

Registration Form

**Collection Construction CEU Training Course \$250.00**  
**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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Operator ID # \_\_\_\_\_ Exp. Date \_\_\_\_\_

Class/Grade \_\_\_\_\_

*Please circle/check which certification you are applying the course CEU's.*

Pretreatment \_\_\_ Collection \_\_\_ Wastewater Treatment \_\_\_

Other \_\_\_\_\_

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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I understand that it is my responsibility to ensure that this CEU course is either approved or accepted in my State for CEU credit. I understand State laws and rules change on a frequent basis and I believe this course is currently accepted in my State for CEU or contact hour credit, if it is not, I will not hold Technical Learning College responsible. I fully understand that this type of study program deals with dangerous, changing conditions and various laws and that I will not hold Technical Learning College, Technical Learning Consultants, Inc. (TLC) liable in any fashion for any errors, omissions, advice, suggestions or neglect contained in this CEU education training course or for any violation or injury, death, neglect, damage or loss of your license or certification caused in any fashion by this CEU education training or course material suggestion or error or my lack of submitting paperwork. It is my responsibility to call or contact TLC if I need help or assistance and double-check to ensure my registration page and assignment has been received and graded. It is my responsibility to ensure all information is correct and to abide with all rules and regulations.

**State Approval Listing Link**, check to see if your State accepts or has pre-approved this course. Not all States are listed. Not all courses are listed. If the course is not accepted for CEU credit, we will give you the course free if you ask your State to accept it for credit.

## **State Approval Listing URL...**

<http://www.abctlc.com/downloads/PDF/CEU%20State%20Approvals.pdf>

*You can obtain a printed version of the course manual from TLC for an additional \$129.95 plus shipping charges.*

## **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.

## **Grading Information**

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.

For security purposes, please fax or e-mail a copy of your driver's license and always call us to confirm we've received your assignment and to confirm your identity.

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**Some States and many employers require the final exam to be proctored.**

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# Collection Construction Answer Key

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

*Did you check with your State agency to ensure this course is accepted for credit?*

*No refunds*

*Method of Course acceptance confirmation. Please fill this section*

Website \_\_ Telephone Call \_\_ Email \_\_ Spoke to \_\_\_\_\_

Did you receive the approval number, if applicable? \_\_\_\_\_

What is the course approval number, if applicable? \_\_\_\_\_

*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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*I will contact TLC if I do not hear back from them within 2 days of assignment submission. I will forfeit my purchase costs and will not receive credit or a refund if I do not abide with TLC's rules.*

**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

**COLLECTION CONSTRUCTION CEU TRAINING COURSE  
CUSTOMER SERVICE RESPONSE CARD**

NAME: \_\_\_\_\_

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? \_\_\_\_\_

How about the price of the course?

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

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 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.*

**Please fax the answer key to TLC Western Campus  
Fax (928) 272-0747.**

**Always call us to confirm we received the paperwork.**

**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...*

## Collection Construction 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.***

## Collection Systems Section

### Collection System and its Purpose

1. 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
2. Wastewater collection is an incomplete liquid waste removal system.  
A. True B. False
3. 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
4. "Wastewater" is a more precise description and has become the standard term for this fluid waste because it encompasses the total slurry of wastes in water that is gathered from homes and businesses.  
A. True B. False

### Collection System Defined

5. Decentralized systems are public sewer systems that serve established towns and cities and transport wastewater to a central location for treatment.  
A. True B. False
6. Centralized systems do not connect to a public sewer system. Wastewater may be treated on site or may be discharged to a private treatment plant.  
A. True B. False
7. Large-scale public sewer systems (municipal wastewater treatment plants) are centralized systems.  
A. True B. False

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

8. Homes and other buildings that are not served by public sewer systems depend on \_\_\_\_\_ septic systems to treat and dispose of wastewater.  
 A. Decentralized C. Remote  
 B. Centralized D. None of the above
9. Most decentralized systems are \_\_\_\_\_ systems (wastewater is treated underground near where it is generated).  
 A. Decentralized C. Onsite  
 B. Centralized D. None of the above
10. 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 C. Onsite  
 B. Centralized D. None of the above
11. Which of the following are the most common wastewater treatment system used in rural areas?  
 A. Decentralized C. Onsite  
 B. Centralized D. None of the above
12. 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 C. Onsite  
 B. Centralized D. None of the above
13. Which of the following are designed to collect both sanitary wastewater and storm water runoff?  
 A. Combined sewer systems C. Wastewater management  
 B. Wastewater collection system D. None of the above
14. 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 C. Onsite  
 B. Centralized D. None of the above
15. 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 C. POTW  
 B. Combined sewers D. None of the above
16. During dry weather, \_\_\_\_\_ carry sanitary waste to a POTW.  
 A. Storm water C. POTW  
 B. Combined sewers D. None of the above

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

### Collection System Operators' Purpose

17. 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

18. Which of the following and the professionals who maintain it operate at such a high level of efficiency, problems are very infrequent?

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

19. Which of the following are generally broken out into three different categories: sanitary sewers, storm sewers, and combined sewers?

- A. Storm water
- B. Combined sewers
- C. Centralized sewer systems
- D. None of the above

20. Which of the following carry wastewater or sewage from homes and businesses to treatment plants?

- A. Sanitary sewers
- B. Combined sewers
- C. Wastewater management
- D. None of the above

21. 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

22. 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

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

- A. True
- B. False

24. 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

25. Sanitary sewers are planned to transport the wastewater by utilizing the \_\_\_\_\_ provided by the natural elevation of the earth resulting in a downstream flow.

- A. Potential energy
- B. Peak flow of population
- C. Flow velocities and design depths of flow
- D. None of the above

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

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

27. 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
28. 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
29. Sanitary sewers should be designed for?  
 A. Peak flow of population C. SSOs, surcharged lines, basement backups  
 B. Flow velocities D. None of the above
30. Which of the following is strongly discouraged and should be designed separate from the sanitary system?  
 A. Stormwater inflow C. Low pressure  
 B. Both wet and dry weather flows D. None of the above
31. Most of the time the flow surface is exposed to the atmosphere within the sewer and it functions as?  
 A. An open channel C. Flow velocities and design depths of flow  
 B. Peak flow of population D. None of the above
32. Which of the following creates low pressure in the sewer system?  
 A. Surge C. Dry weather flows  
 B. Stormwater inflow D. None of the above
33. In order to plan a sewer system, many factors are considered. The purpose of this topic is to aid in the understanding of?  
 A. I/I C. Flow velocities and design depths of flow  
 B. Peak flow of population D. None of the above

**Sewer System Capacity Evaluation - Testing and Inspection**

34. The collection system owner or operator should have a program in place to periodically evaluate this \_\_\_\_\_ in both wet and dry weather flows and ensure the capacity is maintained as it was designed.  
 A. Design flow(s) C. Capacity of the sewer system  
 B. Stormwater inflow D. None of the above
35. The capacity evaluation program evaluation starts with an inventory and characterization of the?  
 A. System components C. Flow velocities and design depths of flow  
 B. Stormwater inflow D. None of the above
36. The system then undergoes general inspection which serves to continuously update and add to the?  
 A. Design flow(s) C. Inventory information  
 B. Sewer system D. None of the above

### Capacity Limitations

37. The next stage in the capacity evaluation is to identify the location of wet weather related \_\_\_\_\_, surcharged lines, basement backups, and any other areas of known capacity limitations.

- A. Peak flow of population
- B. Wastewater
- C. SSOs
- D. None of the above

38. The reviewer should establish that the capacity evaluation includes an estimate peak flows experienced in the system, an estimate of the capacity of this \_\_\_\_\_, and identifies the major sources of I/I that contribute to hydraulic overloading events.

- A. Design flow(s)
- B. Key system components
- C. Both wet and dry weather flows
- D. None of the above

39. The capacity evaluation should also make use of a hydraulic model; this will help identify areas that need to alleviate?

- A. Peak flow of population
- B. Capacity limitations
- C. SSOs, surcharged lines, basement backups
- D. None of the above

### Flow Monitoring

40. Flow monitoring provides information on dry weather flows as well as areas of the collection system potentially affected by?

- A. I/I
- B. Flow measurement
- C. Flow velocities and design depths of flow
- D. None of the above

41. Which of the following may also be performed for billing purposes, to assess the need for new sewers in a certain area, or to calibrate a model?

- A. I/I
- B. Flow measurement
- C. Flow velocities and design depths of flow
- D. None of the above

### Flow Monitoring Plan

42. Checks should include taking independent water level, cleaning accumulated debris and silt from the flow meter area, downloading data, and checking the desiccant and battery state. Records of each inspection should be maintained.

- A. True
- B. False

### Flow Measurements

43. Many collection system owners or operators add a third classification: rainfall induced infiltration (RII).

- A. True
- B. False

44. Base flow is generally taken to mean the wastewater generated without any?

- A. Deposition of solids
- B. Infiltration
- C. Any I/I component
- D. None of the above

45. Which of the following is the seepage of groundwater into pipes or manholes through defects such as cracks, broken joints, etc?

- A. Velocity
- B. Infiltration
- C. Blockage(s)
- D. None of the above

46. Which of the following is the water that enters the sewer through direct connections such as roof leaders, direct connections from storm drains or yard, area?

- A. Stoppages
- B. Infiltration
- C. Inflow
- D. None of the above

47. Although not from piped sources, \_\_\_\_\_ tends to act more like inflow than infiltration.

- A. RII
- B. Infiltration
- C. Inflow
- D. None of the above

48. Other methods of inspecting flows may be employed, such as visually monitoring manholes during low-flow periods to determine areas with?

- A. Infiltration
- B. RII
- C. Excessive I/I
- D. None of the above

**Infiltration and Inflow Sub-Section**

49. Which of the following occurs when groundwater enters the sewer system through cracks, holes, faulty connections, or other openings?

- A. Inflow
- B. Infiltration
- C. Maximum flow capacity of wastewater
- D. None of the above

50. Which of the following occurs when surface water such as storm water enters the sewer system through roof downspout connections, holes in manhole covers, illegal plumbing connections, or other defects?

- A. Inflow
- B. Infiltration
- C. Maximum flow capacity of wastewater
- D. None of the above

51. The sanitary sewer collection system and treatment plants have this \_\_\_\_\_ that can be handled.

- A. I/I
- B. Infiltration
- C. Maximum flow capacity of wastewater
- D. None of the above

**Determining I/I**

52. Flow monitoring and flow modeling provide measurements and data used to determine estimates of?

- A. I/I
- B. Infiltration
- C. Maximum flow capacity of wastewater
- D. None of the above

53. Measurements taken before and after a precipitation event indicate the extent that this term is increasing total flow.

- A. I/I
- B. Infiltration
- C. Maximum flow capacity of wastewater
- D. None of the above

**Identifying sources of I/I**

54. Visual inspection - accessible pipes, gutter and plumbing connections, and manholes are visually inspected for?

- A. Excessive I/I
- B. High wet weather flows
- C. Faults
- D. None of the above



55. Smoke testing – smoke is pumped into sewer pipes. Its reappearance aboveground indicates points of ?

- A. I/I
- B. Stormwater and rainwater
- C. Illegal plumbing, drains, and roof downspouts
- D. None of the above

56. Dye testing – Dye is used at suspected \_\_\_\_\_ sources.

- A. I/I
- B. High wet weather flows
- C. Stormwater and rainwater
- D. None of the above

57. Which of the following are also sometimes identified when sewer backups or overflows bring attention to that part of the system?

- A. Excessive I/I
- B. Sources of I/I
- C. Faults
- D. None of the above

### Repairing I/I Sources

58. Repair techniques include manhole wall spraying, Insituform pipe relining, manhole frame and lid replacement, and disconnecting?

- A. High wet weather flows
- B. Stormwater and rainwater
- C. Illegal plumbing, drains, and roof downspouts
- D. None of the above

### Efficient Identification of Excessive I/I

59. The owner or operator should have in place a program for the efficient identification of?

- A. Excessive I/I
- B. Sources of I/I
- C. Faults
- D. None of the above

60. Areas with high wet weather flows should then be subject to?

- A. High wet weather flows
- B. Stormwater and rainwater
- C. Inspection and rehabilitation activities
- D. None of the above

### Sewer System Testing

61. Sewer system testing techniques are often used to identify leaks that allows this term into the sewer system and determine the location of illicit connections and other sources of stormwater inflow?

- A. Exfiltration
- B. Sources of I/I
- C. Unwanted infiltration
- D. None of the above

62. Two commonly implemented sewer testing techniques include?

- A. I/I
- B. Stormwater and rainwater
- C. Smoke testing and dyed water testing
- D. None of the above

63. Which of the following is a relatively inexpensive and quick method of detecting sources of inflow in sewer systems?

- A. Electric probe
- B. Sound
- C. Smoke testing
- D. None of the above

64. Which of the following can be identified when smoke escapes through them?

- A. Tees
- B. Cockroaches
- C. Sources of inflow
- D. None of the above

65. Building inspections are sometimes conducted as part of a smoke testing program and, in some cases, may be the only way to find?

