the tank to perforated drain pipes. From there, it drains to a

- A. Constructed absorption or leach field
- B. Leach fields or leach drains
- C. A septic tank, the septic drain field
- D. None of the above

187. Septic drain fields, also called leach fields or leach drains are used to remove contaminants and impurities from the liquid that emerges from\_\_\_\_\_.

- A. Effluent water discharges
- B. Leach fields or leach drains
- C. The septic tank
- D. None of the above

188. A septic tank, the septic drain field, and the associated piping compose\_\_\_\_\_.

- A. Effluent water discharges
- B. Leach fields or leach drains
- C. A complete septic system
- D. None of the above

189. \_\_\_\_\_is effective for disposal of organic materials readily catabolized by a microbial ecosystem.

- A. Effluent water discharges
- B. Leach tanks
- C. The septic drain field
- D. None of the above

190. \_\_\_\_\_typically consists of an arrangement of trenches containing perforated pipes and porous material (often gravel) covered by a layer of soil to prevent animals and surface runoff from reaching the wastewater distributed within those trenches.

- A. Effluent water discharges
- B. The drain field
- C. A trench
- D. None of the above

191. Primary design considerations are hydraulic for the \_\_\_\_\_requiring disposal and catabolic for the long-term biochemical oxygen demand of that wastewater.

- A. Septic tank effluent
- B. Volume of wastewater
- C. Insoluble particles small enough
- D. None of the above

192. Many health departments require a percolation test ("perc" test) to establish suitability of drain field soil to receive\_\_\_\_\_. An engineer or licensed designer may be required to work with the local governing agency to design a system that conforms to these criteria.

- A. Groundwater levels
- B. Septic tank effluent
- C. Percolation rates
- D. None of the above

193. \_\_\_\_\_ measure the rate at which clean water disperses through a disposal trench into the soil.

- A. Groundwater levels
- B. Gravitational force
- C. Percolation tests
- D. None of the above

194. Several factors may reduce observed percolation rates when the drain field receives\_\_\_\_\_.

- A. Groundwater levels
- B. Gravitational force
- C. Anoxic septic tank effluent
- D. None of the above

195. Microbial colonies catabolizing \_\_\_\_\_from the septic tank effluent will adhere to soil particles and reduce the interstitial area available for water flow between soil particles.

- A. Soluble organic compounds
- B. Wastewater
- C. Insoluble particles small enough
- D. None of the above

196. A certain vertical distance is required between the effluent level in the disposal trench and the water level where the effluent is leaving the drain field for gravitational force to overcome \_\_\_\_\_ resisting flow through porous soil.

- A. Viscous frictional forces
- B. Gravitational force
- C. Percolation rates
- D. None of the above

197. Effluent levels in the vicinity of the \_\_\_\_\_ will appear to rise toward the ground surface to preserve that vertical distance difference if groundwater levels surrounding the drain field approach the level of effluent in the disposal trench.

- A. Groundwater levels
- B. Gravitational force
- C. Drain field
- D. None of the above

### **Septic Management Considerations**

198. In the past, state and local wastewater management programs rarely specified O&M requirements for \_\_\_\_\_. The regulation of system design, construction, and operation was considered to be satisfactory community oversight.

- A. Cluster system(s)
- B. O&M requirement(s)
- C. Conventional or enhanced wastewater systems
- D. None of the above

199. As more and more systems malfunction and threaten waterways and as more systems include higher maintenance electrical and mechanical components, communities are recognizing the value of \_\_\_\_\_.

- A. Clustered system(s)
- B. O&M requirement(s)
- C. Advanced or innovative technologies
- D. None of the above

200. Many are strengthening programs with a number of tools, including requirements for homeowner service contracts, routine maintenance inspections, revocable operating permits, monitoring, and enhanced reporting and data management that support proper \_\_\_\_\_.

- A. System performance
- B. Pretreatment requirement(s)
- C. Wastewater alternatives
- D. None of the above

### **Aerobic Treatment Units (ATUs)**

201. A mechanical onsite treatment unit that provides \_\_\_\_\_ by mixing air (oxygen) and aerobic and facultative microbes with the wastewater in a sewage tank.

- A. Secondary wastewater treatment
- B. Sewage tank
- C. Size of the household and the size of the tank
- D. None of the above

### **Gravity Effluent Distribution Devices**

202. Divide and/or transport the liquid effluent from a \_\_\_\_\_ to absorption trenches for dispersal into the soil. These devices include distribution boxes, drop boxes, and step-downs.

- A. Proper maintenance
- B. Pressure manifold(s)
- C. Septic tank or ATU
- D. None of the above

### **Gravity Laterals**

203. A system of trenches excavated along ground contours used to distribute effluent by gravity flow from a \_\_\_\_\_ and apply the effluent to the soil infiltrative surface.

- A. Sand/media filter(s)
- B. Septic tank or ATU
- C. Onsite system
- D. None of the above

204. Generally, \_\_\_\_\_-inch deep trenches are used; however, with approval trenches can be up to \_\_\_\_\_ inches deep.
- A. 18-30
  - B. 16-36
  - C. 12-24
  - D. None of the above

### Dosed Gravity Systems

205. Use siphons or pumps to dose into a \_\_\_\_\_ or through a pressure manifold into the ends of gravity lateral trenches.
- A. Necessary pumping frequency
  - B. Gravity distribution device
  - C. Pressure manifold(s)
  - D. None of the above

206. \_\_\_\_\_ can be used to more equally divide effluent between gravity lateral trenches or to proportion effluent to unequal length trenches; however, effluent is still moved along the length of a trench by gravity.
- A. Necessary pumping frequency
  - B. An advanced OWTS
  - C. Pressure manifold(s)
  - D. None of the above

### Impacts of Effluent on Groundwater

207. When the soil is overloaded with a treatable contaminant, or when the contaminant cannot be treated by the soil, the quality of the \_\_\_\_\_ may change significantly.
- A. Distribution media
  - B. Underlying groundwater
  - C. Dispersal zone
  - D. None of the above

208. When a septic system fails to effectively treat and disperse \_\_\_\_\_, it can become a source of pollution. This type of failure can occur in three different ways.
- A. Effluent
  - B. Anaerobic bacteria
  - C. Unsaturated flow
  - D. None of the above

209. The first way is when effluent ponds on the soil surface, causing a wet seepy area. The second obvious way that \_\_\_\_\_ can fail is to have effluent backing up into the dwelling. It is also important to prevent a third, and less obvious, type of failure, which is contamination of the ground or surface waters.
- A. Septic system
  - B. Distribution media
  - C. Soil treatment trench
  - D. None of the above

### Soil Treatment Processes

210. The soil treatment and \_\_\_\_\_ provides for the final treatment and dispersal of septic tank effluent.
- A. Distribution media
  - B. Biomat
  - C. Dispersal zone
  - D. None of the above

211. To varying degrees, the \_\_\_\_\_ and dispersal zone treats the wastewater by acting as a filter, exchanger, or absorber by providing a surface area on which many chemical and biochemical processes occur. The combination of these processes, acting on the effluent as it passes through the soil, and purifies the water.
- A. Pollution of groundwater
  - B. Effluent
  - C. Soil treatment
  - D. None of the above



### **Biomat**

212. As septic tank effluent flows into a soil treatment trench, it moves vertically through the distribution media to the \_\_\_\_\_ where treatment begins.

