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

Collection ___ Wastewater Treatment ___ Other _____

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COLLECTION CONSTRUCTION Answer Key

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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 be compliance and do not follow this course for proper compliance.

**Please fax the answer key to TLC
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Collection Construction CEU Training Course Assignment

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You will have 90 days from the start of this course to complete in order to receive your Professional Development Hours (**PDHs**) or Continuing Education Unit (**CEU**). A score of 70 % is necessary to pass this course. We prefer if this exam is proctored. No intentional trick questions. If you should need any assistance, please email all concerns and the completed manual to info@tlch2o.com.

We would prefer that you utilize the enclosed answer sheet in the front, but if you are unable to do so, type out your own answer key. Please include your name and address on your answer key and make copy for yourself. You can e-mail or fax your Answer Key along with the Registration Form to TLC. **(S) Means answer may be plural or singular. Multiple Choice Section, One answer per question and please use the answer key.**

Wastewater Collection Chapter 1 Understanding Gravity Sanitary Sewers

- Sanitary sewers are designed to transport the wastewater by utilizing which missing term provided by the natural elevation of the earth resulting in a downstream flow?
 - Potential energy
 - Peak flow of population
 - Wastewater
 - Flow velocities and design depths of flow
 - SSO
 - None of the Above
- Sanitary sewers should be designed for?
 - I/I
 - Peak flow of population
 - Wastewater
 - Flow velocities and design depths of flow
 - SSOs, surcharged lines, basement backups
 - None of the Above
- Which of the following terms is highly discouraged and should be designed separate from the sanitary system?
 - Design flow(s)
 - Stormwater inflow
 - I/I
 - Both wet and dry weather flows
 - Low pressure in the sewer system
 - None of the Above
- Sewer systems are designed to maintain proper flow velocities with?
 - Design flow(s)
 - Stormwater inflow
 - I/I
 - Both wet and dry weather flows
 - Minimum head loss
 - None of the Above
- Which of the following terms may find it necessary to dissipate excess potential energy?
 - I/I
 - Peak flow of population
 - Wastewater
 - Flow velocities and design depths of flow
 - Higher elevations in the system
 - None of the Above
- Which of the following terms is determined largely by population served, density of population, and water consumption?
 - Design flow(s)
 - Stormwater inflow
 - Flow
 - In flow
 - I and I
 - None of the Above

7. Most of the time the flow surface is exposed to the atmosphere within the sewer and it functions as?

- A. I/I
- B. Peak flow of population
- C. An open channel
- D. Flow velocities and design depths of flow
- E. SSOs, surcharged lines, basement backups
- F. None of the Above

Sewer System Capacity Evaluation - Testing and Inspection

8. The collection system owner or operator should have a program in place to periodically evaluate _____ in both wet and dry weather flows and ensure the capacity is maintained as it was designed.

- A. Design flow(s)
- B. Stormwater inflow
- C. I/I
- D. Capacity of the sewer system
- E. Low pressure in the sewer system
- F. None of the Above

9. The capacity evaluation program evaluation begins with an inventory and characterization of the?

- A. I/I
- B. System components
- C. Wastewater
- D. Flow velocities and design depths of flow
- E. SSOs, surcharged lines, basement backups
- F. None of the Above

10. The system then undergoes general inspection which serves to continuously update and add to the?

- A. Design flow(s)
- B. Stormwater inflow
- C. I/I
- D. Inventory information
- E. Low pressure in the sewer system
- F. None of the Above

Capacity Limitations

11. The next step 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. I/I
- B. Peak flow of population
- C. Wastewater
- D. Flow velocities and design depths of flow
- E. SSOs
- F. None of the Above

12. An estimate of the capacity of _____, and identifies the major sources of I/I that contribute to hydraulic overloading events.

- A. Design flow(s)
- B. Stormwater inflow
- C. I/I
- D. Both wet and dry weather flows
- E. Key system components
- F. None of the Above

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

- A. I/I
- B. Peak flow of population
- C. Capacity limitations
- D. Flow velocities and design depths of flow
- E. SSOs, surcharged lines, basement backups
- F. None of the Above

14. A sewer inspection is an important part of a sewer system capacity evaluation and determining your?

- A. Design flow(s)
- B. Stormwater inflow
- C. I/I
- D. Both wet and dry weather flows
- E. Low pressure in the sewer system
- F. None of the Above

Flow Monitoring

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

- A. I/I
- B. Peak flow of population
- C. Wastewater
- D. Flow velocities and design depths of flow
- E. SSOs, surcharged lines, basement backups
- F. None of the Above

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

- A. Design flow(s)
- B. Stormwater inflow
- C. I/I
- D. Both wet and dry weather flows
- E. Flow measurement
- F. None of the Above

Flow Capacity

17. Most sewers are designed with the capacity to flow quarter full for less than 15 inches in diameter; larger sewers are designed to flow at half flow.

- A. True
- B. False

18. A velocity in excess of 10 fps can be tolerated with proper consideration of pipe material, abrasive characteristics of the wastewater, _____, and thrust at changes of direction.

- A. Velocity
- B. Infiltration
- C. RII
- D. Blockage(s)
- E. Sewer cleaning
- F. None of the Above

19. The minimum velocity is necessary to prevent the?

- A. Stoppages
- B. Deposition of solids
- C. Infiltration
- D. Inflow
- E. Any I/I component
- F. None of the Above

Sewer Cleaning

20. The purpose of sewer cleaning is to remove accumulated material from the sewer. Cleaning helps to prevent?

- A. Velocity
- B. Infiltration
- C. RII
- D. Blockage(s)
- E. Sewer cleaning
- F. None of the Above

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

- A. Stoppages
- B. Deposition of solids
- C. Infiltration
- D. Inflow
- E. Any I/I component
- F. None of the Above

22. Protruding taps may catch debris, which then causes a further buildup of?

- A. Velocity
- B. Infiltration
- C. RII
- D. Blockage(s)
- E. Solids
- F. None of the Above

Sewer Cleaning Methods

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

- A. Velocity
- B. Infiltration
- C. Material from the sewer
- D. Blockage(s)
- E. Sewer cleaning
- F. None of the Above

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

- A. Stoppages
- B. Deposition of solids
- C. Infiltration
- D. Inflow
- E. Rodent infestation
- F. None of the Above

Parts and Equipment Inventory

25. 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. Inflow
- C. Potential problem areas
- D. Maintenance and equipment problems
- E. Equipment problems
- F. None of the Above

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

- A. Grease producing activities
- B. Problem collection system areas
- C. Infiltration
- D. Maximum flow capacity of wastewater
- E. Breakdown or malfunction
- F. None of the Above

Infiltration and Inflow - What is Infiltration/Inflow (I/I)?

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

- A. Grease producing activities
- B. Problem collection system areas
- C. Infiltration
- D. Maximum flow capacity of wastewater
- E. Breakdown or malfunction
- F. None of the Above

28. Which of the following terms 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. Both infiltration and inflow or I/I
- B. Inflow
- C. Potential problem areas
- D. General I/I source areas
- E. Equipment problems
- F. None of the Above

29. The sanitary sewer collection system and treatment plants have this missing term that can be handled.

- A. Grease producing activities
- B. Problem collection system areas
- C. Infiltration
- D. Maximum flow capacity of wastewater
- E. Breakdown or malfunction
- F. None of the Above

Determining I/I

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

- A. Both infiltration and inflow or I/I
- B. I/I
- C. Potential problem areas
- D. General I/I source areas
- E. Equipment problems
- F. None of the Above

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

- A. Grease producing activities
- B. Problem collection system areas
- C. Infiltration
- D. Maximum flow capacity of wastewater
- E. I/I
- F. None of the Above

32. Infiltration increases when groundwater rises from precipitation, and inflow is mainly stormwater and rainwater. Rainfall monitoring is performed to correlate this data.

- A. True
- B. False

Identifying sources of I/I

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

- A. Smoke
- B. Excessive I/I
- C. Sources of I/I
- D. Sewer system testing techniques
- E. Faults
- F. None of the Above

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

- A. I/I
- B. High wet weather flows
- C. Stormwater and rainwater
- D. Smoke testing and dyed water testing
- E. Illegal plumbing, drains, and roof downspouts
- F. None of the Above

35. TV inspection – camera equipment is used to do?

- A. Smoke
- B. Excessive I/I
- C. Sources of I/I
- D. Sewer system testing techniques
- E. Faults
- F. None of the Above

36. Dye testing – Dye is used at suspected _____ sources.

- A. I/I
- B. High wet weather flows
- C. Stormwater and rainwater
- D. Smoke testing and dyed water testing
- E. Illegal plumbing, drains, and roof downspouts
- F. None of the Above

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

- A. Smoke
- B. Excessive I/I
- C. Sources of I/I
- D. Sewer system testing techniques
- E. Faults
- F. None of the Above

Repairing I/I Sources

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

- A. I/I
- B. High wet weather flows
- C. Stormwater and rainwater
- D. Smoke testing and dyed water testing
- E. Illegal plumbing, drains, and roof downspouts
- F. None of the Above

Efficient Identification of Excessive I/I

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

- A. Smoke
- B. Excessive I/I
- C. Sources of I/I
- D. Sewer system testing techniques
- E. Faults
- F. None of the Above

40. Areas with high wet weather flows should then be subject to?
- A. I/I
 - B. High wet weather flows
 - C. Stormwater and rainwater
 - D. Smoke testing and dyed water testing
 - E. Inspection and rehabilitation activities
 - F. None of the Above

Sewer System Testing

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

- A. Exfiltration
- B. Excessive I/I
- C. Sources of I/I
- D. Unwanted infiltration
- E. Flow
- F. None of the Above

42. Two commonly implemented techniques include?

- A. I/I
- B. High wet weather flows
- C. Stormwater and rainwater
- D. Smoke testing and dyed water testing
- E. Illegal plumbing, drains, and roof downspouts
- F. None of the Above

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

- A. Smoke
- B. Excessive I/I
- C. Sources of I/I
- D. Sewer system testing techniques
- E. Smoke testing
- F. None of the Above

44. Which of the following terms can be identified when smoke escapes through them.

- A. I/I
- B. High wet weather flows
- C. Stormwater and rainwater
- D. Smoke testing and dyed water testing
- E. Sources of inflow
- F. None of the Above

45. The weather conditions in which this term is conducted?

- A. Smoke
- B. Excessive I/I
- C. Sources of I/I
- D. Sewer system testing techniques
- E. Smoke testing
- F. None of the Above

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

- A. I/I
- B. High wet weather flows
- C. Stormwater and rainwater
- D. Smoke testing and dyed water testing
- E. Illegal connections
- F. None of the Above

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

- A. Smoke
- B. Excessive I/I
- C. Sources of I/I
- D. Gases from the sewer system
- E. Faults
- F. None of the Above

Sewer System Inspection

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

- A. Smoke testing
- B. Potential problem areas
- C. Visual inspection of manholes
- D. The presence of roots
- E. Dyed water testing
- F. None of the Above

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

- A. Smoke testing
- B. Potential problem areas
- C. I/I problems
- D. The presence of roots
- E. Degree of I/I problems
- F. None of the Above

50. By observing the manhole directly and the incoming and outgoing lines with this term, and it is possible to determine structural condition, the presence of roots, condition of joints, depth of debris in the line, and depth of flow.