- A. Gutters
- B. Stormwater Manholes
- C. Illegal connections
- D. None of the above

66. If traces of the smoke or its odor enter the building, it is an indication that this term may also be entering.

- A. Smoke
- B. Sources of I/I
- C. Gases from the sewer system
- D. None of the above

### **Dye Testing**

67. Dyed water testing may be used to establish this term to the sewer.

- A. Potential problem areas
- B. I/I problems
- C. Connection of a fixture or appurtenance
- D. None of the above

68. Which of the following can be used to identify structurally damaged manholes that might create potential I/I problems?

- A. Smoke testing
- B. Prober
- C. Dyed water testing
- D. None of the above

### **Sewer System Inspection**

69. Which of the following and pipelines are the first line of defense in the identification of existing or potential problem areas?

- A. The presence of roots
- B. Potential problem areas
- C. Visual inspection of manholes
- D. None of the above

70. Visual inspections provide additional information concerning the accuracy of system mapping, the presence and?

- A. Potential problem areas
- B. The presence of roots
- C. Degree of I/I problems
- D. None of the above

### **Low Pressure System Description and Operation**

#### **Vacuum Sewers**

71. When the wastewater level reaches a certain level, sensors within the holding tank opens this term that allows the contents of the tank to be sucked into the network of collection piping.

- A. Vacuum sewer system(s)
- B. Vacuum valve
- C. Vacuum collection and transportation systems
- D. None of the above

72. Which of the following are small buildings that house a large storage tank and a system of vacuum pumps?

- A. Interface valve
- B. Vacuum stations
- C. Vacuum within the vacuum mains
- D. None of the above

### **Applications**

73. Vacuum collection and transportation systems can provide significant capital and ongoing operating cost advantages over \_\_\_\_\_, particularly in flat terrain, high water table, or hard rock areas.

- A. Vacuum sewer system(s)
- B. Unconventional gravity systems
- C. Conventional gravity systems
- D. None of the above

74. Which of the following are installed at shallow depths, significantly reducing excavation, shoring and restoration requirements, and minimizing the disruption to the community?

- A. Vacuum sewer system(s)
- B. Unconventional gravity systems
- C. Conventional gravity systems
- D. None of the above

75. The alignment of this term is extremely flexible, without the need for manholes at changes in grade or direction.

- A. Conventional gravity sewers
- B. Vacuum mains
- C. Vacuum system
- D. None of the above

76. Turbulent velocities of 5 to 6m/sec are developed as the sewage and air passes through the?

- A. Vacuum sewer system(s)
- B. Interface valve
- C. Vacuum collection and transportation systems
- D. None of the above

77. No electricity is required at this \_\_\_\_\_, enabling the system to be installed in virtually any location.

- A. Interlock valve
- B. Interface valve
- C. Vacuum system loop control
- D. None of the above

78. Which of the following \_\_\_\_\_ and transport systems have many applications in industry for collecting all forms of liquid waste, including toxic and radioactive fluids?

- A. Vacuum sewer system(s)
- B. Interface valve
- C. Vacuum collection
- D. None of the above

### **Vacuum Interface Valves**

79. Interface between the vacuum within the vacuum mains and the atmospheric pressure within the?

- A. Interface valve
- B. Vacuum interface chamber
- C. Interlock backflow valve
- D. None of the above

80. Air pressure is transmitted by a hose to the controller/sensor unit, which opens the valve and the wastewater is rapidly drawn into the?

- A. Collection sump
- B. Controller/sensor unit
- C. Vacuum main
- D. None of the above

81. As the valve opens, a pneumatic timer in \_\_\_\_\_ starts a pre-set time cycle.

- A. Collection sump
- B. Controller/sensor unit
- C. Vacuum main
- D. None of the above

82. Which of the following is capable of serving at least four equivalent tenements, and multiple valve chambers may be installed to serve higher flow rates?

- A. Interface valve
- B. Controller/sensor unit
- C. Vacuum main
- D. None of the above

83. No electricity is required at the?

- A. Collection sump
- B. Valve chamber
- C. Vacuum interface valve
- D. None of the above

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

84. The vacuum sewer lines are under a vacuum of 16"-20" Hg created by which \_\_\_\_\_ located at the vacuum station.

- A. Collection sump
- B. Controller/sensor unit
- C. Vacuum pumps
- D. None of the above

85. Sewage flows by gravity from homes into a?

- A. Collection sump
- B. Vacuum basin
- C. Base
- D. None of the above

86. When 10 gallons accumulates in the sump, the located above the sump automatically opens and differential air pressure propels the sewage through the valve and into the?

- A. Collection tank
- B. Vacuum main
- C. Controller/sensor unit
- D. None of the above

87. Sewage flows through the vacuum lines and into the collection tank at the vacuum station. Sewage pumps transfer the sewage from this term to the wastewater treatment facility or nearby gravity manhole.

- A. Collection tank
- B. Collection sump
- C. Controller/sensor unit
- D. None of the above

#### **Valve Pit Package**

88. Which of the following flows by gravity from up to four homes into a sealed fiberglass sump?

- A. Raw sewage
- B. Liquids
- C. Solids only
- D. None of the above

89. Vacuum from this term opens the valve and outside air from a breather pipe closes it.

- A. Lift station
- B. Sewer line
- C. Vacuum service line
- D. None of the above

90. Which of the following propels the sewage at velocities of 15-18 feet per second, disintegrating solids while being transported to the vacuum station.

- A. Differential air pressure
- B. High velocity
- C. Vacuum pressure
- D. None of the above

#### **Vacuum Lines**

91. Which of the following are installed in narrow trenches in a saw tooth profile for grade and uphill transport?

- A. Vacuum sewer system(s)
- B. Vacuum service lines
- C. Vacuum pump(s)
- D. None of the above

92. Unlike gravity sewers that must be laid at a minimum slope to obtain a 2 ft./sec. scouring velocity, vacuum has a flatter slope since a high scouring velocity is a feature of transporting?

- A. Vacuum sewage
- B. High scouring velocity
- C. Vacuum pump(s)
- D. None of the above

#### **Line Sizes**

93. Which of the following can extend or reduce this range. Longer distances are possible depending on local topography?

- A. Elevation changes
- B. Vacuum pump(s)
- C. Collection tank
- D. None of the above

### **Vacuum Station**

94. The vacuum station is similar in function to a lift station in a gravity sewer system. Sewage pumps transfer the sewage from the?
- A. Elevation changes
  - B. Vacuum pump(s)
  - C. Collection tank
  - D. None of the above

### **Vacuum Pumps**

95. Which of the following typically run 2 to 3 hours each per day and don't need to run continuously since the vacuum interface valves are normally closed?
- A. Elevation changes
  - B. Vacuum pump(s)
  - C. Collection tank
  - D. None of the above
96. Which of the following are sized to increase the system vacuum from 16" to 20" Hg in three minutes or less?
- A. Elevation changes
  - B. Vacuum pump(s)
  - C. Collection tank
  - D. None of the above
97. Which of the following connect individually to the collection tank, effectively dividing the system into zones?
- A. Vacuum sewer system(s)
  - B. The incoming vacuum lines
  - C. Vacuum pump(s)
  - D. None of the above

### **Review**

#### **Pressure Sewers**

98. Which of the following do not rely on gravity, the system's network of piping can be laid in very shallow trenches that follow the contour of the land?
- A. Grinder pump(s)
  - B. Pressure sewers
  - C. Both the STEP and grinder systems
  - D. None of the above
99. There are two kinds of this term, based upon the type of pump used to provide the pressure.
- A. Septic tank/effluent pump
  - B. Pressure sewers
  - C. STEP and grinder systems
  - D. None of the above
100. Systems that use this \_\_\_\_\_ are a combination are referred to as STEP pressure sewers.
- A. Septic tank/effluent pump
  - B. Pressure sewers
  - C. STEP and grinder systems
  - D. None of the above
101. Which of the following eliminate the need to periodically pump the septic tanks for all the properties connected to the system?
- A. Grinder pump(s)
  - B. Pressure sewers
  - C. Two kinds of pressure sewer systems
  - D. None of the above

#### **Manhole Sub-Section**

102. Manholes should undergo routine inspection typically every one to three years.
- A. True
  - B. False
103. There should be a baseline for manhole inspections (e.g., once every year) with problematic manholes being inspected more frequently.
- A. True
  - B. False

104. The reviewer should conduct visual observation at a small but representative number of manholes for the items listed: various pipeline inspection techniques, the most common include: lamping, camera inspection, sonar, and CCTV.  
A. True B. False

**Sewer System Inspection Techniques**

105. There are a number of inspection techniques that may be employed to inspect a sewer system. The reviewer should determine if an inspection program includes frequency and schedule of inspections and procedures to record the results.  
A. True B. False

106. Sewer system cleaning should always be considered before inspection is performed in order to provide adequate clearance and inspection results.  
A. True B. False

**More on Manholes**

107. When designing a wastewater system, the design engineer begins by first determining the amount of money that is available.  
A. True B. False

108. The design engineer bases his design on the average daily use of solids per person in the area to be served.  
A. True B. False

109. An allowance for unavoidable infiltration of surface and subsurface water into the lines is sometimes added to the peak flow to obtain the design flow.  
A. True B. False

110. The average daily flow (based on the average utilization) is multiplied by a peak flow factor to obtain the?  
A. Design flow C. Water per person in the area to be served  
B. Infiltration allowance D. None of the above

111. Which of the following is 500 gallons per inch of pipe diameter per mile of sewer per day?  
A. Design flow C. Water per person in the area to be served  
B. Infiltration allowance D. None of the above

112. A typical infiltration allowance is \_\_\_\_\_ gallons per inch of pipe diameter per mile of sewer per day.  
A. 500 C. 10  
B. 1000 D. None of the above

113. From the types of sewage and the estimated design flow, the engineer can then tentatively select the types, sizes, slopes, and \_\_\_\_\_ of the piping to be used for the system.  
A. Ground elevations C. Soil analysis  
B. Distances below grade D. None of the above

114. Upon acceptance of the preliminary designs, final design may begin. During this phase, adjustments to the preliminary design should be made as necessary, based upon additional surveys, soil analysis, or other design factors. The final designs should include a general map of the area that shows the locations of \_\_\_\_\_.

- A. Ground elevations
- B. Grades
- C. All sewer lines and structures
- D. None of the above

115. Engineers should include detailed plans and profiles of the sewers showing ground elevations, \_\_\_\_\_, and the locations of any appurtenances and structures, such as manholes and lift stations.

- A. Pipe sizes and slopes
- B. Grade
- C. Soil analysis
- D. None of the above

116. Which of the following are also included for those appurtenances and structures?

- A. Ground elevations
- B. Grade
- C. Construction plans and details
- D. None of the above

### **Lead and Oakum Joint, Compression Joint and No-Hub Joints**

117. Which of the following may be made of grout?

- A. Mortar joints
- B. Compression joints
- C. A no-hub joint
- D. None of the above

118. Which of the following eliminate the use of oakum and mortar joints for sewer mains?

- A. Mortar joints
- B. Compression joints
- C. Speed seal joints
- D. None of the above

119. Which of the following is an assembly tool is used to force the spigot end of the pipe or fitting into the lubricated gasket inside the hub?

- A. Mortar joints
- B. Compression joints
- C. A no-hub joint
- D. None of the above

120. Which of the following uses a gasket on the end of one pipe and a stainless steel shield and clamp assembly on the end of the other pipe?

- A. Mortar joints
- B. Compression joints
- C. A no-hub joint
- D. None of the above

121. Which of the following type of seal is made a part of the vitrified pipe joint when manufactured, it is made of polyvinyl chloride and is called a plastisol joint connection?

- A. Mortar joints
- B. Compression joints
- C. Speed seal joints
- D. None of the above

### **Closed Circuit Television (CCTV) Inspections**

#### **Camera Inspection**

122. Which of the following involves lowering a still camera into a manhole?

- A. Lamping
- B. Sonar
- C. Lighting
- D. None of the above

123. The benefits of camera inspection include not requiring \_\_\_\_\_ and little equipment and set-up time is required.

- A. Capacity evaluation
- B. Trench safety
- C. Confined space entry
- D. None of the above

124. Camera inspection is more comprehensive than \_\_\_\_\_ in that more of the sewer can be viewed.

- A. Lamping
- B. Sonar
- C. Lighting
- D. None of the above

125. This technique also does not fully capture the invert of the pipe and its condition. Sonar is a newer technology deployed similarly to?

- A. CCTV cameras
- B. Radar
- C. Camera inspection
- D. None of the above

126. Which of the following emits a pulse that bounces off the walls of the sewer?

- A. Sonar
- B. Trenchless technologies
- C. Radar
- D. None of the above

127. Sewer scanner and evaluation is similar to sonar in that a more complete image of a pipe can be made than with?

- A. Lamping
- B. Sonar
- C. CCTV
- D. None of the above

### **Closed Circuit Television (CCTV) Inspections**

128. Which of the following may be done on a routine basis as part of the preventive maintenance program, as well as part of an investigation into the cause of I/I?