- A. Distribution media
- B. Biomat
- C. Dispersal zone
- D. None of the above

213. The biomat is a biological layer formed by \_\_\_\_\_, which secrete a sticky substance and anchor themselves to the soil, rock particles, or other available surfaces.

- A. Aerobic bacteria
- B. Anaerobic bacteria
- C. Unsaturated flow
- D. None of the above

214. Flow through a \_\_\_\_\_ is considerably slower than flow through natural soil, allowing unsaturated conditions to exist in the soil beneath the soil treatment trench.

- A. Distribution media
- B. Biomat
- C. Dispersal zone
- D. None of the above

215. \_\_\_\_\_ increases the travel time of effluent through the soil, ensuring that it has sufficient time to contact the surfaces of soil particles and microorganisms.

- A. Gravity-fed system
- B. Soil system
- C. Unsaturated flow
- D. None of the above

216. A properly functioning \_\_\_\_\_ will have wastewater ponded in the distribution media while the soil a few inches outside of and below the distribution media will be unsaturated.

- A. Gravity-fed system
- B. Soil system
- C. Unsaturated flow
- D. None of the above

217. Unsaturated soil has pores containing both air and water so aerobic microorganisms living in the soil can effectively treat the wastewater as it travels through the \_\_\_\_\_.

- A. Gravity-fed system
- B. Soil system
- C. Unsaturated flow
- D. None of the above

218. In unsaturated soil under a biomat, \_\_\_\_\_ is restricted.

- A. Water movement
- B. Bacteria
- C. Unsaturated flow
- D. None of the above

### **Sewage Treatment Utilizing Soil**

219. A developed biomat reaches \_\_\_\_\_ over time, remaining at about the same thickness and the same permeability if effluent quality is maintained.

- A. Equilibrium
- B. Quality of the effluent
- C. Permeability of the biomat
- D. None of the above

220. For equilibrium to be maintained, the biomat and the effluent ponded within the trench must be in \_\_\_\_\_, the organic materials in the wastewater feed the anaerobic microorganisms, which grow and multiply, increasing the thickness and decreasing the permeability of the biomat.

- A. Equilibrium
- B. Anaerobic conditions
- C. Permeability of the biomat
- D. None of the above

221. On the soil side of the biomat beneath the drainfield, oxygen is present so that conditions are allowing aerobic soil bacteria to feed on and continuously break down the\_\_\_\_\_. These two processes occur at about the same rate so that the thickness and permeability of the biomat remain in equilibrium.

- A. Aerobic bacteria
- B. Equilibrium
- C. Biomat
- D. None of the above

222. \_\_\_\_\_leaving the septic tank decreases because of failure to regularly pump out the septic tank, more food will be present for the anaerobic bacteria, which will cause an increase in the thickness of the biomat and decrease its permeability.

- A. Wastewater flow/strength
- B. Quality of the effluent
- C. If the quality of the effluent
- D. None of the above

223. If seasonally saturated conditions occur in the soil outside the trench, aerobic conditions will no longer exist, which will prevent \_\_\_\_\_from breaking down the biomat. Under these conditions the biomat will thicken, reducing its permeability and the effectiveness of effluent entering the soil.

- A. Aerobic bacteria
- B. Equilibrium
- C. Aerobic
- D. None of the above

**Site Evaluations**

224. Site evaluations are a key driver of treatment system design. The success of any soil-discharging wastewater treatment system depends on the appropriate match between\_\_\_\_\_, the treatment system design, and the site that receives effluent from the system.

- A. Site-specific
- B. Quality of the effluent
- C. Wastewater flow/strength
- D. None of the above

225. \_\_\_\_\_ and characterization by a qualified, experienced professional is essential to understanding local site conditions and ensuring the proper operation of individual and clustered wastewater systems.

- A. Site-specific observations
- B. Quality of the effluent
- C. Wastewater flow/strength
- D. None of the above

**Assure System Performance**

226. Wastewater systems depend on the soil for 1) final treatment of effluent from the tank or unit process components, and 2)\_\_\_\_\_.

- A. Final treatment of effluent
- B. Dispersal of the effluent to the soil
- C. Upstream processes in the treatment train
- D. None of the above

227. The soil component of the system receives, stores, and treats\_\_\_\_\_.

- A. Site-specific effluent
- B. Incoming effluent
- C. Wastewater flow/strength
- D. None of the above

228. The subsurface “ponding” and slow release of effluent to the soil through the biomat facilitates treatment via chemical, physical, and biological processes such as\_\_\_\_\_, adsorption of potential pollutants (e.g., phosphorus), filtration of solids, and decomposition of organic constituents.

- A. Clustered wastewater system(s)
- B. Equilibrium
- C. Aerobic nitrification of ammonia
- D. None of the above

229. Predicting the \_\_\_\_\_ and overall treatment efficacy of the soil component of the system requires a fairly comprehensive understanding of how these processes work, how they are enhanced or impeded, and how the upstream processes in the treatment train can be adjusted or adapted to ensure that the soil can handle the flow and pollutant load delivered.
- A. Final treatment of effluent
  - B. Wastewater flow/strength
  - C. Pollutant removal
  - D. None of the above

**Improving OSSF Treatment through Performance Requirements**

230. Most onsite wastewater treatment systems are of the conventional type, consisting of a septic tank and a \_\_\_\_\_.

- A. Regular maintenance
- B. Site limitations
- C. Subsurface wastewater infiltration system (SWIS)
- D. None of the above

231. \_\_\_\_\_ and more stringent performance requirements have led to significant improvements in the design of wastewater treatment systems and how they are managed.

- A. Regular maintenance
- B. Site limitations
- C. Subsurface wastewater infiltration system (SWIS)
- D. None of the above

232. Over the past 20 years the onsite wastewater treatment system (OWTS) industry has developed many \_\_\_\_\_ that can achieve high performance levels on sites with size, soil, ground water, and landscape limitations that might preclude installing conventional systems.