- A. Smoke testing
- B. Potential problem areas
- C. I/I problems
- D. The presence of roots
- E. Dyed water testing
- F. None of the Above

Sewer System Inspection Techniques

51. 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

52. Sewer system cleaning should always be considered before which term is performed in order to provide adequate clearance and inspection results?

- A. Sewer system cleaning
- B. Capacity evaluation
- C. Inspection
- D. Closed Circuit Television (CCTV) inspections
- E. Confined space entry
- F. None of the Above

Camera Inspection

53. Which of the following terms involves lowering a still camera into a manhole. The camera is lined up with the centerline of the junction of the manhole frame and sewer.

- A. Lamping
- B. Camera inspection
- C. Sonar
- D. Procedures to record the results
- E. Sewer scanner and evaluation
- F. None of the Above

54. 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. Camera inspection
- C. Sonar
- D. CCTV
- E. Sewer scanner and evaluation
- F. None of the Above

Closed Circuit Television (CCTV) Inspections

55. Which of the following terms are a helpful tool for early detection of potential problems?

- A. Sewer system cleaning
- B. Capacity evaluation
- C. Odor
- D. Closed Circuit Television (CCTV) inspections
- E. Grade 1 Operator
- F. None of the Above

56. Which of the following terms 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. Camera inspection
- C. Sonar
- D. CCTV inspections
- E. Sewer scanner and evaluation
- F. None of the Above

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

- A. Sewer system cleaning
- B. Capacity evaluation
- C. Trenchless technologies
- D. CCTV inspection
- E. Confined space entry
- F. None of the Above

Sewer System Rehabilitation

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

- A. Sewer system program
- B. Capacity evaluation program
- C. Problem solving program
- D. Sewer rehabilitation program
- E. Lamping training program
- F. None of the Above

59. The rehabilitation program should build on information obtained as a result of all forms of maintenance and observations made as part of the sewer system cleaning to assure the continued ability of the system to provide sales and service at the greatest cost.

- A. True
- B. False

60. 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 significant source of infiltration
- B. A serious source of I/I
- C. Non-structural repairs
- D. Warm, moist, nutrient rich atmosphere
- E. Severity of I/I
- F. None of the Above

61. Which of the following terms 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. Debris discharged
- C. Rehabilitation program
- D. Structural repairs
- E. Cracks or loose joints in the sewer pipe
- F. None of the Above

62. The rehabilitation program should identify the methods that have been used in the past, their success rating, and methods to be used in the future.

- A. True
- B. False

63. Manholes should not be neglected in this program.

- A. Sanitary sewer service line
- B. Debris discharged
- C. Rehabilitation
- D. Exert considerable pressure
- E. Cracks or loose joints in the sewer pipe
- F. None of the Above

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

- A. Sanitary sewer service line
- B. Debris discharged
- C. Rehabilitation program
- D. Path of surface runoff
- E. Cracks or loose joints in the sewer pipe
- F. None of the Above

65. Manholes themselves can also be this term from cracks in the barrel of the manhole.
- A. A significant source of infiltration
 - B. A serious source of I/I
 - C. Non-structural repairs
 - D. Warm, moist, nutrient rich atmosphere
 - E. Severity of I/I
 - F. None of the Above

Tree Roots vs. Sanitary Sewer Lines

Root Growth in Pipes

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

- A. Sanitary sewer service line
- B. Debris discharged
- C. Pipes that are full of water
- D. Exert considerable pressure
- E. Cracks or loose joints in the sewer pipe
- F. None of the Above

67. The flow of warm water inside the sanitary sewer service pipe causes water with which missing term surrounding the pipe?

- A. A significant source of infiltration
- B. A serious source of I/I
- C. Non-structural repairs
- D. Vapor to escape to the cold soil
- E. Severity of I/I
- F. None of the Above

68. 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. Debris discharged
- C. Rehabilitation program
- D. Exert considerable pressure
- E. Cracks or loose joints
- F. None of the Above

69. Upon reaching the crack or pipe joint, which term will penetrate the opening to reach the nutrients and moisture inside the pipe?

- A. A significant source of infiltration
- B. A serious source of I/I
- C. Non-structural repairs
- D. Tree roots
- E. Severity of I/I
- F. None of the Above

Problems Caused by Roots Inside Sewers

70. Once inside the pipe, roots will continue to grow, and if not disturbed, they will completely fill the pipe with multiple hair-like root masses at each point of entry.

- A. True
- B. False

71. 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. A serious source of I/I
- C. Non-structural repairs
- D. Slow flowing drainage system
- E. Severity of I/I
- F. None of the Above

72. As roots continue to grow, they expand and exert considerable pressure this term where they entered the pipe.

- A. Sanitary sewer service line
- B. Debris discharged
- C. Rehabilitation program
- D. At the crack or joint
- E. Cracks or loose joints in the sewer pipe
- F. None of the Above

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

- A. A significant source of infiltration
- B. A serious source of I/I
- C. Non-structural repairs
- D. Severe root intrusion
- E. Severity of I/I
- F. None of the Above

Tree Roots in Sewer

74. 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. Root intrusion
- B. Drought conditions
- C. Inflow and infiltration (I&I)
- D. Sanitary sewer service backup(s)
- E. Damaged sewer pipes
- F. None of the Above

75. The replacement cost of a sanitary sewer service line as a result of which term may be very expensive?

- A. Root intrusion
- B. Damage from tree roots
- C. Tree roots
- D. Copper sulfate and sodium hydroxide
- E. The common method of removing roots
- F. None of the Above

Pipes Susceptible to Root Damage

76. 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. Drought conditions
- C. Inflow and infiltration (I&I)
- D. Sanitary sewer service backup(s)
- E. Damaged by tree roots
- F. None of the Above

77. The tightly fitting PVC joints are less likely to do which term as a result of settlement of backfill around the pipe?

- A. Root intrusion
- B. Sewer service
- C. Tree roots
- D. Leak
- E. The common method of removing roots
- F. None of the Above

Root Growth Control

78. To augment the cutting and auguring methods, there are products available commercially that will kill the roots inside the pipe without?

- A. Root intrusion
- B. Drought conditions
- C. Inflow and infiltration (I&I)
- D. Sanitary sewer service backup(s)
- E. Roots removed by auguring
- F. None of the Above

79. 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. Tree roots
- D. Downstream receiving water
- E. Method of removing roots
- F. None of the Above

Smoking out Sewer Leaks

80. Used extensively for over 40 years, smoke testing has proven to be a vital ingredient of successful inflow and infiltration (I&I) studies. It is as important now as it has ever been, as growing municipalities increase demands on aging, often deteriorating collection systems.

- A. True
- B. False

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

- A. Taste testing
- B. Smoke testing
- C. CFM
- D. Video techniques
- E. Sources of flow
- F. None of the Above

82. Which of the following terms 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. Sound
- B. Smoke testing
- C. Dye
- D. Video inspection
- E. Inflow
- F. None of the Above

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

- A. Smoke
- B. Surface water inflow
- C. CFM
- D. Video techniques
- E. Sources of exfiltration
- F. None of the Above

84. Which of the following terms 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. Smoke testing
- C. Dye
- D. Video inspection
- E. Inflow
- F. None of the Above

85. Although video inspection and other techniques are certainly important components of this term, 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. CFM
- D. Video inspection and other techniques
- E. Sources of inflow
- F. None of the Above

86. Smoke travels throughout the system, identifying problems in all connected lines, even sections of line that were not known to exist, or thought to be independent or unconnected. Best results are obtained during dry weather, which allows smoke better opportunity to travel to the surface.

- A. True
- B. False

Necessary Equipment

87. Moving the water very quickly is useless if the blower does not have the static pressure to push that water through the lines.