- A. Lamping
- B. Sonar
- C. CCTV inspections
- D. None of the above

129. A benefit of which of the following is that a permanent visual record is captured for subsequent reviews?

- A. Sewer system cleaning
- B. Trenchless technologies
- C. CCTV inspection
- D. None of the above

### **Sewer Flow Measurements**

130. Which of the following is the water that enters the sewer through direct connections such as roof leaders, direct connections from storm drains or yard, area, and foundation drains, the holes in and around the rim of manhole covers, etc?

- A. RII
- B. Inflow
- C. Infiltration
- D. None of the above

131. Which of the following is stormwater that enters the collection system through defects that lie so close to the ground surface that they are easily reached?

- A. RII
- B. Inflow
- C. Infiltration
- D. None of the above

132. Which of the following performed for the purpose of quantifying I/I are typically separated into three components: base flow, infiltration, and inflow?

- A. Base flow
- B. Infiltration
- C. Flow Measurements
- D. None of the above

133. Which of the following is generally taken to mean the wastewater generated without any I/I component?

- A. Base flow
- B. Infiltration
- C. Flow Measurements
- D. None of the above



134. Which of the following is the seepage of groundwater into pipes or manholes through defects such as cracks, broken joints, etc?

- A. RII
- B. Inflow
- C. Infiltration
- D. None of the above

135. Smoke Testing is achieved by forcing a non-toxic smoke into the sewer system and looking for locations where it is improperly exiting.

- A. True
- B. False

136. Locations that are smoking are considered illegal connections in that they allow stormwater directly or indirectly to enter the sanitary sewer system.

- A. True
- B. False

### **Sewer Flow Capacity**

137. The minimum velocity is necessary to prevent the?

- A. Deposition of solids
- B. Infiltration
- C. Stoppages
- D. None of the above

### **Sewer Line Mapping**

138. Which of the following and repairs are unlikely if mapping is not adequate?

- A. Introduction of flows
- B. Inspection
- C. Efficient collection system maintenance
- D. None of the above

139. Collection system maps should have a numbering system which uniquely identifies all manholes and?

- A. Engineering endeavors
- B. Sewer cleanouts
- C. Quality sanitary sewer designs
- D. None of the above

140. Which of the following should have permanently assigned numbers and never be renumbered. Maps should also indicate the property served and reference its cleanout?

- A. Introduction of flows
- B. Inspection
- C. Manholes and sewer cleanouts
- D. None of the above

141. Which of the following should indicate the diameter, the length between the centers of manholes, and the slope or direction of flow?

- A. Engineering endeavors
- B. Sewer line maps
- C. Quality sanitary sewer designs
- D. None of the above

142. All maps should have this term and was drafted and the date of the last revision?

- A. Overflow points
- B. Introduction of flows
- C. Date the map
- D. None of the above

### **Geographic Information System (GIS)**

143. If a GIS program is being used by the owner or operator, the reviewer should ask if the program is capable of accepting information from the?

- A. Overflow points
- B. Inspection
- C. Owner or operator's management program
- D. None of the above

144. Reviewers should check to see that maps and plans are available to the personnel in the office and to field personnel or contractors involved in all?

- A. Engineering endeavors
- B. Sewer line maps
- C. Quality sanitary sewer designs
- D. None of the above

### **New Sewer Construction**

145. Which of the following keep costs and problems associated with operations, maintenance, and construction to a minimum?

- A. Engineering endeavors
- B. Sewer cleanouts
- C. Sanitary sewer designs
- D. None of the above

146. The owner or operator should have standards for new construction, procedures for reviewing designs and protocols for inspection, start-up, testing, and approval of new construction. The procedures should provide documentation of all activities, especially inspection.

- A. True
- B. False

## **Collection Systems O&M Section 90-100 QUESTIONS**

147. Which of the following of wastewater collection systems activities on a trouble or emergency basis has been the usual procedure and policy in many systems?

- A. Routine preventative operations
- B. Routine operation
- C. Operation and maintenance
- D. None of the above

148. Which of the following activities of the collection system has been delayed or omitted, primarily for political or financial reasons?

- A. Routine preventative
- B. Routine operations
- C. Planned operation and preventive maintenance
- D. None of the above

149. Which of the following activities for wastewater collection lines shall be performed by the system's personnel and outside contractors?

- A. Routine preventative
- B. Routine operations
- C. Planned operation
- D. None of the above

150. Which of the following activities including cleaning and removing roots from small and large diameter lines?

- A. Routine preventative
- B. Routine operations
- C. Routine operations and maintenance
- D. None of the above

151. The system's goal should be a minimum of cleaning between \_\_\_\_\_% of the sewers every year.

- A. 10-20
- B. 20-30
- C. 30-40
- D. None of the above

### **Sewer Cleaning and Inspection**

152. As sewer system networks age, the risk of deterioration, \_\_\_\_\_, and collapses becomes a major concern.

- A. Sanitary sewer overflow(s)
- B. Rehabilitation
- C. Blockages
- D. None of the above

153. Which of the following are essential to maintaining a properly functioning system; these activities further a community's reinvestment into its wastewater infrastructure?
- A. CCTV cleaning
  - B. Rod straitening program(s)
  - C. Cleaning and inspecting sewer lines
  - D. None of the above

**Inspection Techniques**

154. Which of the following are required to determine current sewer conditions and to aid in planning a maintenance strategy?
- A. Documentation of inspections
  - B. Inspection programs
  - C. Cleaning and inspecting sewer lines
  - D. None of the above

**Most sewer lines are inspected using one or more of the following techniques:**

155. Which of the following are the most frequently used most cost efficient in the long term, and most effective method to inspect the internal condition of a sewer?
- A. Television (TV) inspections
  - B. Lamping
  - C. Inspection program(s)
  - D. None of the above

156. Which of the following in smaller sewers are attached to a sled, to which a parachute or droge is attached and floated from one manhole to the next?
- A. Slick
  - B. Kite
  - C. The cable and camera
  - D. None of the above

157. Which of the following produce a video record of the inspection that can be used for future reference?
- A. CCTV inspection(s)
  - B. Inspection program(s)
  - C. Polaroid still photographs
  - D. None of the above

158. Which of the following are vital in fully understanding the condition of a sewer system?
- A. Visual inspections
  - B. Operators
  - C. Walk-through or internal inspection
  - D. None of the above

159. Which of the following should pay specific attention to sunken areas in the groundcover above a sewer line and areas with ponding water?
- A. Cameras
  - B. Operators
  - C. Sonar
  - D. None of the above

160. For large sewer lines, a \_\_\_\_\_ is recommended. This inspection requires the operator to enter a manhole, the channel, and the pipeline, and assess the condition of the manhole frame, cover, and chimney, and the sewer walls above the flow line.
- A. Visual inspections
  - B. Operators
  - C. Walk-through or internal inspection
  - D. None of the above

161. Which of the following of manholes and pipelines are comprised of surface and internal inspections?
- A. Visual inspections
  - B. Operators
  - C. Walk-through or internal inspection
  - D. None of the above

162. If entering the manhole is not feasible, mirrors can be used. Mirrors are usually placed at two adjacent manholes to reflect the interior of the sewer line.
- A. True
  - B. False

163. Lamping inspections are commonly used in high priority pipes, which tend to be pipes that are less than 100 years old.  
A. True B. False

**Smoke Testing of Sewers is Done to Determine:**

164. Location of \_\_\_\_\_ due to settling of foundations, manholes and other structures  
A. Broken sewers C. Illegal connections  
B. Diversion points D. None of the above

165. Location of uncharted manholes and \_\_\_\_\_  
A. Broken sewers C. Illegal connections  
B. Diversion points D. None of the above

166. \_\_\_\_\_ that buildings or residences are connected to the sanitary sewer  
A. Dye testing C. Illegal connections  
B. Proof D. None of the above

167. \_\_\_\_\_ such as roof leaders or downspouts, yard drains and industrial drains  
A. Broken sewers C. Illegal connections  
B. Diversion points D. None of the above

168. \_\_\_\_\_ can be used to verify connections of drains to sanitary or storm sewers.  
A. Dye testing C. Illegal connections  
B. Proof D. None of the above

169. \_\_\_\_\_ can be used to verify the findings of smoke testing.  
A. Dye testing C. Illegal connections  
B. Proof D. None of the above

**Identify the Cleaning Method**

170. Directs high velocities of water against pipe walls. Removes debris and grease build-up, clears blockages, and cuts roots within small diameter pipes. Efficient for routine cleaning of small diameter, low flow sewers.  
A. Jetting C. Kites, Bags, and Poly Pigs  
B. Flushing D. None of the above

171. Round, rubber-rimmed, hinged metal shield that is mounted on a steel framework on small wheels. The shield works as a plug to build a head of water. Scours the inner walls of the pipe lines. Effective in removing heavy debris and cleaning grease from line.  
A. Scooter C. Mechanical Rodding  
B. Hydraulic Balling D. None of the above

172. Similar in function to the ball. Rigid rims on bag and kite induce a scouring action. Effective in moving accumulations of decayed debris and grease downstream.  
A. Jetting C. Kites, Bags, and Poly Pigs  
B. Flushing D. None of the above

173. Most effective in lines up to 12 inches in diameter. Uses an engine and a drive unit with continuous rods or sectional rods. As blades rotate they break up grease deposits, cut roots, and loosen debris.

- A. Scooter
- B. Hydraulic Balling
- C. Mechanical Rodding
- D. None of the above

174. Partially removes large deposits of silt, sand, gravel, and some types of solid waste. Cylindrical device, closed on one end with 2 opposing hinged jaws at the other. Jaws open and scrape off the material and deposit it in the bucket.

- A. Jetting
- B. Flushing
- C. Bucket Machine
- D. None of the above

175. A threaded rubber cleaning ball that spins and scrubs the pipe interior as flow increases in the sewer line. Removes deposits of settled inorganic material and grease build-up. Most effective in sewers ranging in size from 5-24 inches.

- A. Scooter
- B. Hydraulic Balling
- C. Mechanical Rodding
- D. None of the above

176. Introduces a heavy flow of water into the line at a manhole. Removes floatables and some sand and grit. Most effective when used in combination with other mechanical operations, such as rodding or bucket machine cleaning.

- A. Jetting
- B. Flushing
- C. Kites, Bags, and Poly Pigs
- D. None of the above

### More on Sewer Cleaning Procedures

177. Most cities that take advantage of sewer cleaning procedures are able to determine that as the maintenance frequency increased, there was an increase in system performance. It is recommended for \_\_\_\_\_ inspections and maintenance activities for every \_\_\_\_\_ cleanings.

- A. 20 – 50
- B. 70 – 30
- C. 30 – 70
- D. None of the above

A maintenance plan attempts to develop a strategy and priority for maintaining pipes based on several of the following factors:

178. \_\_\_\_\_ - frequency and location; 80 percent of problems occur in 25 percent of the system.

- A. Problems
- B. Location
- C. Cleaning and repairs
- D. None of the above

179. \_\_\_\_\_ - pipes located on shallow slopes or in flood prone areas have a higher priority.

- A. Problems
- B. Location
- C. Cleaning and repairs
- D. None of the above

180. Force main vs. gravity-force mains have a higher priority than gravity, size for size, due to the complexity of the \_\_\_\_\_.

- A. Problems
- B. Location
- C. Cleaning and repairs
- D. None of the above

181. \_\_\_\_\_ - depth to groundwater, depth to bedrock, soil properties (classification, strength, porosity, compressibility, frost susceptibility, erodibility, and pH).

- A. Age
- B. Subsurface conditions
- C. Pipe diameter/volume conveyed
- D. None of the above

182. \_\_\_\_\_ - Hydrogen Sulfide (H<sub>2</sub>S) is responsible for corroding sewers, structures, and equipment used in wastewater collection systems. The interior conditions of the pipes need to be monitored and treatment needs to be implemented to prevent the growth of slime bacteria and the production of H<sub>2</sub>S gases.

- A. Corrosion potential
- B. Subsurface conditions
- C. Pipe diameter/volume conveyed
- D. None of the above

183. \_\_\_\_\_ - older systems have a greater risk of deterioration than newly constructed sewers.

- A. Age
- B. Subsurface conditions
- C. Pipe diameter/volume conveyed
- D. None of the above

184. \_\_\_\_\_ - pipes constructed of materials that are susceptible to corrosion have a greater potential of deterioration and potential collapse. Non-reinforced concrete pipes, brick pipes, and asbestos cement pipes are examples of pipes susceptible to corrosion.

- A. Construction material
- B. Subsurface conditions
- C. Pipe diameter/volume conveyed
- D. None of the above

185. \_\_\_\_\_ - pipes that carry larger volumes take precedence over pipes that carry a smaller volume.

- A. Age
- B. Subsurface conditions
- C. Pipe diameter/volume conveyed
- D. None of the above

### **Limitations of Cleaning Methods**

186. Which of the following will normally utilize a variety of cleaning methods including jetting, high velocity cleaning, rodding, bucket machining, and using stop trucks?