- A. Water resources
- B. Fixed-film reactors
- C. New treatment technologies
- D. None of the above

233. New technologies and \_\_\_\_\_ are based on defining the performance requirements of the system, characterizing wastewater flow and pollutant loads, evaluating site conditions, defining performance and design boundaries, and selecting a system design that addresses these factors.

- A. Existing technologies
- B. Improvements to existing technologies
- C. Wastewater characteristics and site conditions
- D. None of the above

234. \_\_\_\_\_ can be expressed as numeric criteria (e.g., pollutant concentration or mass loading limits) or narrative criteria (e.g., no odors or visible sheen) and are based on the assimilative capacity of regional ground water or surface waters, water quality objectives, and public health goals.

- A. Performance requirements
- B. Water resources
- C. Primary and secondary processes
- D. None of the above

235. \_\_\_\_\_ help define system design and size and can be estimated by comparing the size and type of facility with measured effluent outputs from similar, existing facilities.

- A. Existing technologies
- B. Wastewater flow and pollutant content
- C. Wastewater characteristics and site conditions
- D. None of the above

236. \_\_\_\_\_ integrate detailed analyses of regional hydrology, geology, and water resources with site specific characterization of soils, slopes, structures, property lines, and other site features to further define system design requirements and determine the physical placement of system components.

- A. Site evaluations
- B. Infiltration area protection
- C. Individual and clustered systems
- D. None of the above

**(s) means the answer may be plural or singular in nature.**

237. \_\_\_\_\_ applied today treat wastes after they exit the septic tank; the tank retains settleable solids, grease, and oils and provides an environment for partial digestion of settled organic wastes.

- A. Regular maintenance
- B. Septic system
- C. Most of the alternative treatment technologies
- D. None of the above

238. Post-tank treatment can include aerobic (with oxygen) or anaerobic (with no or low oxygen) biological treatment in suspended or fixed-film reactors, physical/chemical treatment, soil infiltration, \_\_\_\_\_.

- A. Fixed-media filtration, and/or disinfection
- B. Water resources
- C. Primary and secondary processes
- D. None of the above

239. \_\_\_\_\_ based on these technologies are defined by performance requirements, wastewater characteristics, and site conditions.

- A. Alternative treatment technologies
- B. Wastewater flow and pollutant content
- C. The application and sizing of treatment units
- D. None of the above

### Performance-Based Standards

240. The move toward site-appropriate, risk-based system design and the growing interest in \_\_\_\_\_ has increased the need for performance-based design guidance.

- A. Performance requirements
- B. Clustered facilities
- C. Primary and secondary processes
- D. None of the above

241. \_\_\_\_\_ approaches have been proposed as a substitute for prescriptive requirements for system design, siting, and operation.

- A. Alternative treatment technologies
- B. Wastewater flow and pollutant content
- C. Performance-based management
- D. None of the above

### System Design Considerations

242. One of the more common reasons why some individual or cluster systems do not perform properly is inappropriate \_\_\_\_\_ selection.

- A. System/technology
- B. Subsurface drainfield(s)
- C. System compatibility
- D. None of the above

243. A wastewater system should be matched to the volume and \_\_\_\_\_, and the site, soil, and groundwater/surface water conditions must be known in detail in order to develop an appropriate system design.

- A. Alternative treatment technologies
- B. Wastewater flow and pollutant content
- C. Pollutant profile of wastewater
- D. None of the above

244. \_\_\_\_\_ permitting programs are expanding the options available for providing treatment services, especially for sites with limiting soil conditions and those with threatened or impaired water resources nearby.

- A. Regular maintenance
- B. Septic system
- C. State and local wastewater system
- D. None of the above

### Management Considerations

245. All \_\_\_\_\_ systems require management. Management services can be provided by an outside contractor or responsible management entity.

- A. System/technology
- B. Subsurface drainfield(s)
- C. Wastewater treatment
- D. None of the above

246. In general, \_\_\_\_\_ with septic tanks and subsurface drainfields require less management attention; clustered facilities with collection system pumps, mechanized treatment units, and time or demand-dosed infiltration areas require much more.

- A. System/technology
- B. Subsurface drainfield(s)
- C. Individual gravity flow systems
- D. None of the above

247. Factors that influence system management include:

\_\_\_\_\_, such as very cold or wet climates.

- A. Complexity of service
- B. All system components
- C. Operation in extreme conditions
- D. None of the above

248. \_\_\_\_\_ and access to repair parts.

- A. Soil condition(s)
- B. Subsurface drainfield(s)
- C. Life of system components
- D. None of the above

249. Maintenance needs, including frequency and \_\_\_\_\_.

- A. Complexity of service
- B. Final design components
- C. Very cold or wet climates
- D. None of the above

### Permitting and Approval Process

250. State and local governments vary considerably in their approach to approving \_\_\_\_\_ and issuing installation and operation permits.

Consultation with the property owner regarding final design components.

- A. Complexity of service
- B. Final design components
- C. System types and components
- D. None of the above

251. It is important that the application include \_\_\_\_\_, narratives, forms, calculations, catalog cuts, photos, and other data, including detailed equipment and installation specifications to make siting the system components easier.

- A. System drawings
- B. Installation specifications
- C. System maintenance
- D. None of the above

252. If the site has been developed, all structures, utilities, and \_\_\_\_\_ should be identified.

- A. Regular maintenance
- B. Septic system
- C. Ingress and egress pathways
- D. None of the above

253. The source of potable water and distribution lines should be identified as well. If there is an existing wastewater treatment system, the condition of all components, including the reserve area, should be recorded and \_\_\_\_\_.

- A. System location and features
- B. Installation specifications
- C. Minimum setbacks met
- D. None of the above

### Summary

#### OSSF Maintenance

254. \_\_\_\_\_ can add years to an older system. Even well-designed and properly installed septic systems can fail earlier than expected if previous homeowners did not perform routine maintenance.

- A. Proper maintenance
- B. Necessary pumping frequency
- C. Septic tank or ATU
- D. None of the above

255. Try to determine how frequently the tank has been pumped from the realty agent or owner. Ask to see maintenance records. Keep in mind the necessary pumping frequency depends on the size of the household and the size of the \_\_\_\_\_.

- A. Sand/media filter(s)
- C. Onsite system
- B. Tank
- D. None of the above

256. For example, a four-bedroom home with a 1,250 gallon tank should be pumped approximately every \_\_\_\_\_ years. Modern conveniences such as garbage disposals, hot tubs, or whirlpools will increase the necessary pumping frequency.