- A. True
- B. False

88. 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. Dye
- D. Video inspection
- E. Inflow
- F. None of the Above

Blowers

89. In general, squirrel cage blowers are usually larger in size, but can provide more static pressure in relation to?
- A. Smoke
 - B. Smoke testing
 - C. CFM
 - D. Video inspection and other techniques
 - E. Sources of inflow
 - F. None of the Above

More on Manholes

90. When designing a wastewater system, the design engineer begins by first determining the amount of money that is available.
- A. True
 - B. False
91. 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
92. The average daily flow (based on the average utilization) is multiplied by a peak flow factor to obtain the?
- A. Design flow
 - B. Peak flow factor
 - C. A typical value
 - D. Water per person in the area to be served
 - E. A typical infiltration allowance
 - F. None of the Above
93. 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
94. Which of the following terms is 500 gallons per inch of pipe diameter per mile of sewer per day?
- A. Design flow
 - B. Peak flow factor
 - C. A typical value
 - D. Water per person in the area to be served
 - E. Infiltration allowance
 - F. None of the Above

Low Pressure System Description and Operation

Vacuum Sewers

95. When the wastewater level reaches a certain level, sensors within the holding tank opens _____ that allows the contents of the tank to be sucked into the network of collection piping.
- A. Vacuum sewer system(s)
 - B. Vacuum main(s)
 - C. Interface valve
 - D. Vacuum collection and transportation systems
 - E. Vacuum valve
 - F. None of the Above
96. Which of the following terms are small buildings that house a large storage tank and a system of vacuum pumps?
- A. Conventional gravity sewers
 - B. Interface valve
 - C. Vacuum stations
 - D. Vacuum system
 - E. Vacuum within the vacuum mains
 - F. None of the Above
97. Which of the following terms are limited to an extent by elevation changes of the land?
- A. Vacuum sewer system(s)
 - B. Vacuum main(s)
 - C. Interface valve
 - D. Vacuum collection and transportation systems
 - E. Network of collection piping
 - F. None of the Above

98. This minimum property requirement tends to make vacuum sewers most conducive for small communities with a relatively high density of properties per acre.
A. True B. False

Applications

99. 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) D. Conventional gravity systems
B. Vacuum main(s) E. Network of collection piping
C. Interface valve F. None of the Above

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

- A. Vacuum sewer system(s) D. Vacuum collection and transportation systems
B. Vacuum main(s) E. Network of collection piping
C. Interface valve F. None of the Above

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

- A. Conventional gravity sewers D. Vacuum system
B. Interface valve E. Vacuum mains
C. Manholes F. None of the Above

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

- A. Vacuum sewer system(s) D. Vacuum collection and transportation systems
B. Vacuum main(s) E. Network of collection piping
C. Interface valve F. None of the Above

103. No electricity is required at this missing term, enabling the system to be installed in virtually any location.

- A. Conventional gravity sewers D. Vacuum system
B. Interface valve E. Vacuum within the vacuum mains
C. Manholes F. None of the Above

104. A leak in a vacuum main will raise an alarm within minutes of the break. The mains have to be repaired for sewage transport to continue, ensuring up to date maintenance and eliminating deterioration and infiltration.

- A. True B. False

105. Due to the shallow depth of the installation, additional connections can be quickly and simply made by a small construction crew, thus reducing the disruption and restoration work normally required for?

- A. Conventional gravity sewers D. Vacuum system
B. Interface valve E. Vacuum within the vacuum mains
C. Manholes F. None of the Above

106. Which of the following terms _____ and transport systems have many applications in industry for collecting all forms of liquid waste?
- A. Vacuum sewer system(s)
 - B. Vacuum main(s)
 - C. Interface valve
 - D. Vacuum collection
 - E. Network of collection piping
 - F. None of the Above

Vacuum Interface Valves

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

- A. Conventional gravity sewers
- B. Interface valve
- C. Vacuum interface chamber
- D. Vacuum system
- E. Vacuum within the vacuum mains
- F. None of the Above

108. This 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 tank
- B. Collection sump
- C. Vacuum in the sewer
- D. Controller/sensor unit
- E. Vacuum main
- F. None of the Above

109. As the valve opens, a pneumatic timer in this term starts a pre-set time cycle.

- A. Collection tank
- B. Collection sump
- C. Vortex
- D. Controller/sensor unit
- E. Vacuum interface valve
- F. None of the Above

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

- A. Collection tank
- B. Collection sump
- C. Vacuum in the sewer
- D. Controller/sensor unit
- E. Interface valve
- F. None of the Above

111. No electricity is required at the?

- A. Collection tank
- B. Collection sump
- C. Valve chamber
- D. Controller/sensor unit
- E. Vacuum interface valve
- F. None of the Above

112. The vacuum sewer lines are under a vacuum of 16"-20" Hg created by which missing term located at the vacuum station.

- A. Collection tank
- B. Collection sump
- C. Vacuum in the sewer
- D. Controller/sensor unit
- E. Vacuum pumps
- F. None of the Above

113. Sewage flows by gravity from homes into a?

- A. Collection tank
- B. Collection sump
- C. Vacuum in the sewer
- D. Controller/sensor unit
- E. Interface valve
- F. None of the Above

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

- A. Collection tank
- B. Collection sump
- C. Vacuum main
- D. Controller/sensor unit
- E. Vacuum interface valve
- F. None of the Above

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

- A. Collection tank
- B. Collection sump
- C. Vacuum in the sewer
- D. Controller/sensor unit
- E. Interface valve
- F. None of the Above

Valve Pit Package

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

- A. Raw sewage
- B. Solids
- C. High scouring velocity
- D. Potential vacuum loss
- E. Vacuum pump(s)
- F. None of the Above

117. Vacuum from which term opens the valve and outside air from a breather pipe closes it?

- A. Vacuum sewer system(s)
- B. Lift station
- C. Sewer line
- D. Vacuum pump(s)
- E. Vacuum service line
- F. None of the Above

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

- A. Raw sewage
- B. Differential air pressure
- C. High scouring velocity
- D. Potential vacuum loss
- E. Vacuum pump(s)
- F. None of the Above

Vacuum Lines

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

- A. Vacuum sewer system(s)
- B. Lift station
- C. Downhill transport
- D. Vacuum pump(s)
- E. Vacuum service lines
- F. None of the Above

120. 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. Raw sewage
- B. Vacuum sewage
- C. High scouring velocity
- D. Potential vacuum loss
- E. Vacuum pump(s)
- F. None of the Above

Line Sizes

121. The vacuum service line from this term to the main in the street is 3".

- A. Vacuum sewer system(s)
- B. Lift station
- C. Valve
- D. Vacuum pump(s)
- E. Vacuum service line
- F. None of the Above

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

- A. Raw sewage
- B. Elevation changes
- C. High scouring velocity
- D. Potential vacuum loss
- E. Vacuum pump(s)
- F. None of the Above

Vacuum Station

123. The vacuum station is similar in function to a lift station in a gravity sewer system. Sewage pumps transfer the sewage from the?

- A. Vacuum sewer system(s)
- B. Lift station
- C. Collection tank
- D. Vacuum pump(s)
- E. Vacuum service line
- F. None of the Above

Vacuum Pumps

124. Which of the following terms 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. Raw sewage
- B. Solids
- C. High scouring velocity
- D. Potential vacuum loss
- E. Vacuum pump(s)
- F. None of the Above

125. Which of the following terms are sized to increase the system vacuum from 16" to 20" Hg in three minutes or less?

- A. Vacuum sewer system(s)
- B. Lift station
- C. Downhill transport
- D. Vacuum pump(s)
- E. Vacuum service line
- F. None of the Above

126. According the text, Busch rotary vane vacuum pumps are standard. The two non-clog sewage pumps are each sized for peak flow.

- A. True
- B. False

127. Which of the following terms connect individually to the collection tank, effectively dividing the system into zones?

- A. Vacuum sewer system(s)
- B. Lift station
- C. The incoming vacuum lines
- D. Vacuum pump(s)
- E. Vacuum service line
- F. None of the Above

Review

Pressure Sewers

128. Which of the following terms 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. Gravity system
- B. Grinder pump(s)
- C. Pressure sewers
- D. Two kinds of pressure sewer systems
- E. Both the STEP and grinder systems
- F. None of the Above

129. There are two kinds of _____, based upon the type of pump used to provide the pressure.

- A. Gravity system
- B. Grinder pump(s)
- C. Pressure sewers
- D. STEP and grinder systems
- E. Pressure sewer systems
- F. None of the Above

130. Systems that use _____ are a combination are referred to as STEP pressure sewers.

- A. Gravity system
- B. Grinder pump(s)
- C. Pressure sewers
- D. Two kinds of pressure sewer systems
- E. Septic tank/effluent pump
- F. None of the Above

131. The effluent pump delivers the wastewater to the sewer pipes and provides the necessary pressure to move it through the system. The other type of pressure sewer uses a grinder pump.
A. True B. False

132. Which of the following terms eliminate the need to periodically pump the septic tanks for all the properties connected to the system?

- A. Gravity system
- B. Grinder pump(s)
- C. Pressure sewers
- D. Two kinds of pressure sewer systems
- E. Both the STEP and grinder systems
- F. None of the Above

133. Which of the following terms along with the STEP are installed with high water alarms?

- A. Gravity system
- B. Grinder pump(s)
- C. Pressure sewers
- D. Grinder systems
- E. Two kinds of pressure sewer systems
- F. None of the Above

134. Operators will need training on both the plumbing and?

- A. Gravity system
- B. Grinder pump(s)
- C. Pressure sewers
- D. Two kinds of pressure sewer systems
- E. Electrical aspects of the system
- F. None of the Above

Sewer Line Mapping

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

- A. Overflow points
- B. Introduction of flows
- C. Inspection
- D. Owner or operator's management program
- E. Efficient collection system maintenance
- F. None of the Above

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

- A. Engineering endeavors
- B. Sewer line maps
- C. Sewer cleanouts
- D. Quality sanitary sewer designs
- E. Numbering system
- F. None of the Above

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

- A. Overflow points
- B. Introduction of flows
- C. Inspection
- D. Owner or operator's management program
- E. Manholes and sewer cleanouts
- F. None of the Above

138. Which of the following terms 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. Sewer cleanouts
- D. Quality sanitary sewer designs
- E. Numbering system
- F. None of the Above

New Sewer Construction

139. The owner or operator should release strict control over the introduction of flows into the system from new construction.

- A. True
- B. False

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

- A. Engineering endeavors
- B. Sewer line maps
- C. Sewer cleanouts
- D. Sanitary sewer designs
- E. Numbering system
- F. None of the Above

141. 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

Sewer Cleaning and Inspection

142. 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. Check with the local authorities
- E. Education and pollution prevention
- F. None of the Above

143. Which of the following terms are essential to maintaining a properly functioning system; these activities further a community's reinvestment into its wastewater infrastructure?

- A. Inspection technique(s)
- B. CCTV inspection(s)
- C. Inspection program(s)
- D. Visibility of manholes and other structures
- E. Cleaning and inspecting sewer lines
- F. None of the Above

Inspection Techniques

144. Which of the following terms are required to determine current sewer conditions and to aid in planning a maintenance strategy?