- A. Backups into residences
- B. Variety of cleaning methods
- C. The collection system
- D. None of the above

187. With the preventive maintenance approach, most collection system operators also have been using combination trucks with both?

- A. The cleaning and inspection crews
- B. Chemicals' effectiveness
- C. Flush and vacuum systems
- D. None of the above

188. To control roots, most collection system operators use?

- A. Steep-grade hill areas
- B. Variety of cleaning methods
- C. A vapor rooter eradication system
- D. None of the above

189. The cleaning and inspection crews will usually consist of two members to operate each of the?

- A. Flush and vacuum systems
- B. Chemicals' effectiveness
- C. Combination trucks and TV trucks
- D. None of the above

### Detailed Cleaning Methods

The purpose of sewer cleaning is to remove foreign material from the sewer and generally is undertaken to alleviate one of the following conditions:

190. Which of the following is caused by either the premature operation of combined wastewater overflows because of downstream restrictions to hydraulic capacity or pollution caused by the washing through and discharge of debris from overflows during storms?

- A. Odor
- B. Pollution
- C. Blockages
- D. None of the above

191. Which of the following is caused by the retention of solids in the system for long periods resulting in, among other things, wastewater turning septic and producing hydrogen sulfide?

- A. Odor
- B. Pollution
- C. Blockages
- D. None of the above

192. Which of the following is where the sewer needs to be cleaned before inspection. This requirement most often occurs when using in-sewer CCTV inspection techniques?

- A. Sewer rehabilitation
- B. Sewer inspections
- C. Hydraulic capacity
- D. None of the above

193. Which of the following is semisolid obstructions resulting in a virtual cessation of flow?

- A. Odor
- B. Pollution
- C. Blockages
- D. None of the above

194. Which of the following is in some cases, sediment, roots, intrusions, grease, encrustation and other foreign material restrict the capacity of a sewer, causing surcharge or flooding? Cleaning the sewer may alleviate these problems permanently, or at least temporarily.

- A. Sewer rehabilitation
- B. Sewer inspections
- C. Hydraulic capacity
- D. None of the above

195. Which of the following is where it is necessary to clean the sewers immediately before the sewer being rehabilitated?

- A. Sewer rehabilitation
- B. Sewer inspections
- C. Hydraulic capacity
- D. None of the above

196. Traditionally used in larger-diameter sewers, which method involves manually excavating the material and placing it in buckets for removal? As the sewer system can be hazardous, the technique now is used infrequently. High-pressure jet equipment also can be used manually in larger sewers.

- A. Cutting
- B. Rodding
- C. Manual or Mechanical Digging
- D. None of the above

197. Which is a technique where custom buckets are dragged through the sewer and the material deposited into skips?

- A. Cutting
- B. Rodding
- C. Dragging
- D. None of the above

198. Which method depends on the ability of high-velocity jets of water to dislodge materials from the pipe walls and transport them down the sewer?

- A. Jet Rodding
- B. Dragging
- C. Cutting
- D. None of the above

199. The distance from the access point is limited to approximately 60 ft in this method.
- A. Cutting
  - B. Rodding
  - C. Manual or Mechanical Digging
  - D. None of the above
200. Which method is generally a manual push-pull technique used to clear blockages in smaller-diameter, shallow sewer systems typically not exceeding 10 in. in diameter or 6 ft. in depth?
- A. Jet Rodding
  - B. Dragging
  - C. Rodding
  - D. None of the above
201. Which method generally is used for removing roots from sewers? High-pressure water jet cutters have been developed for removing even more solid intrusions, such as intruding connections. Care is required to eliminate damage to the existing sewer structure.
- A. Jet Rodding
  - B. Dragging
  - C. Cutting
  - D. None of the above
202. Which of the following uses water under high pressure is fed through a hose to a nozzle containing a rosette of jets sited so the majority of flow is ejected in the opposite direction of the flow in the hose?
- A. Cutting
  - B. Jet Rodding
  - C. Manual or Mechanical Digging
  - D. None of the above
203. Which of the following the main limitation of this technique is that cautions need to be used in areas with basement fixtures and in steep-grade hill areas?
- A. Jetting
  - B. Bucket machine(s)
  - C. Kite or Bag
  - D. None of the above
204. Balling - Balling cannot be used effectively in pipes with \_\_\_\_\_ or protruding service connections because the ball can become distorted.
- A. Backups into residences
  - B. Completely plugged
  - C. Bad offset joints
  - D. None of the above
205. Which of the following is not very effective in removing heavy solids?
- A. Jetting
  - B. Flushing
  - C. Kite or Bag
  - D. None of the above
206. Which of the following causes backups into residences have been known to occur when this method has been used by inexperienced operators?
- A. Jetting
  - B. Chemicals' effectiveness
  - C. High Velocity Cleaner
  - D. None of the above
207. Which of the following when using this method, use caution in locations with basement fixtures and steep-grade hill areas?
- A. Bucket machine(s)
  - B. Kite or Bag
  - C. Scooter
  - D. None of the above

### **Sewer – Hydraulic Cleaning Sub-Section**

208. The purpose of sewer cleaning is to remove accumulated material from the sewer. Cleaning helps to prevent?
- A. Velocity
  - B. Infiltration
  - C. Blockage(s)
  - D. None of the above



209. Which of the following in gravity sewers are usually caused by a structural defect, poor design, poor construction, an accumulation of material in the pipe?

- A. Stoppages
- B. Infiltration
- C. Inflow
- D. None of the above

210. Protruding traps may catch debris, which then causes a further buildup of?

- A. Velocity
- B. Solids
- C. Blockage(s)
- D. None of the above

### **Sewer Cleaning Methods**

211. Mechanical cleaning uses physical devices to scrape, cut, or pull?

- A. Infiltration
- B. Material from the sewer
- C. Sewer cleaning
- D. None of the above

212. Chemical cleaning can facilitate the control of odors, grease buildup, root growth, corrosion, and insect and?

- A. Deposition of solids
- B. Infiltration
- C. Rodent infestation
- D. None of the above

### **Sewer Cleaning Records**

213. Which of the following identified should include those due to grease or industrial discharges, hydraulic bottlenecks in the collection system, areas of poor design?

- A. Both infiltration and inflow or I/I
- B. Potential problem areas
- C. General I/I source areas
- D. None of the above

214. The owner or operator should also be able to identify the number of stoppages experienced per mile of sewer pipe. If the system is experiencing a steady increase in stoppages, the reviewer should try to determine the cause (i.e., lack of preventive maintenance funding, deterioration of the sewers due to age, an increase in?

- A. Grease producing activities
- B. Breakdown or malfunction
- C. Maximum flow capacity of wastewater
- D. None of the above

### **Parts and Equipment Inventory**

215. The inventory should be based on the equipment manufacturer's recommendations, supplemented by historical experience with?

- A. Both infiltration and inflow or I/I
- B. Potential problem areas
- C. Maintenance and equipment problems
- D. None of the above

216. Without such an inventory, the collection system may experience long down times or periods of inefficient operation in the event of a?

- A. Problem collection system areas
- B. Infiltration
- C. Breakdown or malfunction
- D. None of the above

### **Sewer Maintenance - Advantages and Disadvantages**

#### **Advantages and Disadvantages**

217. According to the text, one benefit of implementing a sewer maintenance program is the reduction of?

- A. SSOs
- B. Rehabilitation
- C. Fire hazard
- D. None of the above

### Visual Inspection

218. In smaller sewers, the scope of problems does provide information needed to make decisions on?

- A. SSOs
- B. Rehabilitation
- C. Sewer line cleaning
- D. None of the above

219. Sewer line cleaning is prioritized based on the age of the pipe and the frequency of the problems within it, many cities use rodding and?

- A. Visual inspection(s)
- B. Rehabilitation
- C. Pressurized cleaning methods to maintain the pipes
- D. None of the above

220. Which of the following are rarely used because cleaning by this method tends to be time consuming?

- A. Bucket machine(s)
- B. Jetting
- C. Scooter
- D. None of the above

221. Most cities that use chemicals into the cleaning program may hire an expert crew, adopting a new program, and instituting a detention time to ensure the?

- A. Results
- B. Chemicals' effectiveness
- C. Cost
- D. None of the above

### Sewer System Rehabilitation

222. The collection system owner or operator should have a?

- A. Sewer sampling system program
- B. Problem solving unit
- C. Sewer rehabilitation program
- D. None of the above

223. There are many rehabilitation methods; the choice of methods depends on pipe size, type, location, dimensional changes, sewer flow, material deposition, surface conditions, and?

- A. A serious source of I/I
- B. Non-structural repairs
- C. Severity of I/I
- D. None of the above

224. Which of the following involve either the replacement of all or a portion of a sewer line, or the lining of the sewer?

- A. Sanitary sewer service line
- B. Rehabilitation program
- C. Structural repairs
- D. None of the above

225. Manholes should not be neglected in this program.

- A. Debris discharged
- B. Rehabilitation
- C. Cracks or loose joints in the sewer pipe
- D. None of the above

226. Manhole covers can allow significant inflow to enter the system because they are often located in the?

- A. Sanitary sewer service line
- B. Rehabilitation program
- C. Path of surface runoff
- D. None of the above

227. Manholes themselves can also be this term from cracks in the barrel of the manhole.

- A. A significant source of infiltration
- B. Non-structural repairs
- C. Warm, moist, nutrient rich atmosphere
- D. None of the above

### **Tree Roots vs. Sanitary Sewer Lines**

#### **Root Growth in Pipes**

228. Roots require oxygen to grow, they do not grow in this term or where high ground water conditions prevail.

- A. Debris discharged
- B. Pipes that are full of water
- C. Cracks or loose joints in the sewer pipe
- D. None of the above

229. The flow of warm water inside the sanitary sewer service pipe causes water with this \_\_\_\_\_ surrounding the pipe.

- A. A significant source of infiltration
- B. Non-structural repairs
- C. Vapor to escape to the cold soil
- D. None of the above

230. Tree roots are attracted to the water vapor leaving the pipe and they follow the vapor trail to the source of the moisture, which are usually in?

- A. Sanitary sewer service line
- B. Cracks or loose joints
- C. Exert considerable pressure
- D. None of the above

231. Upon reaching the crack or pipe joint, this term will penetrate the opening to reach the nutrients and moisture inside the pipe.

- A. A significant source of infiltration
- B. Severity of I/I
- C. Tree roots
- D. None of the above

#### **Problems Caused by Roots Inside Sewers**

232. Homeowners will notice the first signs of this term by hearing gurgling noises from toilet bowls and observing wet areas around floor drains after completing the laundry.

- A. A significant source of infiltration
- B. Non-structural repairs
- C. Slow flowing drainage system
- D. None of the above

233. As roots continue to grow, they expand and exert considerable pressure \_\_\_\_\_ where they entered the pipe.

- A. Sanitary sewer service line
- B. Cracks or loose joints in the sewer pipe
- C. At the crack or joint
- D. None of the above

234. Which of the following term and pipes that are structurally damaged will require replacement?

- A. A significant source of infiltration
- B. Non-structural repairs
- C. Severe root intrusion
- D. None of the above

#### **Tree Roots in Sewer**

235. Roots from trees growing on private property and on parkways throughout the City are responsible for many of the sanitary sewer service backups and?

- A. Drought conditions
- B. Inflow and infiltration (I&I)
- C. Damaged sewer pipes
- D. None of the above

236. The replacement cost of a sanitary sewer service line as a result of \_\_\_\_\_ may be very expensive.

- A. Damage from tree roots
- B. Tree roots
- C. The common method of removing roots
- D. None of the above

### **Pipes Susceptible to Root Damage**

237. Clay tile pipe that was commonly installed by developers and private contractors until the late 1980's is easily penetrated and?

- A. Root intrusion
- B. Damaged by tree roots
- C. Sanitary sewer service backup(s)
- D. None of the above

### **Root Growth Control**

238. The common method of removing roots from \_\_\_\_\_ involves the use of augers, root saws, and high-pressure flushers.

- A. Root intrusion
- B. Sanitary sewer service pipes
- C. Sanitary sewer service backup(s)
- D. None of the above

239. The use of products such as copper sulfate and sodium hydroxide are not recommended because of negative environmental impacts on the?

- A. Root intrusion
- B. Sewer service
- C. Downstream receiving water
- D. None of the above

### **Smoking out Sewer Leaks**

240. Which of the following is an effective method of documenting sources of inflow and should be part of any CMOM program?

- A. Taste testing
- B. Smoke testing
- C. Video techniques
- D. None of the above

241. Which of the following is a relatively simple process, which consists of blowing smoke mixed with larger volumes of air into the sanitary sewer line, usually induced through the manhole?

- A. Smoke testing
- B. Dye
- C. Inflow
- D. None of the above

242. The smoke travels the path of least resistance and quickly shows up at sites that allow?

- A. Surface water inflow
- B. CFM
- C. Sources of exfiltration
- D. None of the above

243. Which of the following will identify broken manholes, illegal connections, uncapped lines, and will even shows cracked mains and laterals providing there is a passageway for the smoke to travel to the surface?