- A. 3
- C. 2.6
- B. 4.5
- D. None of the above

### Permit

257. Several factors should be considered when choosing the type of onsite system for a site including: soil/site limitations, available space, operation and maintenance (O & M) requirements, initial costs as well as \_\_\_\_\_, landscape disturbance, and the owners' preferences and ability to manage the system.

- A. Soil resource
- C. O & M costs
- B. Type of human sewage
- D. None of the above

258. Of these considerations, often the most limiting is the \_\_\_\_\_ or site and space limitations.

- A. Soil resource
- C. O & M costs
- B. Type of human sewage
- D. None of the above

259. When the soil and site are suited to a \_\_\_\_\_ or to a septic tank and conventional soil absorption system, any registered OWTS installer can assist with the permitting and can install a basic onsite system.

- A. Drainfield
- C. An advanced OWTS
- B. Lagoon
- D. None of the above

260. When site limitations or other factors lead to \_\_\_\_\_, the installer must be registered as an advanced OWTS installer.

- A. Drainfield
- C. An advanced OWTS
- B. Lagoon
- D. None of the above

## SUBSURFACE WASTEWATER INFILTRATION CONSTRUCTION SECTION

### Construction Section

261. Correct wastewater treatment system construction and/or installation practices are critical to the performance of individual and \_\_\_\_\_.

- A. Pressure distribution
- C. Clustered systems
- B. Declustered systems
- D. None of the above

262. Construction actions can affect short-term and long-term system performance by failing to adhere to \_\_\_\_\_, neglecting proper pipe slope requirements, inadvertently switching tank inlet/outlet orientation, or failing to protect infiltration area soils from equipment compaction.

- A. Inlet/outlet orientation
- C. Uphill dispersal piping
- B. Material specifications
- D. None of the above

263. Which of the following is a key component of good system installation practice, should be carefully considered during site preparation, construction equipment selection and use, and before and during construction?

- A. Pressure distribution
- B. Infiltration area protection
- C. Individual and declustered systems
- D. None of the above

264. The development of a final design plan that includes drawings, narratives, forms, calculations, photos, and other data, including \_\_\_\_\_, will help ensure a successful outcome.

- A. Infiltration area
- B. Inlet/outlet orientation
- C. Detailed equipment and installation specifications
- D. None of the above

### **Background and Use of Onsite Wastewater Treatment Systems**

265. Only about \_\_\_\_\_ of the land area in the United States has soils suited for conventional subsurface soil absorption fields.

- A. 10 percent
- B. 1/3
- C. 1/4
- D. None of the above

266. System densities in some areas exceed the capacity of even suitable soils to assimilate wastewater flows and retain and transform their \_\_\_\_\_.

- A. Nitrates
- B. Phosphorus compounds
- C. Contaminants
- D. None of the above

267. Many systems are located too close to ground water or surface waters and others, particularly in rural areas with newly installed public water lines, are not designed to handle increasing \_\_\_\_\_ flows.

- A. Wastewater
- B. Phosphorus compounds
- C. Contaminants
- D. None of the above

268. Conventional onsite system installations might not be adequate for minimizing nitrate contamination of ground water, removing \_\_\_\_\_, and attenuating pathogenic organisms (e.g., bacteria, viruses).

- A. Nitrates and phosphorus
- B. Phosphorus compounds
- C. Contaminants
- D. None of the above

269. Which of the following that leach into ground water used as a drinking water source can cause methemoglobinemia, or blue baby syndrome, and other health problems for pregnant women?

- A. Nitrates
- B. Phosphorus
- C. Contaminants
- D. None of the above

270. Which of the following discharged into surface waters directly or through subsurface flows can spur algal growth and lead to eutrophication and low dissolved oxygen in lakes, rivers, and coastal areas?

- A. Nitrates and phosphorus
- B. Phosphorus compounds
- C. Contaminants
- D. None of the above

### **Septic Site Preparation and Excavation Practices**

271. Overhead power lines, steep slopes, and excavations at the installation site can all present serious \_\_\_\_\_.

- A. Safety hazard(s)
- B. Disturbance(s)
- C. Excavation(s)
- D. None of the above

272. A brief preconstruction meeting can ensure that \_\_\_\_\_ and practices to eliminate, minimize, or respond to them are identified.

- A. Safety hazard(s)
- B. Disturbance
- C. Excavation(s)
- D. None of the above

273. Site preparation requires a number of activities including clearing and surface preparation for filling. Use of lightweight tracked equipment will minimize soil \_\_\_\_\_.

- A. Compaction
- B. Infiltration
- C. Excavation
- D. None of the above

274. Soil \_\_\_\_\_ should be determined to ensure that it is dry, and care should be taken to avoid soil disturbance as much as possible.

- A. Compaction
- B. Moisture
- C. Excavation
- D. None of the above

275. To avoid potential soil damage during construction, the soil below the proposed infiltration surface elevation must be below its \_\_\_\_\_ during construction (i.e., it must lack the moisture required to make it moldable into stable shapes). This should be tested before excavation begins.

- A. Compaction
- B. Plastic limit
- C. Excavation
- D. None of the above

276. Site \_\_\_\_\_ is conducted only when the infiltration surface can be covered the same day to avoid loss of soil permeability from wind-blown silt or raindrop impact.

- A. Compaction
- B. Plastic limit
- C. Excavation
- D. None of the above

277. \_\_\_\_\_ and areas for traffic lanes, material stockpiling, and equipment parking should be designated on the drawings for the contractor.

- A. Site access points
- B. Disturbance
- C. Excavation
- D. None of the above

278. Flagging off the \_\_\_\_\_ area as early as possible is critical to ensure long-term function of the system.

- A. Compaction
- B. Infiltration
- C. Excavation
- D. None of the above

279. Grubbing of the site (mechanically raking away roots) should be avoided. If the site is to be filled, the surface should be moldboard- or chisel-plowed parallel to the contour (usually to a depth of seven to ten inches) when the soil is sufficiently dry to ensure maximum vertical \_\_\_\_\_.

- A. Compaction
- B. Infiltration
- C. Permeability
- D. None of the above

280. The organic layer should not be removed. Scarifying the surface with the teeth of a backhoe bucket is not sufficient. All efforts should be made to avoid any disturbance to the exposed \_\_\_\_\_ surface.