- A. Documentation of inspections
- B. CCTV inspection(s)
- C. Visual inspection(s)
- D. Cleaning and inspecting sewer lines
- E. Inspection programs
- F. None of the Above

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

145. Which of the following terms 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. Grade 1 operator
- B. Lamping
- C. Inspection program(s)
- D. Television (TV) inspections
- E. Polaroid still photographs
- F. None of the Above

146. Which of the following terms are recommended for sewer lines with diameters of 4 - 48 inches?

- A. Lining
- B. Rehabilitation
- C. CCTV inspection(s)
- D. Eyeballing
- E. Rodding
- F. None of the Above

147. To see details of the sewer walls, the camera and lights should swivel both vertically and horizontally.

- A. True
- B. False

148. Which of the following terms 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. Cable box
- B. Slick
- C. Kite
- D. Sewer boat
- E. The cable and camera
- F. None of the Above

149. Which of the following terms produce a video record of the inspection that can be used for future reference?

- A. Inspection technique(s)
- B. CCTV inspection(s)
- C. Inspection program(s)
- D. Visibility of manholes and other structures
- E. Polaroid still photographs
- F. None of the Above

150. Inspections of manholes and pipelines are comprised of surface and internal inspections and operators should pay specific attention to sunken areas in the groundcover above a sewer line and areas with ponding water.

- A. True
- B. False

Cleaning Techniques

151. A sewer system needs a cleaning schedule, there are several traditional cleaning techniques used to clear blockages and to act as?

- A. Sanitary sewer overflow(s)
- B. Rehabilitation
- C. CCTV inspection(s)
- D. Preventative maintenance tools
- E. Education and pollution prevention
- F. None of the Above

152. When you are cleaning sewer lines, your local community need to be aware of EPA regulations on solid and hazardous waste as defined in 40 CFR 261.

- A. True
- B. False

153. The ideal method of reducing and controlling the materials found in sewer lines is education and?

- A. Sanitary sewer overflow(s)
- B. Rehabilitation
- C. CCTV inspection(s)
- D. Pollution prevention
- E. Maintaining sewer systems
- F. None of the Above

154. The public needs to be informed that common household substances such as grease and oil do not need to be poured into the sewer lines.

- A. True
- B. False

Advantages and Disadvantages

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

- A. SSOs
- B. Visual inspection(s)
- C. Rehabilitation
- D. Sewer lamping
- E. Fire hazard
- F. None of the Above

Visual Inspection

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

- A. SSOs
- B. Visual inspection(s)
- C. Rehabilitation
- D. Sewer line cleaning
- E. Fire hazard
- F. None of the Above

Camera Inspection

157. Which of the following terms in a large diameter sewer, the inspection crew is essentially taking photographs?

- A. Rodding
- B. Visual inspection(s)
- C. Lamping
- D. Sewer examination
- E. Camera inspection
- F. None of the Above

Closed Circuit Television (CCTV)

158. Which of the following terms requires late night inspection and as a result, the TV operators are vulnerable to lapses in concentration.

- A. Sanitary sewer overflow(s)
- B. Rehabilitation
- C. CCTV inspection(s)
- D. Check with the local authorities
- E. Sewer examination
- F. None of the Above

Lamping Inspection

159. Which of the following terms is only able to inspect the first 10 feet of the pipe?

- A. Bucketing
- B. Rodding
- C. Rehabilitation
- D. Sewer line cleaning
- E. Lamping
- F. None of the Above

160. According to the text, older areas of the sewer system are inspected every four years; whereas, the inspection of relatively new areas may be completed in 1 to 2 years.

- A. True
- B. False

161. 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. SSOs
- B. Visual inspection(s)
- C. Rehabilitation
- D. Kiting
- E. Pressurized cleaning methods to maintain the pipes
- F. None of the Above

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

- A. Bucket machine(s)
- B. Jetting
- C. Chemicals' effectiveness
- D. Scooter
- E. Kite or Bag
- F. None of the Above

163. 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. Bucket machine(s)
- B. Jetting
- C. Chemicals' effectiveness
- D. Results
- E. Cost
- F. None of the Above

Cleaning Method Limitation

164. Balling, Jetting, Scooter: In general, these methods are only successful when necessary water pressure or Head is maintained without flooding basements or houses at high elevations.

- A. True
- B. False

165. Which of the following terms 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. Bucket machine(s) D. Scooter
- B. Jetting E. Kite or Bag
- C. Chemicals' effectiveness F. None of the Above

166. Balling cannot be used effectively in pipes with _____ or protruding service connections because the ball can become distorted.

- A. Steep-grade hill areas D. Completely plugged
- B. Backups into residences E. Bad offset joints
- C. Variety of cleaning methods F. None of the Above

167. Which of the following terms cleaning larger lines, the manholes need to be designed to a larger size in order to receive and retrieve the equipment?

- A. Bucket machine(s) D. Scooter
- B. Jetting E. Kite or Bag
- C. Chemicals' effectiveness F. None of the Above

168. Bucket Machine- This device has been known to damage sewers and the set-up of this equipment is?

- A. Good for steep-grade hill areas D. Time-consuming
- B. Able to backups into residences E. Not effectively remove sand or grit
- C. Able for a variety of cleaning methods F. None of the Above

169. Which of the following terms is not very effective in removing heavy solids?

- A. Bucket machine(s) D. Scooter
- B. Jetting E. Kite or Bag
- C. Flushing F. None of the Above

170. Which of the following terms causes backups into residences have been known to occur when this method has been used by inexperienced operators?

- A. Bucket machine(s) D. Scooter
- B. Jetting E. High Velocity Cleaner
- C. Chemicals' effectiveness F. None of the Above

171. Which of the following terms when using this method, use caution in locations with basement fixtures and steep-grade hill areas?

- A. Bucket machine(s) D. Scooter
- B. Jetting E. Kite or Bag
- C. Chemicals' effectiveness F. None of the Above

172. Rodding does _____, but may only loosen the material to be flushed out at a later time.

- A. Steep-grade hill areas D. Completely plugged
- B. Backups into residences E. Not effectively remove sand or grit
- C. Variety of cleaning methods F. None of the Above

Limitations of Cleaning Methods

173. Most of collection inspections use?

- A. Visual inspection(s)
- B. CCTV system
- C. Chemicals' effectiveness
- D. Flush and vacuum systems
- E. The cleaning and inspection crews
- F. None of the Above

174. Which of the following terms are also used in the most recently installed lines and manholes?

- A. Visual inspection(s)
- B. CCTV system
- C. Chemicals' effectiveness
- D. Flush and vacuum systems
- E. The cleaning and inspection crews
- F. None of the Above

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

- A. Steep-grade hill areas
- B. Backups into residences
- C. Variety of cleaning methods
- D. Completely plugged
- E. The collection system
- F. None of the Above

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

- A. Completely plugged
- B. Backups into residences
- C. Chemicals' effectiveness
- D. Flush and vacuum systems
- E. The cleaning and inspection crews
- F. None of the Above

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

- A. Steep-grade hill areas
- B. Backups into residences
- C. Variety of cleaning methods
- D. A vapor rooter eradication system
- E. The cleaning and inspection crews
- F. None of the Above

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

- A. Visual inspection(s)
- B. CCTV system
- C. Chemicals' effectiveness
- D. Flush and vacuum systems
- E. Combination trucks and TV trucks
- F. None of the Above

Grease (FOG) Chapter 2

Grease Interceptors

179. Which of the following terms use grease interceptors which are larger than the traps and are installed underground, outside of a facility?

- A. Grease interceptor(s)
- B. High-volume or new establishments
- C. Notice of Violation
- D. Pass-through of contaminants
- E. An inspection and enforcement program
- F. None of the Above

180. Which of the following terms should be accessible by three manhole covers, and a sample box?

- A. Sewer
- B. Manhole
- C. Grease interceptor(s)
- D. Grease trap
- E. POTW sampling point
- F. None of the Above

Plan Checks and Inspections

181. All plans for new commercial food establishments should receive a plan review from the?

- A. Grease interceptor(s)
- B. POTW
- C. Notice of Violation
- D. Pass-through of contaminants
- E. An inspection and enforcement program
- F. None of the Above

Grease Blockages

182. A determination should be made as to which commercial facilities contributed to the blockage, and more in-depth inspections are conducted at those facilities. Where appropriate, additional requirements and/or procedures are put in place.

- A. True
- B. False

183. A Notice of Violation, with this term, is issued once a facility has passed its final due date.

- A. Grease interceptor(s)
- B. POTW
- C. An administrative fee
- D. Pass-through of contaminants
- E. An inspection and enforcement program
- F. None of the Above

Regular Grease Inspection

184. Which of the following terms should require a minimum cleaning frequency of once every six months?

- A. POTW(s)
- B. Local ordinance
- C. Grease interceptor rule
- D. International Plumbing Code
- E. POTW inspectors
- F. None of the Above

185. Equipment that is not regularly maintained puts the food service facility at risk of violating this term, and this may not be known until an overflow and violation have occurred.

- A. Grease interceptor(s)
- B. POTW
- C. Notice of Violation
- D. Pass-through of contaminants
- E. Sewer use ordinance
- F. None of the Above

186. A large measuring stick and/or a clear piece of conduit may be used to determine the depth of the grease accumulation. You should require that restaurants contract with a licensed grease hauler to remove it from your premises for appropriate disposal.

- A. True
- B. False

Other Types of Devices

187. A grease trap may be approved in lieu of this term for full service food service facilities only in very limited circumstances when space is not available.

- A. Grease interceptor(s)
- B. POTW
- C. An interceptor
- D. Pass-through of contaminants
- E. An inspection
- F. None of the Above

188. Grease traps may also be approved by this term for facilities such as delicatessens and small bakeries that produce small quantities of oil, grease, or fat.