- A. Smoke
- B. Dye
- C. Video inspection
- D. None of the above

244. Although video inspection and other techniques are certainly important components of \_\_\_\_\_, research has shown that approximately 65% of all extraneous stormwater inflow enters the system from somewhere other than the main line.

- A. An I&I survey
- B. Smoke testing
- C. Video inspection and other techniques
- D. None of the above

### **Necessary Equipment**

245. If you've used this term and found that smoke frequently backs up to the surface, this may be your problem.

- A. High CFM blowers
- B. Smoke testing
- C. Video inspection
- D. None of the above

### Blowers

246. In general, squirrel cage blowers are usually larger in size, but can provide more static pressure in relation to?

- A. Smoke
- B. CFM
- C. Video inspection and other techniques
- D. None of the above

247. Smoke Types: There are two types of smoke currently offered for smoke testing sewers, classic smoke candles and?

- A. Smoke fluids
- B. Dye
- C. Stink bombs
- D. None of the above

248. Which of the following are available in various sizes that can be used singularly or in combination to meet any need?

- A. Fire candles
- B. Dye
- C. Smoke candles
- D. None of the above

249. Blocking off sections of line is usually a good idea with any type of smoke, but becomes almost a necessity when using?

- A. Smoke fluid
- B. Dye
- C. One dozen smoke candles
- D. None of the above

### Fats, Oils and Grease Section

250. Commercial food preparation establishments with inadequate grease controls is the primary method that FOG gets into our sewer collection system.

- A. True
- B. False

251. Sewer backups and overflows will occur on streets, properties and even in customers' homes and/or businesses are caused because of improper disposal of fats, oils and grease.

- A. True
- B. False

252. Ponds, streams or rivers will be contaminated due to \_\_\_\_\_ and will also impact the environment negatively.

- A. Sewer backup(s)
- B. Overflow(s)
- C. Management Practices (MPs)
- D. None of the above

### Food Service Establishments (FSEs)

253. Because of the amount of grease used in cooking, \_\_\_\_\_ are a significant source of fats, oil and grease (FOG).

- A. Sewer system infiltration
- B. Customer(s) Inflow
- C. Food Service Establishments (FSEs)
- D. None of the above

254. To assist improper handling and disposal of FOG \_\_\_\_\_ are generally developed to assist restaurants and other FSEs with instruction and compliance.

- A. CSO/SSO
- B. POTWs
- C. POTW Commercial FOG Program
- D. None of the above

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

255. According to the text, the \_\_\_\_\_ can handle properly disposed wastes, but to work effectively, sewer systems need to be properly maintained, from the drain to the treatment plant.  
A. Vactor  
B. Honey pumpers  
C. POTW's sewer system  
D. None of the above

256. Various businesses and individuals need to be responsible in maintaining the POTW system because repeated repairs are disruptive to residences and businesses alike. Proper sewer disposal by commercial establishments is required by \_\_\_\_\_.  
A. Law  
B. Best management advice (BMAs)  
C. POTW's recommendations  
D. None of the above

### **Environmental problem with FOG sewers**

257. Grease balls are formed by various solids that enter the sewer system eventually solidifies. The various sizes of these grease balls can range in size from molecules to grapes and must be removed periodically.  
A. True  
B. False

258. Customer(s) complaints about the maintenance of the collection systems and/or treatment plants is the best method to handle or treat FOG effectively.  
A. True  
B. False

259. The repair or replacement of their damaged property caused by FOG creating \_\_\_\_\_ can also cost customers thousands of dollars for the repair or replacement of their damaged property.  
A. Infiltration  
B. Sewer backup(s)  
C. Exfiltration  
D. None of the above

### **Controlling FOG discharges**

260. According to the text, FOG wastes are generated at \_\_\_\_\_ as byproducts from food preparation activities.  
A. FSEs  
B. POTWs  
C. Customer service  
D. None of the above

261. There are generally two FOG captured on-site broad categories:  
A. Yellow grease and grease trap waste  
B. White grease and grease waste  
C. Soft and Hard  
D. None of the above

262. Food service establishments can adopt a variety of \_\_\_\_\_ or install interceptor/collector devices to control and capture the FOG material before discharge to the collection system.  
A. Customer service  
B. POTW's Rules  
C. Best management practices  
D. None of the above

### **Keeping Fats, Oils, and Grease out of the Sewer System**

263. Manholes can overflow into parks, yards, streets, and storm drains, allowing FOG to contaminate local waters, including drinking water. Exposure to untreated wastewater is a public-health hazard and is an \_\_\_\_\_. FOG discharged into septic systems and drain fields can cause malfunctions, resulting in more frequent tank pump-outs and other expenses.  
A. EPA violation  
B. OSHA violation  
C. EPA NOV recommendation  
D. None of the above

264. When FOG is poured down kitchen drains accumulating inside sewer pipes. As the FOG builds up, it restricts the flow in the pipe and can cause \_\_\_\_\_.
- A. Infiltration
  - B. Overflow and clogging
  - C. Exfiltration
  - D. None of the above

**Residential and Commercial Guidelines**

265. \_\_\_\_\_ into homes create a health hazard as well as an unpleasant mess that can cost hundreds and sometimes thousands of dollars to clean up.
- A. Sewage backflow
  - B. Trash and debris
  - C. Sewer backups
  - D. None of the above
266. According to the text, serious environmental and health conditions are created and can enter certain parts of the POTW, \_\_\_\_\_ can enter storm drains and flow directly into water bodies and onto beaches creating problems.
- A. Sewage backups
  - B. Trash and debris
  - C. FOG
  - D. None of the above
267. Storm sewers need to be kept clean and car washing can often results in \_\_\_\_\_ entering the storm sewers.
- A. Sewage backups
  - B. Health hazard(s)
  - C. Soap and oil residue(s)
  - D. None of the above
268. \_\_\_\_\_ enters into storm sewers from run-off from your sprinkler, watering hose, or from the rain can carry yard waste.
- A. Fertilizer
  - B. Negligence
  - C. Petroleum-based oil(s)
  - D. None of the above
269. Littering can cause \_\_\_\_\_ to clog catch basins and storm drains.
- A. Sewage backups
  - B. Health hazard(s)
  - C. Trash and debris
  - D. None of the above
270. One million gallons of water can be easily contaminated by simply poring \_\_\_\_\_ down a storm drain could contaminate up to
- A. A gallon of oil
  - B. FOG
  - C. Dye
  - D. None of the above

**Using best management practices can:**

271. \_\_\_\_\_ is the primary cause of sewer problems; this in turn causes the likelihood of lawsuits by nearby businesses over sewer problems.
- A. Backup
  - B. Negligence
  - C. FOG Violation(s)
  - D. None of the above
272. Workers or the public can be exposed to \_\_\_\_\_ during a problem, it is best to reduce exposure, thus limiting some lawsuits.
- A. Backup
  - B. FOG buildup
  - C. Raw sewage
  - D. None of the above
273. In order to lessen the likelihood of surcharges from the sewer authority or chargebacks for repairs to sewer pipes are most likely attributable to customer's \_\_\_\_\_.
- A. Health hazard(s)
  - B. Soap and oil residue(s)
  - C. FOG
  - D. None of the above

## pH Section

274. Pure water has a pH very close to?

- A. 7
- C. 7.7
- B. 7.5
- D. None of the Above

275. \_\_\_\_\_ are determined using a concentration cell with transference, by measuring the potential difference between a hydrogen electrode and a standard electrode such as the silver chloride electrode.

- A. Primary pH standard values
- C. pH measurement(s)
- B. Alkalinity
- D. None of the Above

276. Mathematically, pH is the negative logarithm of the activity of the (solvated) hydronium ion, more often expressed as the measure of the?

- A. Electron concentration
- C. Hydronium ion concentration
- B. Alkalinity concentration
- D. None of the Above

277. Which of the following terms for aqueous solutions can be done with a glass electrode and a pH meter, or using indicators?

- A. Primary sampling
- C. Determining values
- B. Measurement of pH
- D. None of the Above

278. The pH scale is logarithmic and therefore pH is?

- A. An universal indicator
- C. An excess of alkaline earth metal concentrations
- B. A dimensionless quantity
- D. None of the Above

279. Measuring alkalinity is important in determining a stream's ability to neutralize acidic pollution from rainfall or wastewater. It is one of the best measures of the sensitivity of the stream to acid inputs. There can be long-term changes in the \_\_\_\_\_ of rivers and streams in response to human disturbances.

- A. Acid
- C. pH measurement(s)
- B. Alkalinity
- D. None of the Above

280. pH is defined as the decimal logarithm of the reciprocal of the \_\_\_\_\_,  $a_{H^+}$ , in a solution.

- A. Hydrogen ion activity
- C. Brønsted–Lowry acid–base theory
- B. Acid-base behavior
- D. None of the Above

## Pumps and Lift Stations Section

281. Pumping Station is a relatively large sewage pumping installation designed not only to lift sewage to a higher elevation, but also to convey it through force mains to gravity flow points located relatively long distances from the?

- A. Submersible pump(s)
- C. Pumping Station
- B. Dry well
- D. None of the above

### Lift Stations

282. Which of the following are designed to operate continuously to keep sewerage from backing up through the system?

- A. Lift Station
- C. Submersible pump(s)
- B. Dry well
- D. None of the above



283. Which of the following identifies potential problems instantaneously and take the proper steps to rectify the situation before it becomes a public health risk?
- A. Telemetry
  - B. Checker
  - C. Pumping valve
  - D. None of the above

**A Lift Station contains 4 main Components:**

284. A wet well - usually \_\_\_\_\_ + ft. in depth and \_\_\_\_\_ ft. in diameter - that houses two submersible pumps of varying horsepower, discharging piping and floats that operate the pumps and keep a set level in the well.

- A. 8 & 15
- B. 15 & 8
- C. 4 & 15
- D. None of the above

285. Which of the following houses the piping and valves that prevent backflow in the station, and can lock connection used to bypass the submersibles in an emergency situation?

- A. Pumping station panel
- B. Dry well
- C. Supervisory panel
- D. None of the above

286. A "Log Book" or "Station Book" which contains the records and maps of the?

- A. Lift Station's area
- B. Dry well area
- C. Pumping Station location
- D. None of the above

**Collection Systems, Lift Stations**

287. Which of the following include a wastewater receiving well, often equipped with a screen or grinding to remove coarse materials?

- A. Key elements of lift stations
- B. Key elements of dry well
- C. Dry-pit or dry-well
- D. None of the above

288. Which of the following are often installed in an enclosed structure?

- A. Lift station equipment and systems
- B. Key elements of dry well
- C. Submersible station(s)
- D. None of the above

289. Centrifugal pumps are commonly used in?

- A. Wet-well
- B. Lift station(s)
- C. Pump station control
- D. None of the above

290. A more sophisticated control operation involves the use of?

- A. Squirrel motors
- B. Non-adjustable speed drives
- C. Variable speed drives
- D. None of the above

291. Which of the following houses pumps and valves are housed in a pump room (dry pit or dry-well), that are easily accessible?

- A. Dry-well lift stations
- B. Submersible lift station(s)
- C. Trapped air column, or bubbler system
- D. None of the above

292. Which of the following is a separate chamber attached or located adjacent to the dry-well structure?

- A. Wet-well
- B. Lift station(s)
- C. Dry-pit or dry-well and submersible lift stations
- D. None of the above

293. Which of the following do not have a separate pump room; the lift station header piping, associated valves, and flow meters are located in a separate dry vault at grade for easy access?

- A. Lift station(s)
- B. Submersible lift station(s)
- C. Dry-pit or dry-well and submersible lift stations
- D. None of the above

294. Which of the following include sealed pumps that operate submerged in the wet-well?

- A. Submersible lift station(s)
- B. Lift station(s)
- C. Dry-pit
- D. None of the above

295. Which of the following allow easy access for routine visual inspection and maintenance?

- A. Submersible pump(s)
- B. Submersible lift station(s)
- C. Dry-well lift stations
- D. None of the above

296. Which of the following do not usually include large aboveground structures and tend to blend in with their surrounding environment in residential areas?

- A. Submersible lift station(s)
- B. Dry-well lift stations
- C. Operation and maintenance building
- D. None of the above

### **Applicability**

297. Which of the following are used to move wastewater from lower to higher elevation, particularly where the elevation of the source is not sufficient for gravity flow and/or when the use of gravity conveyance will result in excessive excavation depths and high sewer construction costs?

- A. Lift station(s)
- B. Submersible lift station(s)
- C. Dry-pit or dry-well and submersible lift stations
- D. None of the above

### **Current Status**

298. Which of the following are widely used in wastewater conveyance systems?

- A. Wet-well
- B. Lift station(s)
- C. Pump station control
- D. None of the above

299. Which of the following is often used to optimize pump performance and minimize power use?

- A. Variable speed pumping
- B. D-C Motors
- C. A-C Motors
- D. None of the above

300. Which of the following can reduce the size and cost of the wetwell and allows the pumps to operate at maximum efficiency under a variety of flow conditions?