- A. Moisture
- B. Disturbance
- C. Infiltration
- D. None of the above



### Field Construction Practices

281. Changes in construction practices over the past 25 years have led to improvements in the performance of \_\_\_\_\_.

- A. Individual wastewater system(s)
- B. System design
- C. Long-term system performance
- D. None of the above

282. \_\_\_\_\_ in infiltration trenches should be scarified and the surface gently raked prior to installing the gravel or gravel-less piping/chambers.

- A. Compaction
- B. Smearred soil surfaces
- C. Excavation
- D. None of the above

283. If gravel or crushed rock is to be used for the system medium, the rock should be placed in the trench by using the backhoe bucket to \_\_\_\_\_.

- A. Individual wastewater system(s)
- B. System design
- C. Long-term system performance
- D. None of the above

284. It might be necessary to remove as much as four inches of soil to regain the natural soil porosity and \_\_\_\_\_.

- A. Permeability
- B. Disturbance
- C. Horizon
- D. None of the above

285. Consequences of the removal of this amount of soil over the entire infiltration surface can be significant. It will reduce the separation distance to the restrictive horizon and could place the infiltration surface in an unacceptable soil \_\_\_\_\_.

- A. Permeability
- B. Disturbance
- C. Horizon
- D. None of the above

286. For gravel filled trenches, the trench bottom should be left rough and covered with six inches of clean (i.e., no fines) rock. \_\_\_\_\_ should be carefully placed over the rock, leveled, and bedded in on the sides.

- A. Infiltration area
- B. System design
- C. Distribution pipe(s)
- D. None of the above

287. After the rock and pipes have been placed in the trench, the \_\_\_\_\_ should be placed over the top of the rock to prevent soil from moving into the rock. The soil backfill should be carefully crowned to fill the trench cavity at a height to allow for settling.

- A. Filter fabric
- B. Infiltration area
- C. Onsite management
- D. None of the above

288. Post construction activities include accurate documentation of all of the system components and the system location. Flag off the \_\_\_\_\_ to keep construction and other traffic away.

- A. System design
- B. Infiltration area
- C. Onsite management
- D. None of the above

### Management Considerations

289. All \_\_\_\_\_ programs should carefully consider construction and installation elements to ensure the proper operation of onsite systems. These programs should include permits, inspections, and installer training requirements.

- A. System design
- B. Infiltration area
- C. Onsite management
- D. None of the above

## Construction/Installation Programs Basic Approach

290. Construction permit based on code-compliant site evaluations and \_\_\_\_\_.
- A. System design
  - B. Infiltration area
  - C. Onsite management
  - D. None of the above

## Construction Phases

### Preparation Phase

291. Conduct a pre-construction conference at the site to \_\_\_\_\_, verify setbacks and other site conditions, check surface elevations, and identify potential problems or safety concerns.

- A. Assess changes in conditions
- B. Septic system
- C. Identify site component locations
- D. None of the above

292. \_\_\_\_\_ that may have occurred since design work was completed.

- A. Assess changes in conditions
- B. Septic system
- C. Identify site component locations
- D. None of the above

293. If work will be delayed, flag off or otherwise protect the \_\_\_\_\_.

- A. Infiltration area(s)
- B. Gravity flow system(s)
- C. Gravity flow pipe(s)
- D. None of the above

### Project Execution

294. Verify designed treatment system components and materials, such as tank type, size, and material; piping; and gravel (if used) that is free of \_\_\_\_\_.

- A. Gravity flow system(s)
- B. Fines
- C. Pipe slopes
- D. None of the above

295. Excavate areas for conveyance piping, the tank(s), secondary treatment units, and infiltration or soil dispersal components according to designated depths and required \_\_\_\_\_.

- A. Gravity flow system(s)
- B. Treatment system components
- C. Pipe slopes
- D. None of the above

296. For \_\_\_\_\_, all elevations are tied to the building sewer line elevation. Ensure that the proper fall is available from the building to the tank, then to the distribution box(es), and to the infiltration area.

- A. Gravity flow system(s)
- B. Treatment system components
- C. Pipe slopes
- D. None of the above

297. Ensure that the tank is on solid tamped ground, installed level and at the proper elevation, and that \_\_\_\_\_ is correct. Secure tank covers after hours to prevent accidents. Backfill tanks as soon as possible.

- A. Inlet/outlet orientation
- B. Distribution pipe effluent
- C. Uphill dispersal piping
- D. None of the above

298. Follow manufacturer's recommendations for \_\_\_\_\_. Plastic and fiberglass tanks usually require special installation techniques (e.g., anchoring, backfilling with sand, tamping backfill in lifts, filling tank with water as its backfilled, etc.)

- A. Infiltration area(s)
- B. Installing tanks
- C. Gravity flow pipe(s)
- D. None of the above

299. Ensure that trench bottoms for \_\_\_\_\_ are tamped and stable and free of rocks and roots, and that backfilled areas around pipes are tamped to prevent dips and rises that could impede flow.

- A. Infiltration area(s)
- B. Site component location(s)
- C. Gravity flow pipe(s)
- D. None of the above

300. Ensure that \_\_\_\_\_ effluent dispersal holes go on the bottom.

- A. Site component location(s)
- B. Gravity flow system(s)
- C. Distribution pipe
- D. None of the above

301. Extend \_\_\_\_\_ piping stubs below tank access ports, but do not block ports to ensure access for pumping and inspection. Use rubber boots or grout to completely seal around pipes and risers.

- A. Inlet/outlet
- B. Distribution pipe effluent
- C. Uphill dispersal piping
- D. None of the above

302. Install access \_\_\_\_\_ to the surface, install outlet filters/screens, and complete installation of pumps, wiring, control panels, and other components.

- A. Port risers
- B. Gravity flow system(s)
- C. Gravity flow pipe(s)
- D. None of the above

303. Install \_\_\_\_\_ in key locations (near building sewer, D-box, etc.); this aids in operation/maintenance later on.

- A. Infiltration area
- B. Inlet/outlet orientation
- C. Cleanouts and inspection ports
- D. None of the above

### Soil Texture

Identify the missing term.

304. When moist, a thin ribbon or 1/8 inch or smaller wire formed between thumb and finger will withstand considerable movement and deformation.

- A. Sand
- B. Loamy Sand
- C. Silty Clay
- D. None of the above

305. Consists of large amounts of clay and moderate to small amounts of sand and silt. It breaks into very hard clods or lumps when dry. When moist, a thin, long ribbon or 1/16-inch wire can be molded with ease. Fingerprints will show on the soil, and a dull to bright polish is made on the soil by a shovel.

- A. Silt Loam
- B. Clay
- C. Loam
- D. None of the above

306. Consists of an even mixture of the different sizes of sand and of silt and clay. It is easily crumbled when dry and has a slightly gritty, yet fairly smooth feel. It is slightly plastic.