- A. POTW(s)
- B. Local ordinance
- C. Grease interceptor(s)
- D. International Plumbing Code
- E. Industrial Pretreatment Program
- F. None of the Above

189. Flow restrictors are not required for grease traps because they decrease retention time and efficiency.

- A. True
- B. False

Pumps and Lift Stations Chapter 3

Pumps and Lift Stations

190. Lift Station: A facility in a sewer system consisting of a receiving chamber, pumping equipment, and associated drive and control devices which collect and lift wastewater to a higher elevation when the continuance of the sewer at reasonable slopes would involve excessive trench depths.

- A. True B. False

191. There should not be an odor coming from a?

- A. Lift Station D. Pumping Station
B. Gravity driven E. Submersible pump(s)
C. Wet well F. None of the Above

192. 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. Key elements of lift stations D. Backup
B. Lift Station's area E. Pumping Station
C. Dry well F. None of the Above

Lift Stations

193. Wastewater flows slowly downhill until it reaches a certain low point, at that point a pump or "lift" stations push the wastewater back uphill to a high point where gravity can once again take over the process.

- A. True B. False

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

- A. Key elements of lift stations D. Sanitary sewer system(s)
B. Lift Station E. Pumping Station
C. Dry well F. None of the Above

195. Which of the following terms identifies potential problems instantaneously and take the proper steps to rectify the situation before it becomes a public health risk?

- A. Key elements of lift stations D. Telemetry
B. Lift Station's area E. Pumping Station
C. Dry well F. None of the Above

A Lift Station contains 4 main Components:

196. A wet well - usually 15+ ft. in depth and 8ft. in diameter - that houses two submersible pumps of varying horsepower, discharging piping and floats that operate the?

- A. Lift Station D. Radio telemetry, or SCADA system(s)
B. Gravity driven E. Pumps and keep a set level in the well
C. Wet well F. None of the Above

197. Which of the following terms 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. Key elements of lift stations D. Backup electrical supply
B. Lift Station's area E. Pumping Station
C. Dry well F. None of the Above

198. An electrical panel houses control for the?
- A. Lift Station
 - B. Gravity driven
 - C. Wet well
 - D. Radio telemetry, or SCADA system(s)
 - E. Submersible pump(s)
 - F. None of the Above

199. A "Log Book" or "Station Book" which contains the records and maps of the?
- A. Key elements of lift stations
 - B. Lift Station's area
 - C. Dry well area
 - D. Quarter section
 - E. Pumping Station location
 - F. None of the Above

Collection Systems, Lift Stations

200. Which of the following terms are facilities designed to move wastewater from lower to higher elevation through pipes?

- A. Wastewater lift stations
- B. Gravity driven
- C. Wet well
- D. Sewer station
- E. Sewer well
- F. None of the Above

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

- A. Key elements of lift stations
- B. Lift Station's area
- C. Key elements of dry well
- D. Dry-pit or dry-well and submersible lift stations
- E. Lift station equipment and systems
- F. None of the Above

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

- A. Key elements of lift stations
- B. Lift Station's area
- C. Key elements of dry well
- D. Dry-pit or dry-well and submersible lift stations
- E. Lift station equipment and systems
- F. None of the Above

203. Centrifugal pumps are commonly used in?

- A. Submersible lift station(s)
- B. Wet-well
- C. Lift station(s)
- D. Operation and maintenance
- E. Pump station control
- F. None of the Above

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

- A. Lift station(s)
- B. Submersible pump(s)
- C. Submersible lift station(s)
- D. Dry-pit or dry-well and submersible lift stations
- E. Variable speed drives
- F. None of the Above

205. Which of the following terms are typically provided with equipment for easy pump removal?

- A. Submersible lift station(s)
- B. Wet-well
- C. Lift station(s)
- D. Operation and maintenance
- E. Pump station control
- F. None of the Above

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

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

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

- A. Submersible lift station(s)
- B. Wet-well
- C. Lift station(s)
- D. Operation and maintenance
- E. Pump station control
- F. None of the Above

208. Which of the following terms 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 pump(s)
- C. Submersible lift station(s)
- D. Dry-pit or dry-well and submersible lift stations
- E. Trapped air column, or bubbler system
- F. None of the Above

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

- A. Submersible lift station(s)
- B. Wet-well
- C. Lift station(s)
- D. Operation and maintenance
- E. Pump station control
- F. None of the Above

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

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

211. Which of the following terms 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. Wet-well
- C. Lift station(s)
- D. Operation and maintenance building
- E. Pump station control
- F. None of the Above

Applicability

212. According to the text, which of the following terms 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 pump(s)
- C. Submersible lift station(s)
- D. Dry-pit or dry-well and submersible lift stations
- E. Trapped air column, or bubbler system
- F. None of the Above

Current Status

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

- A. Submersible lift station(s)
- B. Wet-well
- C. Lift station(s)
- D. Operation and maintenance
- E. Pump station control
- F. None of the Above

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

- A. Variable speed pumping
- B. Submersible pump(s)
- C. Submersible lift station(s)
- D. A-C Motors
- E. D-C Motors
- F. None of the Above

215. Which of the following terms 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. Submersible lift station(s)
- B. Variable-speed pumping
- C. Lift station(s)
- D. Operation and maintenance
- E. Pump station control
- F. None of the Above

216. According to the text, which of the following terms may allow a given flow range to be achieved with fewer pumps than a constant-speed alternative?

- A. Lift station configuration
- B. Gravity wastewater conveyance
- C. Variable-speed pumping
- D. Wet-well maximum detention time
- E. Key disadvantages of lift stations
- F. None of the Above

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

- A. Variable-speed pumping
- B. Wastewater quality
- C. Variable-speed station(s)
- D. Softer starting
- E. Wet-well design
- F. None of the Above

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

- A. Lift station configuration
- B. Variable speed equipment
- C. Lift station
- D. Wet-well maximum detention time
- E. Key disadvantages of lift stations
- F. None of the Above

219. According to the text, lift stations are complex facilities with?

- A. Gravity sewer
- B. Wastewater quality
- C. Variable-speed station(s)
- D. Gravity wastewater conveyance
- E. Many auxiliary systems
- F. None of the Above

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

- A. Lift station configuration
- B. Gravity wastewater conveyance
- C. Emergency power supply systems
- D. Wet-well maximum detention time
- E. Key disadvantages of lift stations
- F. None of the Above

221. Which of the following terms 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. Wastewater quality
- C. Wastewater taste
- D. Lift station reliability
- E. The design
- F. None of the Above

Common Hydraulic Terms

222. Which of the following definitions is the engineering science pertaining to liquid pressure and flow?

- A. Pressure, Absolute
- B. Pressure
- C. Hydraulics
- D. Hydrokinetics
- E. Pascal's Law
- F. None of the Above

223. Which of the following definitions is the engineering science pertaining to the energy of liquid flow and pressure?

- A. Pressure, Absolute
- B. Pressure
- C. Hydraulics
- D. Hydrokinetics
- E. Pascal's Law
- F. None of the Above

224. Which of the following definitions is the pressure applied to a confined fluid at rest is transmitted with equal intensity throughout the fluid?

- A. Pressure, Absolute
- B. Pressure
- C. Hydraulics
- D. Hydrokinetics
- E. Pascal's Law
- F. None of the Above

225. Which of the following definitions is the application of continuous force by one body upon another that it is touching; compression?

- A. Pressure, Absolute
- B. Pressure
- C. Hydraulics
- D. Hydrokinetics
- E. Pascal's Law
- F. None of the Above

226. Which of the following definitions is the force per unit area, usually expressed in pounds per square inch?

- A. Pressure, Absolute
- B. Pressure
- C. Hydraulics
- D. Hydrokinetics
- E. Pascal's Law
- F. None of the Above

227. Which of the following definitions is the pressure differential above or below ambient atmospheric pressure?

- A. Pressure, Atmospheric
- B. Pressure, Static
- C. Hydraulics
- D. Pressure, Gauge
- E. Pascal's Law
- F. None of the Above

228. Which of the following definitions is height of a column or body of fluid above a given point expressed in linear units?

- A. Head, Friction
- B. Head, static
- C. Head
- D. Hydraulics
- E. Hydrokinetics
- F. None of the Above

Advantages

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

- A. Submersible lift station(s)
- B. Wet-well
- C. Lift station(s)
- D. Operation and maintenance
- E. Pump station control
- F. None of the Above

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

- A. Lift station configuration
- B. Gravity wastewater conveyance
- C. Lift station
- D. Wet-well maximum detention time
- E. Gravity sewer lines
- F. None of the Above

Disadvantages

231. Compared to sewer lines where gravity drives wastewater flow, lift stations require a source of electric power. If the power supply is interrupted, flow conveyance is discontinued and can result in flooding upstream of the lift station.

- A. True B. False

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

- A. Lift station configuration D. Wet-well maximum detention time
B. Gravity wastewater conveyance E. Key disadvantages of lift station(s)
C. Lift station(s) F. None of the Above

233. The high cost of gravity wastewater conveyance and the higher costs of building, operating, and maintaining lift stations means that wastewater pumping should not be avoided.

- A. True B. False

234. Which of the following terms 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 D. Gravity wastewater conveyance
B. Wastewater quality E. Wastewater pumping
C. Variable-speed station(s) F. None of the Above

Wet-well

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

- A. Lift station configuration D. Wet-well maximum detention time
B. Gravity wastewater conveyance E. Key disadvantages of lift stations
C. Wet-well design F. None of the Above

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

- A. Gravity sewer D. Gravity wastewater conveyance
B. Wastewater quality E. Drainage
C. Odor release F. None of the Above

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

- A. Lift station pump D. Wet-well
B. Gravity wastewater conveyance E. Dry well
C. Lift station F. None of the Above

238. The minimum recommended wet-well bottom slope is to 2:1 to allow?

- A. Gravity sewer D. Gravity wastewater conveyance
B. Wastewater quality E. Self-cleaning and minimum deposit of debris
C. Variable-speed station(s) F. None of the Above

239. Which of the following terms may include sewer pipelines, especially when variable speed drives are used?

- A. Bar screens
- B. Gravity wastewater conveyance
- C. Turd herder
- D. Wet-well maximum detention time
- E. Effective volume of the wet-well
- F. None of the Above

240. Which of the following terms should always hold some level of sewage to minimize odor release?

- A. Gravity sewer
- B. Wastewater quality
- C. Bar screens
- D. Gravity wastewater conveyance
- E. Wet-well
- F. None of the Above

Wastewater Pumps

241. The number of wastewater pumps and associated capacity should be selected to provide head capacity characteristics that correspond as nearly as possible to wastewater quantity fluctuations.