- A. Variable-speed pumping
- B. Lift station(s)
- C. Pump station control
- D. None of the above

301. Which of the following may allow a given flow range to be achieved with fewer pumps than a constant-speed alternative?

- A. Gravity wastewater conveyance
- B. Variable-speed pumping
- C. Key disadvantages of lift stations
- D. None of the above

302. Which of the following also minimize the number of pump starts and stops, reducing mechanical wear?

- A. Variable-speed pumping
- B. Slow-speed pumping
- C. Softer starting
- D. None of the above

303. Which of the following also requires more room within the lift station and may produce more noise and heat than constant speed pumps?

- A. Variable-speed pumping
- B. Slow-speed pumping
- C. Softer starting
- D. None of the above

304. Lift station reliability can be significantly improved by providing stand-by equipment and?

- A. Gravity wastewater conveyance
- B. Emergency power supply systems
- C. Key disadvantages of lift stations
- D. None of the above

305. Which of the following is improved by using non-clog pumps suitable for the particular wastewater quality and by applying emergency alarm and automatic control systems?

- A. Gravity sewer reliability
- B. Lift station configuration
- C. Lift station reliability
- D. None of the above

### **Advantages**

306. Which of the following are used to reduce the capital cost of sewer system construction?

- A. Wet-well
- B. Lift station(s)
- C. Pump station control
- D. None of the above

307. Which of the following size is dependent on the minimum pipe slope and flow?

- A. Lift station configuration
- B. Gravity sewer lines
- C. Wet-well maximum detention time
- D. None of the above

### **Disadvantages**

308. Which of the following also require a significant amount of power, are sometimes expensive to upgrade, and may create public concerns and negative public reaction?

- A. Gravity wastewater conveyance
- B. Lift station(s)
- C. Dry well
- D. None of the above

309. Which of the following can be eliminated or reduced by selecting alternative sewer routes or extending a gravity sewer using direction drilling or other state-of-the-art deep excavation methods?

- A. Gravity sewer
- B. Wastewater pumping
- C. Gravity wastewater conveyance
- D. None of the above

### **Wet-Well**

310. Which of the following depends on the type of lift station configuration and the type of pump controls?

- A. Lift station configuration
- B. Wet-well design
- C. Wet-well maximum detention time
- D. None of the above

311. Wet-wells are typically designed large enough to prevent rapid pump cycling but small enough to prevent a long detention time and associated?

- A. Wastewater quality
- B. Odor release
- C. Drainage
- D. None of the above

312. Which of the following maximum detention time in constant speed pumps is typically 20 to 30 minutes?

- A. Lift station pump
- B. Dry well
- C. Wet-well
- D. None of the above

313. The minimum recommended wet-well bottom slope is to 2:1 to allow?  
 A. Gravity wastewater conveyance      C. Self-cleaning and minimum deposit of debris  
 B. Quicker sewer speed                      D. None of the above
314. Which of the following may include sewer pipelines, especially when variable speed drives are used?  
 A. Wet-well maximum detention time      C. Effective volume of the wet-well  
 B. Ineffective volume of the wet-well      D. None of the above
315. Which of the following should always hold some level of sewage to minimize odor release?  
 A. Lift station pump                              C. Wet-well  
 B. Dry well    D. None of the above

**Wastewater Pumps**

316. In small stations, with maximum inflows of less than \_\_\_\_\_ gallons per minute, two pumps are customarily installed, with each unit able to meet the maximum influent rate.  
 A. 1500    C. 700  
 B. 500    D. None of the above
317. Large lift stations, the size and number of pumps should be selected so that the range of this \_\_\_\_\_ can be met without starting and stopping pumps too frequently and without excessive wet-well storage.  
 A. Head-losses                                      C. Influent flow rates  
 B. Head capacity                                    D. None of the above
318. Additional pumps may provide intermediate capacities better matched to typical daily flows, an alternative option is to provide?  
 A. Flexibility    C. Maximum influent rate  
 B. Flow flexibility with variable speed pumps      D. None of the above
319. For pump stations with \_\_\_\_\_, the single pump flow approach is usually the most suitable.  
 A. Head-losses    C. High head-losses  
 B. Wet-well storage                                      D. None of the above
320. Which of the following is to be achieved with multiple pumps in parallel?  
 A. Peak flow    C. Low-flow/high head conditions  
 B. Head-losses      D. None of the above
321. Parallel peak pumping is typically used in large lift stations with relatively?  
 A. Low or moderate head(s)                      C. Flat system head curve(s)  
 B. Wear and tear    D. None of the above
322. Several types of centrifugal pumps are used in wastewater lift stations, these pumps are well suited for?  
 A. Head capacity    C. Low-flow/high head conditions  
 B. Wet-well storage                                      D. None of the above
323. In angle-flow pump is appropriate for pumping against?  
 A. Low or moderate head(s)                      C. Maximum influent rate  
 B. Wear and tear    D. None of the above

324. Mixed flow pumps are most viable for pumping large quantities of wastewater at?  
A. Head-losses C. Low head  
B. Head capacity D. None of the above

### Ventilation

325. Ventilation and heating are required if this \_\_\_\_\_ includes an area routinely entered by personnel.

- A. Lift station C. Motor control center (MCC) rooms  
B. Ventilation systems D. None of the above

326. Which of the following is particularly important to prevent the collection of toxic and/or explosive gases?

- A. Ventilation C. Motor control center (MCC) rooms  
B. Dry-well ventilation codes D. None of the above

327. Dry-well ventilation codes typically require \_\_\_\_\_ continuous air changes per hour or 30 intermittent air changes per hour.

- A. 12 C. 10  
B. 6 D. None of the above

328. Motor control center (MCC) rooms should have a ventilation system adequate to provide six air changes per hour and should be air conditioned to between 55 to 90 degrees F?

- A. 55-75 C. 75-90  
B. 55 to 90 D. None of the above

### Odor Control

329. Odor control is frequently required for lift stations, a relatively simple and widely used odor control alternative is minimizing?

- A. Chemical flatulence C. Wet-well turbulence  
B. Ventilation turbulence D. None of the above

330. Which of the following typically used for odor control include chlorine, hydrogen peroxide, metal salts oxygen, air, and potassium permanganate?

- A. Chemicals C. Biofilter flatulence  
B. Ventilation turbulence D. None of the above

### Performance

331. The overall performance of a lift station depends on the?

- A. Overall efficiency C. Performance of the pump(s)  
B. Efficiency D. None of the above

332. Which of the following is the quantity of liquid pumped per unit of time, typically measured as gallons per minute or million gallons per day?

- A. Capacity (flow rate) C. Head  
B. Efficiency D. None of the above

333. Which of the following is the energy supplied to the wastewater per unit weight, typically expressed as feet of water?

- A. Capacity (flow rate) C. Head  
B. Efficiency D. None of the above

334. Which of the following is the energy consumed by a pump per unit time, typically measured as kilowatt-hours?

- A. Power
- B. Efficiency
- C. Capacity, head, power, and overall efficiency
- D. None of the above

335. Which of the following is the ratio of useful hydraulic work performed to actual work input?

- A. Overall efficiency
- B. Efficiency
- C. Capacity, head, power, and overall efficiency
- D. None of the above

336. Which of the following reflects the pump relative power losses and is usually measured as a percentage of applied power?

- A. Overall efficiency
- B. Efficiency
- C. Capacity, head, power, and overall efficiency
- D. None of the above

### Operation and Maintenance

337. Which of the following includes observation of pumps, motors and drives for unusual noise, vibration, heating and leakage, check of pump suction?

- A. Lift station inspection
- B. Lift station operation
- C. Scrubber system
- D. None of the above

338. Which of the following are conducted, although the frequency really depends on the size of the lift station?

- A. Daily inspection
- B. Annual inspections
- C. Weekly inspections
- D. None of the above

339. If chemicals are added for \_\_\_\_\_, the chemical feed stations should be inspected weekly and chemicals replenished as needed.

- A. Odor control after of the lift station
- B. Grease control ahead of the lift station
- C. Odor control ahead of the lift station
- D. None of the above

340. The operator should tabulate \_\_\_\_\_ and its recommended spare parts.

- A. Maintenance program
- B. Each pumping element in the system
- C. Operation and maintenance manuals
- D. None of the above

### SCADA Introduction

341. Industrial organizations and companies in the public and private sectors to maintain and control efficiency, distribute data for smarter decisions, and communicate system issues to help mitigate downtime utilize SCADA systems.

- A. True
- B. False

342. SCADA systems are critical for industrial organizations (like water and wastewater facilities) since they help to maintain efficiency, process data for smarter decisions, and communicate system issues to help mitigate downtime.

- A. True
- B. False

343. The SCADA software will process, distribute, and display important data, helping operators and other employees understand the data and make important decisions.

- A. True
- B. False

344. The acronym SCADA refers to the centralized computer systems that control and monitor the entire sites, or they are the complex systems spread out over large areas. Nearly all the control actions are automatically performed by the remote terminal units (RTUs) or by the programmable logic controllers (PLCs).

- A. True B. False

## Collection Rules and Regulation Section

### What are Sanitary Sewer Overflows?

345. Sanitary Sewer Overflows (SSOs) are discharges of raw sewage from?

- A. Deteriorating Sewer Systems C. Municipal sanitary sewer systems  
B. Pipe Failure(s) D. None of the above

346. Which of the following can release untreated sewage into basements or out of manholes and onto city streets, playgrounds, and into streams before it can reach a treatment facility?

- A. Pipe Failure(s) C. SSOs  
B. Destructive compounds D. None of the above

### Why do Sewers Overflow?

347. Which of the following occasionally occur in almost every sewer system, even though systems are intended to collect and contain all the sewage?

- A. SSOs C. Poor sewer collection system management  
B. Undersized Systems D. None of the above

### Problems that Can Cause Chronic SSOs Include:

348. Which of the following is too much rainfall or snowmelt infiltrating through the ground into leaky sanitary sewers?

- A. Infiltration and Inflow (I&I) C. Sanitary Sewer Overflows or (SSOs)  
B. Destructive compounds D. None of the above

349. Which of the following represents sewers and pumps are too small to carry sewage from newly-developed subdivisions or commercial areas?

- A. Undersized Systems C. Oversized Systems  
B. Sewer Service Connections D. None of the above

350. Which of the following: blocked, broken or cracked pipes, tree roots grow into the sewer, sections of pipe settle or shift?

- A. Deteriorating Sewer System C. Badly connected sewer service lines  
B. Pipe Failure(s) D. None of the above

351. Which of the following discharges occur at sewer service connections to houses and other buildings; some cities estimate that as much as 60% of overflows comes from the service lines?

- A. Undersized Systems C. Back-ups and sewer overflows  
B. Sewer Service Connections D. None of the above

352. Which of the following is improper installation, improper maintenance; widespread problems that can be expensive to fix develop over time?

- A. Deteriorating Sewer System C. Badly connected sewer service lines  
B. Sanitary Sewer Overflows or (SSOs) D. None of the above

**Why are SSOs a Problem?**

353. Many municipalities have asked for national consistency in the way permits are considered for wastewater discharges, including \_\_\_\_\_, and in enforcement of the law prohibiting unpermitted discharges.

- A. Deteriorating Sewer System
- B. SSOs
- C. Badly connected sewer service lines
- D. None of the above

**Clean Water Act (Rule) Summary**

**33 U.S.C. s/s 1251 et seq. (1977)**

354. Which of the following has clarified and expanded permit requirements under the Clean Water Act for 19,000 municipal sanitary sewer collection systems in order to reduce sanitary sewer overflows?

- A. OSHA
- B. Clean water legislation
- C. Environmental Protection Agency (EPA)
- D. None of the above

355. The Clean Water Act is a \_\_\_\_\_ amendment to the Federal Water Pollution Control Act of 1972, which set the basic structure for regulating discharges of pollutants to waters of the United States.

- A. 1977
- B. 1999
- C. 2009
- D. None of the above

356. Which of the following gave the authority to set effluent standards on an industry basis and continued the requirements to set water quality standards for all contaminants in surface waters?

- A. EPA
- B. Congress
- C. Public notification program(s)
- D. None of the above

357. The \_\_\_\_\_ makes it unlawful for any person to discharge any pollutant from a point source into navigable waters unless a permit (NPDES) is obtained under the Act?

- A. CWA
- B. EPA
- C. OSHA
- D. None of the above

358. The CWA provisions for the delegation by EPA of many permitting, administrative, and enforcement aspects of the law to state governments. In \_\_\_\_\_ with the authority to implement CWA programs, the EPA still retains oversight responsibilities.

- A. POTW's areas
- B. Some counties
- C. States
- D. None of the above

359. Which of the following's primary objective is to restore and maintain the integrity of the nation's waters?

- A. Clean Water Act
- B. Clean water legislation
- C. EPA oversight responsibilities
- D. None of the above

**Combined Sewer Overflows**

360. Which of the following are sewers that are designed to collect rainwater runoff, domestic sewage, and industrial wastewater in the same pipe?