- A. Silt Loam
- B. Clay
- C. Loam
- D. None of the above

307. Consists of a moderate amount of clay, a large amount of silt, and a small amount of sand. It breaks into moderately hard clods or lumps when dry.

- A. Sandy Loam
- B. Silty Clay Loam
- C. Soil Texture
- D. None of the above

308. When moist, a thin ribbon or 1/8-inch wire can be formed between thumb and finger that will sustain its weight and will withstand gentle movement.

- A. Sandy Loam
- B. Silty Clay Loam
- C. Soil Texture
- D. None of the above

309. Consists largely of sand, but has enough silt and clay present to give it a small amount of stability.

- A. Sandy Loam
- B. Silty Clay Loam
- C. Soil Texture
- D. None of the above

310. Individual sand grains can be readily seen and felt. Squeezed in the hand when dry, this soil will readily fall apart when the pressure is released.

- A. Sandy Loam
- B. Silty Clay Loam
- C. Soil Texture
- D. None of the above

311. Squeezed when moist, it forms a cast that will not only hold its shape when the pressure is released but will withstand careful handling without breaking. The stability of the moist cast differentiates this soil from sand.

- A. Sandy Loam
- B. Silty Clay Loam
- C. Soil Texture
- D. None of the above

312. Means the amount of each soil separate in a soil mixture. Field methods for judging the texture of a soil consist of forming a cast of soil, both dry and moist, in the hand and pressing a ball of moist soil between thumb and finger.

- A. Sandy Loam
- B. Silty Clay Loam
- C. Soil Texture
- D. None of the above

313. Individual grains can be seen and felt readily. Squeezed in the hand when dry, this soil will fall apart when the pressure is released.

- A. Sand
- B. Loamy Sand
- C. Silty Clay
- D. None of the above

314. Squeezed when moist, it will form a cast that will hold its shape when the pressure is released but will crumble when touched.

- A. Sand
- B. Loamy Sand
- C. Silty Clay
- D. None of the above

315. Consists primarily of sand, but has enough silt and clay to make it somewhat cohesive. The individual sand grains can readily be seen and felt.

- A. Sand
- B. Loamy Sand
- C. Silty Clay
- D. None of the above

316. Squeezed when dry, the soil will form a cast that will readily fall apart, but if squeezed when moist, a cast can be formed that will withstand careful handling without breaking.

- A. Sand
- B. Loamy Sand
- C. Silty Clay
- D. None of the above



325. \_\_\_\_\_ allow marginal soils to more easily absorb and treat wastewater.
- A. Allowable hydraulic loading rates                      C. An inappropriately high loading rate  
 B. Higher levels of treatment                                D. None of the above
326. Regular operation and maintenance attention for these systems is critical to maintaining performance and \_\_\_\_\_ over the long term.
- A. Critical factors    C. Effluent application rate(s)  
 B. Ensuring system operation                              D. None of the above
327. The site evaluator needs to understand and analyze all of these critical factors when recommending \_\_\_\_\_.
- A. Allowable hydraulic loading rates                      C. An inappropriately high loading rate  
 B. An alternative or advanced treatment system        D. None of the above
328. \_\_\_\_\_ may also need to be considered when planning large wastewater treatment systems or clustered facilities.
- A. Critical factors    C. Effluent application rate(s)  
 B. Several additional site evaluation factors            D. None of the above

**Perc Condition Terms Associated with Saturation**

329. Mineral soils with a high amount of decomposed organic matter in the saturated zone, a value of 3 or less, and a chroma of 1 or less. Included in this category are organic soils with a minor amount of mineral matter.
- A. High Chroma Matrix with Iron Depletions  
 B. Dark Colored Soils with Organic Matter Accumulation  
 C. Depleted Matrix without Iron Concentrations  
 D. None of the above
330. Soil horizons whose matrix color has a value of 4 or more and a chroma of 2 or less as a result of removal of iron and manganese oxides. Some visible zones of iron concentration are present as soft masses or pore linings.
- A. High Chroma Matrix with Iron Depletions  
 B. Depleted Matrix with Iron Concentrations  
 C. Depleted Matrix without Iron Concentrations  
 D. None of the above
331. Soil horizons whose color is more or less uniform with a value of 4 or more and a chroma of 2 or less as a result of removing iron and manganese oxides. These horizons lack visible iron concentrations as soft masses or pore linings.
- A. High Chroma Matrix with Iron Depletions  
 B. Depleted Matrix with Iron Concentrations  
 C. Depleted Matrix without Iron Concentrations  
 D. None of the above

**Bedding and Backfilling**

332. The tank should rest on \_\_\_\_\_. It is good practice to provide a level, granular base for the tank. The underlying soils must be capable of bearing the weight of the tank and its contents.
- A. Tank and its contents                                      C. Shape and material of the tank  
 B. A uniform bearing surface                              D. None of the above

333. Soils with a \_\_\_\_\_ or containing large boulders or massive rock edges are not suitable.

- A. Imported granular material
- B. High organic content
- C. Drainage swales or depressions
- D. None of the above

334. After setting the tank, leveling, and joining the \_\_\_\_\_, the tank can be backfilled.

- A. Tank and its contents
- B. Effluent line
- C. Building sewer and effluent line
- D. None of the above

335. The backfill material should be free-flowing and free of stones larger than \_\_\_\_\_ inches in diameter, debris, ice, or snow. It should be added in lifts and each lift compacted.

- A. 2
- B. 3
- C. 4
- D. None of the above

336. In fine-textured soils such as silts, silt loams, clay loams, and clay, \_\_\_\_\_ should be used. This is a must where freeze and thaw cycles are common because the soil movement during such cycles can work tank joints open. This is a significant concern when using plastic and fiberglass tanks.

- A. Imported granular material
- B. High organic content
- C. Drainage swales or depressions
- D. None of the above

337. \_\_\_\_\_ and backfilling requirements vary with the shape and material of the tank. The manufacturer should be consulted for acceptable materials and procedures.

- A. Tank and its contents
- B. Effluent line
- C. The specific bedding
- D. None of the above

### Joint Watertightness

338. The joints should be clean and dry before applying the joint sealer. Only \_\_\_\_\_ joint sealers should be used.

- A. High-quality
- B. Clean and dry
- C. Cured
- D. None of the above

### Flotation Prevention

339. If the tank is set where the soil can be saturated, tank flotation may occur, particularly when the tank is empty (e.g., recently pumped dose tanks or septic tank after septage removal). Tank manufacturers should be consulted for \_\_\_\_\_.