- A. True
- B. False

242. In small stations, with maximum inflows of less than 700 gallons per minute, two pumps are customarily installed, with each unit able to meet the?

- A. Low or moderate head(s)
- B. Flexibility
- C. Wear and tear
- D. Maximum influent rate
- E. An alternative option
- F. None of the Above

243. Large lift stations, the size and number of pumps should be selected so that the range of _____ can be met without starting and stopping pumps too frequently and without excessive wet-well storage.

- A. Head-losses
- B. Head capacity
- C. Wet-well storage
- D. Influent flow rates
- E. Low-flow/high head conditions
- F. None of the Above

244. Additional pumps may provide intermediate capacities better matched to typical daily flows, an alternative option is to provide?

- A. Low or moderate head(s)
- B. Flexibility
- C. Flow flexibility with variable speed pumps
- D. Maximum influent rate
- E. An alternative option
- F. None of the Above

245. For pump stations with this term, the single pump flow approach is usually the most suitable.

- A. Head-losses
- B. Head capacity
- C. Wet-well storage
- D. High head-losses
- E. Low-flow/high head conditions
- F. None of the Above

246. Parallel pumping is not as effective for such stations because two pumps operating together yield only?

- A. Low or moderate head(s)
- B. Slightly higher flows than one pump
- C. Wear and tear
- D. Maximum influent rate
- E. An alternative option
- F. None of the Above

247. Which of the following terms is to be achieved with multiple pumps in parallel?

- A. Head-losses
- B. Head capacity
- C. Wet-well storage
- D. Peak flow
- E. Low-flow/high head conditions
- F. None of the Above

248. Parallel peak pumping is typically used in large lift stations with relatively?

- A. Low or moderate head(s)
- B. Flexibility
- C. Wear and tear
- D. Maximum influent rate
- E. Flat system head curve(s)
- F. None of the Above

249. Several types of centrifugal pumps are used in wastewater lift stations, these pumps are well suited for?

- A. Head-losses
- B. Head capacity
- C. Wet-well storage
- D. Emergency backup
- E. Low-flow/high head conditions
- F. None of the Above

250. In angle-flow pump is appropriate for pumping against?

- A. Low or moderate head(s)
- B. Head-losses
- C. Wear and tear
- D. Maximum influent rate
- E. An alternative option
- F. None of the Above

251. Mixed flow pumps are most viable for pumping large quantities of wastewater at?

- A. Head-losses
- B. Head capacity
- C. Wet-well storage
- D. Low head
- E. Low-flow/high head conditions
- F. None of the Above

Performance

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

- A. Overall efficiency
- B. Capacity (flow rate)
- C. Efficiency
- D. Performance of the pump(s)
- E. Head
- F. None of the Above

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

- A. Overall efficiency
- B. Capacity (flow rate)
- C. Efficiency
- D. Capacity, head, power, and overall efficiency
- E. Head
- F. None of the Above

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

- A. Overall efficiency
- B. Capacity (flow rate)
- C. Efficiency
- D. Capacity, head, power, and overall efficiency
- E. Head
- F. None of the Above

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

- A. Power
- B. Capacity (flow rate)
- C. Efficiency
- D. Capacity, head, power, and overall efficiency
- E. Head
- F. None of the Above

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

- A. Overall efficiency
- B. Capacity (flow rate)
- C. Efficiency
- D. Capacity, head, power, and overall efficiency
- E. Head
- F. None of the Above

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

- A. Overall efficiency
- B. Capacity (flow rate)
- C. Efficiency
- D. Capacity, head, power, and overall efficiency
- E. Head
- F. None of the Above

Operation and Maintenance

258. Which of the following terms is usually automated and does not require continuous on-site operator presence?

- A. On-site operator presence
- B. Maintenance program
- C. Lift station operation
- D. Weekly inspections
- E. Lift station inspection
- F. None of the Above

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

- A. On-site operator presence
- B. Maintenance program
- C. Lift station operation
- D. Weekly inspections
- E. Lift station inspection
- F. None of the Above

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

- A. On-site operator presence
- B. Maintenance program
- C. Lift station
- D. Weekly inspections
- E. Operation and maintenance manuals
- F. None of the Above

261. If chemicals are added for this term, the chemical feed stations should be inspected weekly and chemicals replenished as needed.

- A. On-site operator presence
- B. Maintenance program
- C. Scrubber system
- D. Weekly inspection(s)
- E. Odor control ahead of the lift station
- F. None of the Above

262. The most labor-intensive task for lift stations is routine preventive maintenance. A well-planned maintenance program for lift station pumps prevents unnecessary equipment wear and downtime.

- A. True
- B. False

263. The operator should tabulate this term and its recommended spare parts.

- A. On-site operator presence
- B. Maintenance program
- C. Each pumping element in the system
- D. Weekly inspections
- E. Operation and maintenance manuals
- F. None of the Above

Hydraulics

264. Hydraulics is a branch of engineering concerned mainly with moving liquids.

- A. True
- B. False

265. Which of the following terms includes the manner in which liquids act in tanks and pipes, deals with their properties, and explores ways to take advantage of these properties.

- A. Pressure
- B. Hydrostatics
- C. Hydrokinetics
- D. Hydraulics
- E. Flow
- F. None of the Above

266. Which of the following terms includes the consideration of liquids at rest, involves problems of buoyancy and flotation?

- A. Pressure
- B. Hydrostatics
- C. Hydrokinetics
- D. Hydraulics
- E. Flow
- F. None of the Above

267. Hydraulics is applied commonly to the study of the _____, other liquids, and even gases when the effects of compressibility are small.

- A. Fluids
- B. Hydrostatics
- C. Hydrokinetics
- D. Mechanical properties of water
- E. Flow
- F. None of the Above

268. Hydraulics can be divided into two areas, _____ and hydrokinetics.

- A. Fluids
- B. Hydrostatics
- C. Hydrokinetics
- D. Mechanical properties of water
- E. Flow
- F. None of the Above

269. Hydrostatics is based on the Greek word for water, and originally covered the study of the physical behavior of water at rest and in motion.

- A. True
- B. False

270. Which of the following terms includes the behavior of all liquids, although it is primarily concerned with the motion of liquids?

- A. Fluids
- B. Hydrostatics
- C. Hydrokinetics
- D. Hydraulics
- E. Flow
- F. None of the Above

271. Which of the following terms includes the study of liquids in motion, is concerned with such matters as friction and turbulence generated in pipes by flowing liquids?

- A. Pressure
- B. Hydrostatics
- C. Hydrokinetics
- D. Hydraulics
- E. Flow
- F. None of the Above

272. Which of the following terms is about the pressures exerted by a fluid at rest?

- A. Pressure
- B. Hydrostatics
- C. Hydrokinetics
- D. Hydraulics
- E. Flow
- F. None of the Above

273. Which of the following terms is an excellent example of deductive mathematical physics, and in which the predictions agree closely with experiment?

- A. Pressure
- B. Hydrostatics
- C. Hydrokinetics
- D. Hydraulics
- E. Flow
- F. None of the Above

274. Which of the following terms is usually stated that a fluid is a substance that cannot resist a shearing stress, so that pressures are normal to confining surfaces?

- A. Pressure
- B. Hydrostatics
- C. Hydrokinetics
- D. Hydraulics
- E. Flow
- F. None of the Above

275. According to the text, hydraulics may be the physical property that varies over the largest numerical range, competing with electrical resistivity.

- A. True
- B. False

Atmospheric Pressure

276. The atmosphere is the entire mass of air that surrounds the earth.

- A. True
- B. False

277. Which of the following terms is the layer called that extends upward for about 500 miles, the section of primary interest is the portion that rests on the earth's surface and extends upward for about 7 1/2 miles?

- A. Column
- B. Troposphere
- C. Sea level
- D. Mass
- E. Atmospheric pressure
- F. None of the Above

278. According the text, if a column of air 1-inch square extending all the way to the "atmosphere", this column of air would weigh approximately 2.31 pounds at sea level.

- A. True
- B. False

279. Which of the following terms at sea level is approximately 14.7 psi?

- A. Static pressure
- B. Pressure
- C. Gauge pressure
- D. Bottom
- E. Atmospheric pressure
- F. None of the Above

280. If you were to ascend, the atmospheric pressure increases by approximately 1.0 psi for every 2,343 feet.

- A. True
- B. False

281. Which of the following terms if you could be below, in excavations and depressions, atmospheric pressure increases?

- A. Static pressure
- B. Pressure
- C. Gauge pressure
- D. Sea level
- E. Atmospheric pressure
- F. None of the Above

282. Pressures under water differ from those under air only because the weight of the water must be added to the?

- A. Barometer
- B. Pressure(s) of the air
- C. Height
- D. Altitude
- E. Seal Level
- F. None of the Above

283. Which of the following terms can be measured by any of several methods, one method is the mercury column barometer?

- A. Static pressure
- B. Pressure
- C. Gauge pressure
- D. Sea level
- E. Atmospheric pressure
- F. None of the Above

284. At sea level and at a temperature of 0° Celsius (C), the height of the mercury column is approximately 30 inches, or 76 centimeters. This represents a pressure of approximately 14.7 psi.

- A. True B. False

285. Which of the following terms could be measured with the aneroid barometer?

- A. Static pressure D. Sea level
B. Pressure E. Atmospheric pressure
C. Gauge pressure F. None of the Above

286. The atmospheric pressure does not vary uniformly with?

- A. Barometer D. Altitude
B. Pressure(s) E. Equipment
C. Weight F. None of the Above

287. Atmospheric pressure is defined as the force per unit area exerted against a surface by the _____ of the air above that surface.