- A. Combined sewer systems
- B. Decentralized sewer systems
- C. Centralized sewer systems
- D. None of the above

361. Which of the following transport all of their wastewater to a sewage treatment plant, where it is treated and then discharged to a water body?

- A. Combined sewer systems
- B. Decentralized sewer systems
- C. Centralized sewer systems
- D. None of the above



362. Which of the following are designed to overflow occasionally and discharge excess wastewater directly to nearby streams, rivers, or other water bodies?

- A. Combined sewer systems
- B. Decentralized sewer systems
- C. Centralized sewer systems
- D. None of the above

363. Which of the following release raw sewage from the collection system before it can reach a treatment facility?

- A. Sanitary sewage overflows (SSOs)
- B. Decentralized sewer systems
- C. Centralized sewer systems
- D. None of the above

364. A SSO is a release of untreated wastewater before the flow reaches a treatment plant. SSOs pose a significant threat to public health and?

- A. Dissolved organics
- B. Water quality
- C. Certain compounds and undesirable solids
- D. None of the above

365. High levels of inflow and infiltration (I/I) during wet weather can cause\_\_\_\_\_.

- A. Dissolved organics
- B. SSOs
- C. Certain compounds and undesirable solids
- D. None of the above

366. Many collection SSOs include untreated discharges from \_\_\_\_\_ that reach waters of the United States systems that were designed according to industry standards experience wet weather SSOs because levels of I/I may exceed levels originally expected.

- A. Sanitary sewer systems
- B. Decentralized sewer systems
- C. Centralized sewer systems
- D. None of the above

#### **Treatment Balance and the Effects of Undesirable Solids**

367. Which of the following to operate properly, the operator has to maintain a skillfully balanced mixture of microorganisms which contact and digest the organics in the wastewater, and bacteria then grows on this media to treat the wastewater?

- A. Sanitary sewage overflows (SSOs)
- B. Decentralized sewer systems
- C. Wastewater treatment plant
- D. None of the above

368. When a plant is properly maintained these bacteria or bugs eat the dissolved organics in the water, thus removing?

- A. Public health and water quality
- B. BOD, Ammonia, Nitrates, and Phosphorus
- C. Dissolved organics
- D. None of the above

369. The wastewater treatment process leaves extremely clean and reusable water that can be injected back into the ground, sent to ponds or used for?

- A. Irrigation
- B. Wastewater
- C. Clean decantible water
- D. None of the above

370. Which of the following and undesirable solids, like grease and grass clippings, can disturb this delicate balance and necessary process at the wastewater treatment facility?

- A. Dissolved organics
- B. Certain compounds
- C. Disrepair
- D. None of the above

371. Which of the following include but are not limited to: cleaning solvents, grease, oils, pesticides, herbicides, antifreeze and other automotive products?

- A. Deteriorating Sewer System
- B. Pipe Failure(s)
- C. Destructive compounds
- D. None of the above

### Purpose of CMOM Programs

372. The CMOM approach helps the owner or operator provide a high level of service to customers and reduce \_\_\_\_\_.

- A. Performance goals
- B. Overflows and backups
- C. Regulatory noncompliance
- D. None of the above

373. On a periodic basis, utility activities should be reviewed and adjusted to better meet the \_\_\_\_\_.

- A. Performance goals
- B. Overflows and backups
- C. Regulatory noncompliance
- D. None of the above

374. Once the GIS is complete, a new goal might be to use the GIS to track emergency calls and use the information to improve \_\_\_\_\_.

- A. Maintenance planning
- B. Performance goals
- C. A matter of policy
- D. None of the above

375. CMOM can help utilities optimize use of human and material resources by shifting maintenance activities from “reactive” to “proactive”—often leading to savings through avoided costs due to overtime, reduced emergency construction costs, lower insurance premiums, changes in financial performance goals, and \_\_\_\_\_.

- A. Fewer lawsuits
- B. Overflows and backups
- C. Regulatory noncompliance
- D. None of the above

376. In CMOM planning, the owner or operator selects \_\_\_\_\_ targets, and designs CMOM activities to meet the goals.

- A. Maintenance planning
- B. Performance goal
- C. A matter of policy
- D. None of the above

377. Information collection and management practices are used to track how the elements of the CMOM program are meeting \_\_\_\_\_, and whether overall system efficiency is improving.

- A. Maintenance planning
- B. Performance goals
- C. A matter of policy
- D. None of the above

378. An important component of a \_\_\_\_\_ is periodically collecting information on current systems and activities to develop a “snapshot-in-time” analysis. From this analysis, the owner or operator evaluates its performance and plans its CMOM program activities.

- A. Catastrophic system failure
- B. CMOM program activity
- C. Successful CMOM program
- D. None of the above

379. Equipment and facilities will deteriorate through \_\_\_\_\_. Maintaining value of the capital asset is a major goal of the CMOM program.

- A. Normal use and age
- B. CMOM program activities
- C. Compliance with environmental requirements
- D. None of the above

380. Proper reinvestment in capital facilities maintains the ability to provide service and generate sales at the least cost possible and helps ensure compliance with \_\_\_\_\_.

- A. Catastrophic system failures
- B. CMOM program activities
- C. Environmental requirements
- D. None of the above

381. Performance characteristics of a system with an inadequate CMOM program include frequent blockages resulting in \_\_\_\_\_.

- A. Performance goals
- B. Overflows and backups
- C. Regulatory noncompliance
- D. None of the above

382. Other major performance indicators include pump station reliability, equipment availability, and avoidance of \_\_\_\_\_ such as a collapsed pipe.

- A. Catastrophic system failures
- B. CMOM program activities
- C. Compliance with environmental requirements
- D. None of the above

### **The Elements of a Proper CMOM Program**

#### **Purposeful**

383. Which of the following when present and properly maintained, they support customer service and protect system assets, public health, and water quality?

- A. MOM programs
- B. Combined sewer systems
- C. Publicly Owned Treatment Works (POTW)
- D. None of the above

#### **Goal-Oriented**

384. Which of the following have goals directed toward their individual purposes. Progress toward these goals is measurable, and the goals are attainable?

- A. MOM program(s)
- B. Combined sewer system(s)
- C. Proper MOM programs
- D. None of the above

#### **Uses Performance Measures**

385. Performance measures should be established for each of this \_\_\_\_\_ in conjunction with the program goal.

- A. MOM program
- B. Program goal
- C. Publicly Owned Treatment Works (POTW)
- D. None of the above

#### **Periodically Evaluated**

386. An evaluation of the progress toward reaching the goals, or \_\_\_\_\_, should be made periodically and based upon the quantified performance measures.

- A. A reassessment of the goals
- B. Combined sewer system(s)
- C. NPDES Compliance Inspection Manual
- D. None of the above

#### **Implemented by Trained Personnel**

387. Appropriate safety, equipment, technical, and program training is essential for implementing?

- A. MOM program(s)
- B. Utility's plan/schedule
- C. NPDES Compliance Inspection Manual
- D. None of the above

#### **What MOM programs should be audited?**

388. Which of the following at a utility involves its entire wastewater infrastructure. Common utility management activities and operations and maintenance activities associated with sewer systems and pretreatment are listed in the Self-Audit Review Document?

- A. Written MOM programs
- B. MOM activity
- C. Publicly Owned Treatment Works (POTW)
- D. None of the above

**What are the elements of a proper Self-Audit?**

**Initial Assessment**

389. Begin by performing a general assessment of the utility, and prioritizing the order of programs to be audited. Which of the following may be useful references in making this assessment?

- A. Program goal
- B. Water quality
- C. NPDES Compliance Inspection Manual and Guidance
- D. None of the above

**Develop the Audit Plan**

390. Identify the MOM programs present and/or needed at the utility, establish performance measures, and?

- A. Combined sewer system(s)
- B. Utility's plan/schedule
- C. Develop a schedule for auditing the programs
- D. None of the above

**Conduct the Audit**

391. Evaluate each MOM program against the defined elements of a proper program. This can be accomplished by reviewing the program's records and resources, conducting a field evaluation, and comparing the program understanding of?

- A. Both personnel and management
- B. NPDES permit authority
- C. Recurrent SSOs
- D. None of the above

**Develop Improvement Plan**

392. Define the utility's plan/schedule to remediate the?

- A. Necessary improvements
- B. NPDES permit authority
- C. Preventative operations
- D. None of the above

**Prepare the Self-Audit Report**

393. Which of the following including any deficiencies found and the corresponding improvement plan, which is useful for the utility?

- A. Audit results
- B. Unpermitted discharges
- C. Raw sewage
- D. None of the above

**What Health Risks do SSOs present?**

394. Which of the following contain raw sewage they can carry bacteria, viruses, protozoa, helminths, and borroughs?

- A. Unpermitted discharges
- B. SSOs
- C. Infiltration and inflow
- D. None of the above

**What other Damage can SSOs do?**

395. Which of the following also damage property and the environment?

- A. MOM Programs Self-Audit
- B. SSOs
- C. Capacity and/or reliability
- D. None of the above

396. Which of the following enter oceans, bays, estuaries, rivers, lakes, streams, or brackish waters is their effect on water quality?

- A. Self-audit results
- B. SSOs
- C. Raw sewage
- D. None of the above

**How can SSOs be Reduced or Eliminated?**

397. Which of the following are caused by inadequate or negligent operation or maintenance, inadequate system capacity, and improper system design and construction?

- A. MOM Programs Self-Audit
- B. SSOs
- C. Capacity and/or reliability
- D. None of the above

398. Reducing which of the following through system rehabilitation and repairing broken or leaking service lines?

- A. Unpermitted discharges
- B. SSOs
- C. Infiltration and inflow
- D. None of the above

399. Enlarging or upgrading sewer, pump station, or sewage treatment plant capacity and/or?

- A. Utility's plan/schedule
- B. Preventative operations
- C. Reliability
- D. None of the above

**Collection System Management**

400. Without the \_\_\_\_\_, O&M activities may lack organization and precision, resulting in a potential risk to human health and environmental contamination of surrounding water bodies, lands, dwellings, or groundwater.

- A. CMOM program
- B. Outside contractors
- C. Proper procedures, management and training systems
- D. None of the above

**Confined Space Section**

**Scope**

401. According to the text, you are required to recognize \_\_\_\_\_ associated with confined spaces.

- A. Internal configurations
- B. Permit-Required Confined Spaces
- C. The dangers and hazards
- D. None of the above

**Definitions**

**Confined space:**

402. A confined space is large enough or so configured that an employee can \_\_\_\_\_.

- A. Have sufficient oxygen
- B. Bodily enter and perform work
- C. Recognize serious safety or health hazards
- D. None of the above

403. A confined space has limited or restricted means for \_\_\_\_\_.

- A. An internal configuration
- B. Entry or exit
- C. Hazardous atmosphere
- D. None of the above

404. A confined space is not designed for \_\_\_\_\_.

- A. An internal configuration
- B. Hazardous atmospheres
- C. Continuous employee occupancy
- D. None of the above

405. A permit required confined space (permit space) contains or has a potential to contain a \_\_\_\_\_.

- A. Recognized internal configuration
- B. Hazardous atmosphere
- C. Entry or exit
- D. None of the above

406. A permit required confined space (permit space) contains a material that has \_\_\_\_\_.

- A. Authorized entrants
- B. Hazardous atmospheres
- C. The potential for engulfing an entrant
- D. None of the above

407. A permit required confined space (permit space) has an internal configuration such that \_\_\_\_\_ could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section.

- A. An entrant
- B. Hazardous atmosphere
- C. An internal configuration
- D. None of the above

408. A permit required confined space (permit space) contains any other recognized serious safety or \_\_\_\_\_.

- A. Engulfing problems
- B. Strange atmospheres
- C. Health hazard
- D. None of the above

409. Each \_\_\_\_\_ must be marked "Confined Space - Entry Permit Required".

- A. Permit-Required Confined Space
- B. Hazardous atmosphere
- C. Entry or exit
- D. None of the above

### Confined Space Hazards

410. Fatalities and injuries constantly occur among construction workers who are required to enter \_\_\_\_\_.

- A. An internal configuration
- B. Hazardous atmosphere
- C. Confined spaces
- D. None of the above

411. Workers encounter both inherent and \_\_\_\_\_ within confined workspaces.

- A. An internal configuration
- B. Induced hazards
- C. Hazardous atmosphere
- D. None of the above

### Inherent Hazards

412. \_\_\_\_\_ are associated with specific types of equipment and the interactions among them. These hazards can be electrical, thermal, chemical, mechanical, etc.

- A. Inherent hazards
- B. Hazardous atmospheres
- C. Recognized serious safety or health hazards
- D. None of the above

413. Inherent hazards include high voltage, radiation generated by equipment, \_\_\_\_\_, omission of protective features, high or low temperatures, high noise levels, and high-pressure vessels and lines.

- A. Defective design
- B. Hazardous atmosphere
- C. An internal configuration
- D. None of the above

414. Inherent hazards usually cannot be eliminated without degrading or shutting down the system or equipment. Therefore, emphasis must be placed on \_\_\_\_\_.