- A. Tank and its contents
- B. Appropriate anti-flotation devices
- C. Shape and material of the tank
- D. None of the above

### Placement of the Infiltration Surface

340. Placement of a SWIS infiltration surface may be below, at, or \_\_\_\_\_ (in an in-ground trench, at grade, or elevated in a mound system).

- A. Original soil profile
- B. SWIS infiltration surface
- C. Above the existing ground surface
- D. None of the above

341. Actual placement relative to \_\_\_\_\_ at the site is determined by desired separation from a limiting condition.

- A. Original soil profile
- B. SWIS infiltration surface
- C. A limiting condition
- D. None of the above

342. Treatment by removal of additional pollutants during movement through soils and the potential for excessive ground water mounding will control the \_\_\_\_\_ from a limiting condition.

- A. Minimum separation distance
- B. SWIS infiltration surface
- C. A limiting condition
- D. None of the above

## Collection Systems Section

### Collection System and its Purpose

343. In accumulation to what homes and businesses flush down the drain, the system also collects excess groundwater, infiltration liquids, and inflow water.

- A. True
- B. False

344. Wastewater collection is an incomplete liquid waste removal system.

- A. True
- B. False

345. The fluid waste distributed through this system is about 78% water. The waste floats on, is carried along by, and goes into suspension or solution in water.

- A. True
- B. False

### Collection System Defined

346. Centralized systems are more inexpensive, allow for greater control, require fewer people, and produce only one discharge to monitor instead of several. However, \_\_\_\_\_ systems can be useful, and this option should be evaluated on a case-by-case basis.

- A. Decentralized
- B. Centralized
- C. Onsite
- D. None of the above

347. Which of the following are the most common wastewater treatment system used in rural areas?

- A. Decentralized
- B. Centralized
- C. Onsite
- D. None of the above

348. Wastewater in \_\_\_\_\_ systems can also be treated by a small, private wastewater treatment plant. These plants can have similar treatment processes and equipment as centralized systems but on a smaller scale.

- A. Decentralized
- B. Centralized
- C. Onsite
- D. None of the above

349. Which of the following are designed to collect both sanitary wastewater and storm water runoff?

- A. Combined sewer systems
- B. Wastewater collection system
- C. Wastewater management
- D. None of the above

350. Which of the following systems can be a single septic system and drainfield serving one residence or a large soil absorption system serving an entire subdivision?

- A. Decentralized
- B. Centralized
- C. Onsite
- D. None of the above



351. During wet weather, the combined sanitary waste and \_\_\_\_\_ can overflow and discharge untreated wastewater directly to a surface water through a combined sewer overflow (CSO).

- A. Storm water
- B. Combined sewers
- C. POTW
- D. None of the above

352. During dry weather, \_\_\_\_\_ carry sanitary waste to a POTW.

- A. Storm water
- B. Combined sewers
- C. POTW
- D. None of the above

### Collection System Operators' Purpose

353. Collection system operators are charged with protecting public health and the environment, and therefore must have documented proof of their certifications in the respective \_\_\_\_\_.

- A. POTW
- B. Wastewater collection system
- C. Wastewater management system
- D. None of the above

354. Collection system operators ensure that the system pipes remain clear and open. They eliminate obstructions and are constantly striving to improve flow characteristics. They keep the wastewater moving underground, unseen and unheard.

- A. True
- B. False

355. Underground sanitary sewer pipes can clog or break, causing unplanned "overflows" of raw sewage that flood basements and streets.

- A. True
- B. False

356. Storm sewers are not designed to quickly get rainwater off the streets during rain events.

- A. True
- B. False

357. When there is too much rain, combined sewer systems cannot handle the extra volume and designed "overflows" of raw sewage into streams and rivers occur. The great majority of sewer systems have separated, not combined, sanitary and storm water pipes.

- A. True
- B. False

358. The maintenance of the sewer system is a semi-continuous cycle.

- A. True
- B. False

359. As sections of the system age, problems such as corroded concrete pipe, cracked tile, lost joint integrity, grease, and heavy root intrusion must be constantly monitored and repaired.

- A. True
- B. False

360. Technology has developed collection system maintenance with such tools as television camera assisted line inspection equipment, jet-cleaning trucks, and improvements in pump design. Because of the increasing complexity of wastewater collection systems, collection system maintenance is evolving into a highly skilled trade.

- A. True
- B. False

361. Leaking, overflowing, and insufficient wastewater collection systems cannot release untreated wastewater into receiving waters.

- A. True
- B. False

362 Outdated pump stations, undersized to carry sewage from newly developed subdivisions or commercial areas, will not create any potential overflow hazards, adversely affecting human health and degrading the water quality of receiving waters.  
A. True B. False

### Understanding Gravity Sanitary Sewers

363. Sewer systems are designed to maintain proper flow velocities with?

- A. Stormwater inflow C. Minimum head loss
- C. Maximum head loss D. None of the above

364. Which of the following may find it necessary to dissipate excess potential energy?

- A. Flow velocities C. Higher elevations in the system
- B. Wastewater D. None of the above

365. Which of the following is determined largely by population served, density of population, and water consumption?

- A. Design flow(s) C. Inflow
- B. Flow D. None of the above

### Excavation and Trenching Section

366. According to the text, the \_\_\_\_\_ was revised because excavating is the most dangerous of all construction operations.

- A. Competent rule C. Emergency rule
- B. OSHA excavation standard D. None of the above

367. OSHA also revised the \_\_\_\_\_ to clarify the requirements.

- A. Competent rule C. Protective equipment standard
- B. Existing standard D. None of the above

368. The performance criteria in the new standard provides employers with options when classifying soil and when selecting methods to protect the \_\_\_\_\_ from cave-ins.

- A. Competent person C. Construction equipment
- B. Employee D. None of the above

### Competent Person

369. Competent person means one who is capable of identifying existing hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees. The \_\_\_\_\_ has authorization to take prompt corrective measures to eliminate identified hazards.

- A. Competent person C. Watchman
- B. Contractor D. None of the above

370. A \_\_\_\_\_ must have specific training in and be knowledgeable about soils analysis, the use of protective systems and the requirements of 29 CFR Part 1926.650-652 Subpart P.

- A. Competent person C. Watchman
- B. Contractor D. None of the above

371. Everyone is required to practice \_\_\_\_\_ one a year.

- A. Competent person training C. Emergency procedures
- B. Rescue training exercises D. None of the above

### Competent Person Duties

372. The competent person performs daily inspections of the protective equipment, \_\_\_\_\_, safety equipment, and adjacent areas.