- A. Barometer D. Altitude
B. Pressure(s) E. Equipment
C. Weight F. None of the Above

Barometric Loop

288. According to the text, the barometric loop, will provide protection against backsiphonage, is based upon the principle that a water column, at sea level pressure, will not rise above 33.9 feet. In general, barometric loops are locally fabricated, and are 35 feet high.

- A. True B. False

289. Which of the following terms could be measured on an absolute scale, pounds per square inch absolute (psia), or gauge scale, (psig).

- A. Static pressure D. Sea level
B. Pressure E. Atmospheric pressure
C. Gauge pressure F. None of the Above

290. Absolute pressure is equal to gauge pressure plus the atmospheric pressure.

- A. True B. False

291. The barometric loop consists of a continuous section of supply piping that abruptly rises to a height of approximately 233 feet and then returns back down to the originating level.

- A. True B. False

292. The barometric loop is a loop in the piping system that effectively protects against backpressure.

- A. True B. False

293. The barometric loop may not be used to protect against backsiphonage.

- A. True B. False

294. According to the text, absolute pressure and gauge pressure?

- A. Are the same D. That effectively protects
B. Referred to using pressure E. Permanent forces tangential
C. Are related F. None of the Above

295. Which of the following terms at sea level is 14.7 psai?

- A. Static pressure
- B. Pressure
- C. Gauge pressure
- D. Sea level
- E. Atmospheric pressure
- F. None of the Above

296. Which of the following terms is the total pressure?

- A. Static pressure
- B. Absolute pressure
- C. Gauge pressure
- D. Sea level
- E. Atmospheric pressure
- F. None of the Above

297. Gauge pressure is simply the pressure read on the gauge. If there is no pressure on the gauge other than atmospheric, the gauge will read zero.

- A. True
- B. False

298. Which of the following terms would be equal to 14.7 psi, which is the atmospheric pressure?

- A. Static pressure
- B. Absolute pressure
- C. Gauge pressure
- D. Sea level
- E. Atmospheric pressure
- F. None of the Above

Pressure

299. Water is incompressible, while air is very compressible.

- A. True
- B. False

300. Both air and water are considered to be?

- A. Absolute pressure
- B. Atmospheric pressure
- C. Fluid(s)
- D. Volume
- E. Shearing force
- F. None of the Above

301. Which of the following terms does water possess and air does not?

- A. Absolute pressure
- B. Atmospheric pressure
- C. Fluid(s)
- D. Volume
- E. Shearing force
- F. None of the Above

302. A fluid is a substance that cannot exert any permanent forces tangential to a boundary and any force that it exerts on a boundary must be normal to the boundary.

- A. True
- B. False

303. According to the text, a force is proportional to the _____, and is called a pressure.

- A. Pascal's Principle
- B. Hydrostatics
- C. Acting on the body of the fluid
- D. Permanent forces tangential
- E. Area on which it is exerted
- F. None of the Above

304. In order for the fluid to be in equilibrium, the pressure must be the same in all directions (or the element would move in the direction of least pressure), and if no other forces are?

- A. Pascal's Principle
- B. Hydrostatics
- C. Acting on the body of the fluid
- D. Permanent forces tangential
- E. Area on which it is exerted
- F. None of the Above

305. Which of the following terms does water and air have; that is, layers of them slide very easily on one another?

- A. Low viscosity
- B. Atmospheric pressure
- C. Fluid(s)
- D. Volume
- E. Shearing force
- F. None of the Above

306. Molasses and other like fluids may have high viscosity and take a long time to come to equilibrium, but they are no less?

- A. Absolute pressure
- B. Atmospheric pressure
- C. Fluid(s)
- D. Volume
- E. Shearing force
- F. None of the Above

307. The coefficient of viscosity is the ratio of _____ to the velocity gradient.

- A. Absolute pressure
- B. Atmospheric pressure
- C. Fluid(s)
- D. Volume
- E. Shearing force
- F. None of the Above

308. Which of the following terms deals with permanent, time-independent states of fluids, so viscosity does not appear?

- A. Pascal's Principle
- B. Hydrostatics
- C. Acting on the body of the fluid
- D. Permanent forces tangential
- E. Area on which it is exerted
- F. None of the Above

309. Therefore, in this case the pressure will be the same throughout the fluid, and the same in any direction at a point?

- A. Pascal's Principle
- B. Hydrostatics
- C. Acting on the body of the fluid
- D. Permanent forces tangential
- E. Area on which it is exerted
- F. None of the Above

310. Which of the following terms that if a certain volume of fluid were somehow made solid, the equilibrium of forces would not be disturbed?

- A. Axiom
- B. Gravitational body force
- C. Pressure
- D. Displaced fluid
- E. Gravitation
- F. None of the Above

311. Which of the following terms is an example of a body force that disturbs the equality of pressure in a fluid?

- A. Axiom
- B. Gravitational body force
- C. Pressure
- D. Displaced fluid
- E. Gravitation
- F. None of the Above

Pump Categories

312. The key to understanding a pumps operation is that a pump is to move water and generate the _____ we call pressure.

- A. Centrifugal pump(s)
- B. Impeller blade(s)
- C. Delivery force
- D. Diaphragm pump(s)
- E. Cylindrical pump housing
- F. None of the Above

313. According to the text, pumps may be classified on the basis of the application they serve.

- A. True
- B. False

314. According to the text, all pumps may be divided into two major categories: (1) dynamic and (2)?

- A. Centrifugal
- B. Impeller
- C. Displacement
- D. Diaphragm
- E. Rotary
- F. None of the Above

Basic Water Pump

315. According to the text, the centrifugal pumps work by spinning water around in a circle inside a?

- A. Vortex
- B. Cylinder
- C. Viscous drag pump
- D. Center of the impeller
- E. Cylindrical pump housing
- F. None of the Above

316. The pump makes the water spin by pulling it with an impeller.

- A. True
- B. False

317. The blades of this impeller project inward from an axle like the arms of a turnstile and, as the impeller spins, the water moves through it.

- A. True
- B. False

318. In a centrifugal pump, the water pressure at the edge of the turning impeller rises until it is able to keep water circling with the _____.

- A. Centrifugal pump(s)
- B. Impeller blade(s)
- C. Bernoulli's equation
- D. Diaphragm pump(s)
- E. Cylindrical pump housing
- F. None of the Above

319. In a centrifugal pump, as water drifts outward between the _____ of the pump, it must move faster and faster because its circular path is getting larger and larger.

- A. Centrifugal pump(s)
- B. Impeller blade(s)
- C. Bernoulli's equation
- D. Diaphragm pump(s)
- E. Cylindrical pump housing
- F. None of the Above

320. As the water slows down and its kinetic energy decreases, that water's pressure potential energy increases.

- A. True
- B. False

321. As the water spins, the pressure near the outer edge of the pump housing becomes much lower than near the center of the impeller.

- A. True
- B. False

322. The impeller blades cause the water to move faster and faster.

- A. True
- B. False

323. The impellers may be of either a semi-open or closed type.

- A. True
- B. False

324. According to the text, without an inward force, an object will travel in a straight line and will not complete the?

- A. Circle
- B. Pump pushes
- C. Viscous drag pump
- D. Center of the impeller
- E. Incompressible fluid
- F. None of the Above

325. In a centrifugal pump, the inward force is provided by high-pressure water near the outer edge of the?

- A. Centrifugal pump(s)
- B. Impeller blade(s)
- C. Pump housing
- D. Diaphragm pump(s)
- E. Cylindrical pump housing
- F. None of the Above

326. In the operation of the pump, the water at the edge of the _____ inward on the water between the impeller blades and makes it possible for that water to travel in a circle.

- A. Inward force
- B. Pump pushes
- C. Viscous drag pump
- D. Center of the impeller
- E. Incompressible fluid
- F. None of the Above

327. In the operation of the pump, when water is actively flowing through the pump, arriving through a hole near the center of the impeller and leaving through a _____ near the outer edge of the pump housing, the pressure rise between center and edge of the pump is not as large.

- A. Centrifugal pump(s)
- B. Impeller blade(s)
- C. Hole
- D. Diaphragm pump(s)
- E. Cylindrical pump housing
- F. None of the Above

Types of Water Pumps

328. The water production well industry almost exclusively uses Turbine pumps, which are a type of centrifugal pump.

- A. True
- B. False

329. The most common type of water pumps used for municipal and domestic water supplies are?

- A. Axial flow
- B. Submersible
- C. Rotary pump
- D. Turbine pump(s)
- E. Variable displacement pumps
- F. None of the Above

330. Which of the following terms will produce at different rates relative to the amount of pressure or lift the pump is working against?

- A. Variable displacement pump
- B. Drive shaft
- C. Column pipe
- D. Single or multiple bowls
- E. Pump's lifting capacity
- F. None of the Above

331. Impellers are rotated by the pump motor, which provides the _____ needed to overcome the pumping head.

- A. Spider bearing(s)
- B. Horsepower
- C. Impeller(s)
- D. Turbine pump(s)
- E. Desired pumping rate
- F. None of the Above

332. The size and number of stages, horsepower of the motor and _____ are the key components relating to the pump's lifting capacity.

- A. Pumping head
- B. Drive shaft
- C. Column pipe
- D. Single or multiple bowls
- E. Pump's lifting capacity
- F. None of the Above

333. Which of the following terms are variable displacement pumps that are by far used the most?

- A. Axial flow
- B. Submersible
- C. Rotary pump
- D. Turbine pump(s)
- E. Centrifugal pumps
- F. None of the Above

334. According to the text, the turbine pump utilizes impellers enclosed in single or multiple bowls or stages to?

- A. Lift water
- B. Drive shaft
- C. Column pipe
- D. Single or multiple bowls
- E. Pump's lifting capacity
- F. None of the Above

335. Vertical turbine pumps are commonly used in groundwater wells. These pumps are driven by a shaft rotated by a motor on the surface.