- A. Hazard control methods
- B. Hazardous atmospheres
- C. Continuous employee occupancy
- D. None of the above

### Induced Hazards

415. \_\_\_\_\_ result from a multitude of incorrect decisions and actions that occur during the actual construction process.

- A. Induced hazards
- B. Below-grade locations
- C. Build-up of explosive gases
- D. None of the above

### Typical Examples of Confined Workspaces

416. Confined workspaces in construction contain \_\_\_\_\_.

- A. Purging agents
- B. Below-grade location
- C. Both inherent and induced hazards
- D. None of the above

### Vaults

417. Workers must enter \_\_\_\_\_ found on the construction jobsite to perform a number of functions.

- A. Common confined spaces
- B. Hazards
- C. A variety of vaults
- D. None of the above

418. The restricted nature of vaults and their frequently \_\_\_\_\_ are reasons that vaults have an assortment of safety and health problems.

- A. Purged atmosphere
- B. Below-grade location
- C. Explosive atmosphere
- D. None of the above

### Oxygen-Deficient Atmosphere

419. The ever-present possibility of \_\_\_\_\_ is one of the major problems confronting construction workers while working in vaults.

- A. A common confined space
- B. Vaults
- C. An oxygen-deficient atmosphere
- D. None of the above

### Explosive or Toxic Gases, Vapors, or Fumes

420. \_\_\_\_\_ produce toxic fumes which are confined in the limited atmosphere of a confined space.

- A. Purging agents
- B. Below-grade locations
- C. Welding and soldering
- D. None of the above

### Manholes

421. Manholes are necessary to provide a means of entry into and exit from vaults, tanks, and pits, but these confined spaces may present \_\_\_\_\_ which could cause injuries and fatalities.

- A. Serious hazards
- B. Ventilation ducts
- C. Sumps
- D. None of the above

422. \_\_\_\_\_ are associated with manholes. For example, workers could fall into manholes when covers are missing.

- A. Nitrogen purges
- B. Collection places
- C. A variety of hazards
- D. None of the above

### Pipe Assemblies

423. The pipe assembly is one of the \_\_\_\_\_ encountered throughout the construction site,

- A. Electrical shock risks
- B. Ventilation ducts
- C. Most frequently unrecognized types of confined spaces
- D. None of the above

424. Once inside a pipe assembly, workers are faced with \_\_\_\_\_, often caused by purging with argon or another inert gas.

- A. Nitrogen purge or dry air
- B. Collection places
- C. Potential oxygen-deficient atmospheres
- D. None of the above

425. The worker in a pipe may be subject to toxic atmospheres from \_\_\_\_\_ generated by the worker in the pipe, or by other workers operating outside the pipe at either end.

- A. Electrical shock
- B. Welding fumes
- C. Sumps
- D. None of the above

426. Pipes have \_\_\_\_\_ which provide little room for the workers to move about and gain any degree of comfort while performing their tasks.

- A. Nitrogen purge or dry air
- B. Collection places
- C. Generally restricted dimensions
- D. None of the above

427. The worker may suffer \_\_\_\_\_ caused by heat within the pipe run.

- A. Heat prostration
- B. Exposure to toxic gases
- C. Problems with the pumps
- D. None of the above

### Ventilation Ducts

428. Ventilation ducts create a \_\_\_\_\_ which moves heated and cooled air and exhaust fumes to desired locations in the plant.

- A. Collection place
- B. Complex network
- C. Shortcut to other areas
- D. None of the above

429. Depending on where the ventilation ducts are located, \_\_\_\_\_.

- A. Nitrogen purge or dry air may be found
- B. Collection places could exist
- C. Oxygen deficiency could exist
- D. None of the above

430. Other problems associated with work inside ventilation ducts are electrical shock hazards and \_\_\_\_\_.

- A. Heat stress
- B. Water
- C. Welding fumes
- D. None of the above

### Unusual Conditions

#### Confined Space within a Confined Space

431. The \_\_\_\_\_ associated with the outer confined space and those of the inner confined space both require testing, monitoring, and control.

- A. Potential hazards
- B. Access passages
- C. Manholes
- D. None of the above

432. Often, only the outer space is evaluated for potential hazards. Workers are also faced with \_\_\_\_\_ when they enter the inner space.

- A. Poor lighting
- B. Excavations
- C. Potentially hazardous conditions
- D. None of the above

433. Workers entering a vessel inside an access pit should do so only after both spaces have been evaluated and \_\_\_\_\_.

- A. Purged
- B. Accessed
- C. Proper control measures established
- D. None of the above



### Hazards in One Space Entering another Space

434. According to the text, during an examination of \_\_\_\_\_, situations are often encountered which are not always easy to evaluate or control.

- A. Tanks
- B. Excavations
- C. Confined spaces in construction
- D. None of the above

435. A room that classifies as a confined space may be relatively safe for work. However, access passages from other areas outside or adjacent to the room could, at some point, allow the transfer of \_\_\_\_\_ into the "safe" room.

- A. Hazardous agents
- B. Equipment and tools
- C. Unauthorized workers
- D. None of the above

436. Welding fumes and other \_\_\_\_\_ generated in one room may easily travel through a pipe into another area, causing that area to change from a safe to an unsafe workplace.

- A. Toxic materials
- B. Construction debris
- C. Noise
- D. None of the above

437. In a situation where hazards in one space may enter another, a serious problem is that workers working in the "safe" area are not aware of the \_\_\_\_\_.

- A. Oxygen Level
- B. Access passages
- C. Hazards leaking into their area
- D. None of the above

### Permitted Confined Space Entry Program

438. Subpart P (of OSHA's Construction Regulations) applies to all \_\_\_\_\_ in the earth's surface.

- A. Open excavations
- B. Vaults
- C. Pits
- D. None of the above

439. According to the text, all trenches are \_\_\_\_\_.

- A. Too narrow for work
- B. Excavations
- C. Safe for short-term work
- D. None of the above

440. According to the text, all excavations are \_\_\_\_\_.

- A. Permit-required
- B. Not trenches
- C. Access passages
- D. None of the above

### Permit Required Confined Space Entry General Rules

441. According to the text, only authorized and trained employees may enter a \_\_\_\_\_ or act as safety watchmen/attendants.

- A. Hazard
- B. Pipe
- C. Confined space
- D. None of the above

442. Employees are not permitted to smoke \_\_\_\_\_ or near the entrance/exit area.

- A. Near air and oxygen monitors
- B. During a side entry
- C. In a confined space
- D. None of the above

443. A watchmen or attendant must be present at all times during \_\_\_\_\_.

- A. Confined space entries
- B. Access passages
- C. Air monitoring
- D. None of the above

444. According to the text, constant visual or voice communication will be maintained between the safety watchmen and employees entering \_\_\_\_\_.

- A. Inner spaces
- B. Access passages
- C. A confined space
- D. None of the Above

445. According to the text, no \_\_\_\_\_ will be made or work conducted below the level of any hanging material or material that could cause engulfment.

- A. Monitoring of entrant status
- B. Bottom or side entry
- C. Identification of authorized entrants
- D. None of the above

446. \_\_\_\_\_ is required before workers are allowed to enter any permit-required confined space. Oxygen levels in the confined space must be between 19.5 and 23.5 percent.

- A. Air and oxygen monitoring
- B. A supervisor
- C. Communication
- D. None of the above

447. Air and oxygen monitoring will check the levels of oxygen, explosive gasses, and carbon monoxide. Entry will not be permitted if explosive gas is detected above one-half the \_\_\_\_\_.

- A. Nitrogen level
- B. Argon level
- C. Lower Explosive Limit (LEL)
- D. None of the above

448. When covers are removed, all \_\_\_\_\_ will be protected by a barricade to prevent injuries to others.

- A. Air and oxygen monitoring
- B. Side entries
- C. Openings to confined spaces
- D. None of the above

### **Confined Space Duties and Responsibilities Employees**

449. Employees must not \_\_\_\_\_ that have not been evaluated for safety concerns.

- A. Follow program requirements
- B. Report hazards
- C. Enter any confined spaces
- D. None of the above

### **Entry Attendants**

450. \_\_\_\_\_ A responsibility of the entry attendant is to be aware of \_\_\_\_\_ of hazard exposure on entrants.

- A. The attendants' primary duty
- B. Worker training
- C. Possible behavioral effects
- D. None of the above

451. \_\_\_\_\_ A responsibility of the entry attendant is to continuously maintain an accurate count of entrants in the permit space and ensure a means to \_\_\_\_\_.

- A. Timely complete the work
- B. Add workers when needed
- C. Accurately identify authorized entrants
- D. None of the above

452. \_\_\_\_\_ A responsibility of the entry attendant is to remain outside the permit space during entry operations until \_\_\_\_\_.

- A. Assistance is requested
- B. Safety equipment arrives
- C. Relieved by another attendant
- D. None of the above

453. A responsibility of the entry attendant is to \_\_\_\_\_ as necessary to monitor entrant status and alert entrants of the need to evacuate.
- A. Communicate with entrants
  - B. Encourage entrants
  - C. Check the work progress
  - D. None of the above

**Permit Required Confined Space Entry General Rules**  
**Confined Space Entry Permits**

454. According to the text, Confined Space Entry Permits must be completed before any employee \_\_\_\_\_.
- A. Begins work
  - B. Leaves the permit space
  - C. Enters a permit-required confined space
  - D. None of the above
455. \_\_\_\_\_ will expire before the shift is completed or if any pre-entry conditions change.
- A. Air and oxygen monitoring
  - B. Project schedules
  - C. Confined Space Entry Permits
  - D. None of the above
456. \_\_\_\_\_ will be maintained on file for 12 months.
- A. Air and oxygen monitoring data
  - B. Project schedules
  - C. Confined Space Entry Permits
  - D. None of the above

**Excavation and Trenching Section**

457. According to the text, the \_\_\_\_\_ was revised because excavating is the most dangerous of all construction operations.
- A. Competent rule
  - B. OSHA excavation standard
  - C. Emergency rule
  - D. None of the above
458. OSHA also revised the \_\_\_\_\_ to clarify the requirements.
- A. Competent rule
  - B. Existing standard
  - C. Protective equipment standard
  - D. None of the above
459. 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
  - B. Employee
  - C. Construction equipment
  - D. None of the above
460. Although employers have options when meeting some of the requirements, \_\_\_\_\_ must realize that the employee must be protected at all times.
- A. Competent persons
  - B. Employers
  - C. Contractors
  - D. None of the above
461. Professional engineers will be required in some situations to plan or design the excavation and/or method of protecting the worker.
- A. True
  - B. False

**Competent Person**

462. 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
- B. Contractor
- C. Watchman
- D. None of the above

463. 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
- B. Contractor
- C. Watchman
- D. None of the above

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

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

**Competent Person Duties**

465. 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

466. 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

467. 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

468. 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

469. The competent person removes employees and \_\_\_\_\_ from hazardous conditions and makes all changes necessary to ensure their safety.

- A. Competent persons
- B. All other personnel
- C. Protective equipment
- D. None of the above

470. The competent person makes sure that all \_\_\_\_\_ have proper protective equipment, hard-hats, reflective vests, steel-toed boots, harnesses, eye protection, hearing protection and drinking water.

- A. Competent persons
- B. Contractors
- C. Employees
- D. None of the above

### Scope of Work

471. 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

472. 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

473. \_\_\_\_\_ 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

474. 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

475. 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

476. 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

477. 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

478. 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

479. 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

480. 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

481. 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

482. 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

483. 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

484. 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

485. 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

486. 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

487. 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

488. 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

489. 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

490. 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

491. 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

492. Another option for sloping is to utilize \_\_\_\_\_ prepared by a registered professional engineer.

- A. Instructions
- B. Tabulated data
- C. Standards
- D. None of the above

493. According to the text, a registered professional engineer can design a \_\_\_\_\_ for a specific job.

- A. Table
- B. Sloping plan
- C. Protective system
- D. None of the above

494. \_\_\_\_\_ for excavations five (5) to twenty (20) feet in depth must be constructed in accordance with the instructions of a designated competent person.

- A. Sloping and benching systems
- B. Tabulated data
- C. Trench excavation limits
- D. None of the above

495. A registered professional engineer must design and stamp the sloping and benching systems for excavations \_\_\_\_\_.

- A. Greater than twenty (20) feet deep
- B. In traffic areas
- C. To be made by contractors
- D. None of the above

### Shoring Systems

496. \_\_\_\_\_ 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)

497. 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

498. Shields are designed to \_\_\_\_\_, thereby protecting the employees working inside the structure.

- A. Withstand the soil forces caused by a cave-in
- B. Keep water out of the excavation
- C. Bend but not break
- D. None of the above

499. Design and construction of \_\_\_\_\_ is not covered in the OSHA Standards.
- A. Sloping and benching systems
  - B. Shielding
  - C. Protective systems
  - D. None of the above

**Personal Protective Equipment**

500. \_\_\_\_\_ 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