- A. Work progress
- B. Construction Crew
- C. Trench conditions
- D. None of the above

373. The competent person shall make \_\_\_\_\_ prior to the start of work and as needed throughout the shift.

- A. Personnel assignments
- B. Training available
- C. Inspections
- D. None of the above

374. The competent person shall make \_\_\_\_\_ after every rainstorm or other hazard occurrence.

- A. Inspections
- B. Training available
- C. Protective equipment available
- D. None of the above

375. The competent person must have knowledge of \_\_\_\_\_, telephone or radio dispatch.

- A. Personnel assignments
- B. Work schedules
- C. Emergency contact methods
- D. None of the above

### Scope of Work

376. According to the text, during excavation work a competent person shall be on the job site at all times when personnel are working within or around the \_\_\_\_\_.

- A. Competent person
- B. Contractors
- C. Excavation
- D. None of the above

377. Prior to opening an excavation, the estimated locations of \_\_\_\_\_ that reasonably may be expected to be encountered during excavation work shall be determined.

- A. Unauthorized persons
- B. Employees
- C. Underground utility installations
- D. None of the above

378. \_\_\_\_\_ shall be taken to protect employees against the hazards posed by water accumulation in the excavation.

- A. Additional care
- B. Adequate precautions
- C. Ladders
- D. None of the above

379. In trench excavations that are four (4') feet or more in depth, a stairway, ladder, or ramp shall be used as a \_\_\_\_\_.

- A. Tool
- B. Means of access or egress
- C. Bridge
- D. None of the above

380. When ladder(s) are employed, the top of the ladder shall extend a minimum of \_\_\_\_\_ feet above the ground and shall be properly secured.

- A. Two
- B. Three
- C. Four
- D. None of the above

381. When excavations are made in vehicular traffic areas, \_\_\_\_\_ shall wear a warning vest made with reflective material or highly visibility material.

- A. Competent persons
- B. Each employee
- C. Rescue personnel
- D. None of the above

382. The air shall be tested in excavations where \_\_\_\_\_ exist, or could be reasonably expected to exist.

- A. Limited visibilities
- B. Employees
- C. Oxygen deficiency or gaseous conditions
- D. None of the above

383. When the atmosphere contains less than 19.5 percent oxygen, the area must be continuously ventilated until the \_\_\_\_\_.

- A. Excavation is closed
- B. Employees enter the space
- C. Oxygen levels are above 19.5 percent
- D. None of the above

384. Where a \_\_\_\_\_, the area shall be ventilated until the flammable gas concentration is below 20 percent of the LFL (lower flammable limit).

- A. Competent person requires monitoring
- B. Gaseous condition exists
- C. Worker encounters fumes
- D. None of the above

385. Whenever \_\_\_\_\_ exist or could reasonably exist, the air must be monitored continuously to assure that workers are protected.

- A. Traffic conditions
- B. Excavations
- C. Oxygen deficiency or gaseous conditions
- D. None of the above

386. Where the stability of adjoining buildings, walls or other structures are \_\_\_\_\_, shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.

- A. Not a concern
- B. Not mentioned in the specifications
- C. Endangered by excavation operations
- D. None of the above

387. In situations where sidewalks, pavement and appurtenant structures may be undermined, a support system such as shoring must be provided to protect \_\_\_\_\_ from the possible collapse of such structures.

- A. Unauthorized persons
- B. Employees
- C. Vehicles
- D. None of the above

### **Personnel Protective Systems**

388. According to the text, employees in \_\_\_\_\_ shall be protected from cave-ins by an adequate protective system, which shall be inspected by a competent person.

- A. Excavations
- B. Vehicles
- C. Protective systems
- D. None of the above

389. The use of \_\_\_\_\_ is required for all excavations deeper than five (5') feet, except when excavation is within stable rock.

- A. Tables
- B. Tabulated data
- C. Protective systems
- D. None of the above

390. For trench excavations less than five (5') feet deep, the use of \_\_\_\_\_ may not be required unless there is evidence of a potential cave-in. The competent person shall make this determination.

- A. Ladders
- B. Protective systems
- C. Ramps
- D. None of the above

391. Requirements for sloping, benching or protective systems are found in \_\_\_\_\_.
- A. Safety Manuals
  - B. Tabulated data
  - C. CFR 1926.652 (OSHA Construction Standards)
  - D. None of the above

392. Whenever support systems, \_\_\_\_\_, or other protective systems are being used, a written copy of the manufacturer's specifications, recommendations, and limitations sheet shall be available at the job site.
- A. Shield systems
  - B. Tabulated data
  - C. Ramps
  - D. None of the above

### **Excavation Protection Systems**

393. There are three basic protective systems for excavations and trenches. They are sloping and benching systems, \_\_\_\_\_, and shields.
- A. Shoring
  - B. Ramps
  - C. Attendants
  - D. None of the above

394. Every employee in an excavation or trench shall be protected from \_\_\_\_\_ by an adequate protective system.
- A. Unauthorized persons
  - B. Cave-ins
  - C. Polluted air
  - D. None of the above

### **Sloping and Benching Systems**

395. An option for sloping is to slope to the angle required by OSHA Construction Standards for Type C, which is the most \_\_\_\_\_.
- A. Unstable soil type
  - B. Stable soil type
  - C. Porous soil type
  - D. None of the above

396. Another option for sloping is to first determine the soil type, then use the table provided in Appendix B of the standard to determine the \_\_\_\_\_.
- A. Maximum allowable angle
  - B. Porosity
  - C. Protective system to be used
  - D. None of the above

### **Shoring Systems**

397. \_\_\_\_\_ is another protective system that utilizes a framework of vertical members, horizontal members, and cross braces to support the sides of the excavation to prevent a cave-in.
- A. Shoring
  - B. Tabulated data
  - C. Lateral support
  - D. None of the above

### **Shield Systems (Trench Boxes)**

398. Shielding is the third method of providing a safe workplace in excavations. Unlike sloping and shoring, \_\_\_\_\_ does not prevent a cave-in.
- A. Shielding
  - B. Tabulated data
  - C. Soil testing
  - D. None of the above

### **Safety Precautions for Shield Systems**

399. There must not be any lateral movement of \_\_\_\_\_ when installed.
- A. Sloping and benching systems
  - B. Shields
  - C. Ladders
  - D. None of the above

**Personal Protective Equipment**

400. \_\_\_\_\_ requires that employees wear a hard hat, safety glasses, and work boots on the jobsite.

- A. The contractor
- B. OSHA policy
- C. Recommended practice
- D. None of the above

**When Finished with Your Assignment...**

**REQUIRED DOCUMENTS**

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