- A. True
- B. False

336. The shaft turns the impellers within the pump housing while the?

- A. Spider bearing(s)
- B. Horsepower turns the shaft
- C. Impeller(s)
- D. Water moves up the column
- E. Desired pumping rate is obtained
- F. None of the Above

337. The rotating shaft in a line shaft turbine is actually housed within the column pipe that delivers the water to the surface.

- A. True
- B. False

338. The size of the _____ are selected based on the desired pumping rate and lift requirements.

- A. Spider bearing(s)
- B. Horsepower
- C. Impeller(s)
- D. Column, impeller, and bowls
- E. Desired pumping rate
- F. None of the Above

339. According to the text, column pipe sections can be threaded or coupled together while the drive shaft is coupled and suspended within the column by?

- A. Oil tube
- B. Spider bearings
- C. Column pipe
- D. Single or multiple bowls
- E. Pump's lifting capacity
- F. None of the Above

340. The water passing through the column pipe serves as the lubricant for the bearings.

- A. True
- B. False

341. Which of the following terms, provide both a seal at the column pipe joints and keep the shaft aligned within the column?

- A. Spider bearing(s)
- B. Keyway
- C. Impeller(s)
- D. Roller bearings
- E. Lantern rings
- F. None of the Above

Common Hydraulic Terms

342. Which of the following definitions is the engineering science pertaining to liquid pressure and flow?

- A. Pressure, Absolute
- B. Pressure
- C. Hydraulics
- D. Hydrokinetics
- E. Pascal's Law
- F. None of the Above

343. Which of the following definitions is the engineering science pertaining to the energy of liquid flow and pressure?

- A. Pressure, Absolute
- B. Pressure
- C. Hydraulics
- D. Hydrokinetics
- E. Pascal's Law
- F. None of the Above

344. Which of the following definitions is the pressure applied to a confined fluid at rest is transmitted with equal intensity throughout the fluid?

- A. Pressure, Absolute
- B. Pressure
- C. Hydraulics
- D. Hydrokinetics
- E. Pascal's Law
- F. None of the Above

345. Which of the following definitions is the application of continuous force by one body upon another that it is touching; compression?

- A. Pressure, Absolute
- B. Pressure
- C. Hydraulics
- D. Hydrokinetics
- E. Pascal's Law
- F. None of the Above

346. Which of the following definitions is the force per unit area, usually expressed in pounds per square inch?

- A. Pressure, Absolute
- B. Pressure
- C. Hydraulics
- D. Hydrokinetics
- E. Pascal's Law
- F. None of the Above

347. Which of the following definitions is the pressure differential above or below ambient atmospheric pressure?

- A. Pressure, Atmospheric
- B. Pressure, Static
- C. Hydraulics
- D. Pressure, Gauge
- E. Pascal's Law
- F. None of the Above

348. Which of the following definitions is height of a column or body of fluid above a given point expressed in linear units?

- A. Head, Friction
- B. Head, static
- C. Head
- D. Hydraulics
- E. Hydrokinetics
- F. None of the Above

349. Which of the following definitions is often used to indicate gauge pressure?

- A. Head, Friction
- B. Head, static
- C. Head
- D. Hydraulics
- E. Hydrokinetics
- F. None of the Above

350. Which of the following definitions is the pressure is equal to the height times the density of the liquid?

- A. Head, Friction
- B. Head, static
- C. Head
- D. Hydraulics
- E. Hydrokinetics
- F. None of the Above

**Wastewater Collection Rules and Regulations Chapter 5
CMOM - "Capacity, Management, Operation and Maintenance"**

351. Which of the following terms is vital to protect public health, property, and waterways in the surrounding area?

- A. Sanitary sewage overflows (SSOs)
- B. Wastewater
- C. Clean decantible water
- D. Management, operation, and maintenance
- E. Proper function of sanitary sewer systems
- F. None of the Above

352. Cities have used a wide variety of building materials, designs, and installation techniques, which aren't durable enough to withstand heavy, continuous use.

- A. True
- B. False

353. The Management, Operation and Maintenance (MOM) Programs Project is a pilot enforcement approach developed by?

- A. Clean Water Act
- B. EPA
- C. Congress
- D. Water quality standard(s)
- E. EPA Region 4
- F. None of the Above

354. 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. Public health and water quality
- B. Disrepair
- C. Water quality
- D. Dissolved organics
- E. Certain compounds and undesirable solids
- F. None of the Above

Treatment Balance and the Effects of Undesirable Solids

355. Which of the following terms 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. Wastewater
- C. Wastewater treatment plant
- D. Management, operation, and maintenance
- E. Full compliance with the Clean Water Act
- F. None of the Above

356. 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. Sanitary sewage overflows SSOs
- D. Dissolved organics
- E. Certain compounds
- F. None of the Above

357. 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. Management, operation, and maintenance
- E. Full compliance with the Clean Water Act
- F. None of the Above

358. _____ and undesirable solids, like grease and grass clippings, can disturb this delicate balance and necessary process at the wastewater treatment facility.

- A. Public health and water quality
- B. Disrepair
- C. Sanitary sewage overflows SSOs
- D. Dissolved organics
- E. Certain compounds
- F. None of the Above

359. There are compounds and _____ that should never be introduced into a sanitary sewer system.

- A. Certain compounds
- B. Wastewater
- C. Clean decantable water
- D. Dissolved organics
- E. Mixtures
- F. None of the Above

360. Which of the following terms 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. Badly connected sewer service lines
- E. Sanitary Sewer Overflows or (SSOs)
- F. None of the Above

361. The solids include but are not limited to: plastics, rubber goods, grass clippings, metal products such as aluminum foil, beer or soda cans, wood products, glass, paper products such as disposable diapers and sanitary napkins. Items such as these disturb or even kill the delicate balance of microorganisms and bacteria that are needed to treat the wastewater.

- A. True
- B. False

What are Sanitary Sewer Overflows?

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

- A. Deteriorating Sewer System
- B. Pipe Failure(s)
- C. Destructive compounds
- D. Municipal sanitary sewer systems
- E. Sanitary Sewer Overflows or (SSOs)
- F. None of the Above

363. Which of the following terms 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. Deteriorating Sewer System
- B. Pipe Failure(s)
- C. Destructive compounds
- D. Badly connected sewer service lines
- E. SSOs
- F. None of the Above

Why do Sewers Overflow?

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

- A. SSOs
- B. Undersized Systems
- C. Sewer Service Connections
- D. Poor sewer collection system management
- E. Back-ups and sewer overflows
- F. None of the Above

Problems that Can Cause Chronic SSOs Include:

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

- A. Deteriorating Sewer System
- B. Infiltration and Inflow (I&I)
- C. Destructive compounds
- D. Badly connected sewer service lines
- E. Sanitary Sewer Overflows or (SSOs)
- F. None of the Above

366. _____: Sewers and pumps are too small to carry sewage from newly-developed subdivisions or commercial areas?

- A. SSOs occasionally occur
- B. Undersized Systems
- C. Sewer Service Connections
- D. Poor sewer collection system management
- E. Back-ups and sewer overflows
- F. None of the Above

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

- A. Deteriorating Sewer System
- B. Pipe Failure(s)
- C. Destructive compounds
- D. Badly connected sewer service lines
- E. Sanitary Sewer Overflows or (SSOs)
- F. None of the Above

368. Which of the following terms 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. SSOs occasionally occur
- B. Undersized Systems
- C. Sewer Service Connections
- D. Poor sewer collection system management
- E. Back-ups and sewer overflows
- F. None of the Above

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

- A. Deteriorating Sewer System
- B. Pipe Failure(s)
- C. Destructive compounds
- D. Badly connected sewer service lines
- E. Sanitary Sewer Overflows or (SSOs)
- F. None of the Above

The Elements of a Proper CMOM Program

Utility Specific

370. The complexity and expense associated with a NPDES program is specific to the size and complexity of the Publicly Owned Treatment Works and related infrastructure.

- A. True
- B. False

Purposeful

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

- A. MOM programs
- B. Program goal
- C. Water quality
- D. Publicly Owned Treatment Works (POTW)
- E. Combined sewer systems
- F. None of the Above

Goal-Oriented

372. Which of the following terms 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. Utility's plan/schedule
- D. Proper MOM programs
- E. Utility's CMOM or MOM programs
- F. None of the Above

Uses Performance Measures

373. Performance measures should be established for each of _____ in conjunction with the program goal.

- A. MOM program
- B. Program goal
- C. Water quality
- D. Publicly Owned Treatment Works (POTW)
- E. Combined sewer systems
- F. None of the Above

Periodically Evaluated

374. An evaluation of the progress toward reaching the goals, or missing term, should be made periodically and based upon the quantified performance measures.

- A. A reassessment of the goals
- B. Combined sewer system(s)
- C. Utility's plan/schedule
- D. NPDES Compliance Inspection Manual
- E. Utility's CMOM or MOM programs
- F. None of the Above

Available In Writing

375. The effectiveness of a MOM program quickly breaks down unless it is available in writing. Personnel turnover and lapses in communication between staff and management can change otherwise proper MOM programs to improper ones.

- A. True
- B. False

Implemented by Trained Personnel

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

- A. MOM program(s)
- B. Combined sewer system(s)
- C. Utility's plan/schedule
- D. NPDES Compliance Inspection Manual
- E. Utility's CMOM or MOM programs
- F. None of the Above

What MOM programs should be audited?

377. Which of the following terms 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. Program goal
- C. Water quality
- D. Publicly Owned Treatment Works (POTW)
- E. MOM activity
- F. None of the Above

378. If a utility owns treatment works or a pond system, then activities associated with the management, operation, and maintenance of these facilities should also be included in the audit.

- A. True
- B. False

What are the elements of a proper Self-Audit?

Initial Assessment

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

- A. Written MOM programs
- B. Program goal
- C. Water quality
- D. Publicly Owned Treatment Works (POTW)
- E. NPDES Compliance Inspection Manual and Guidance
- F. None of the Above

Develop the Audit Plan

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

- A. MOM program(s)
- B. Combined sewer system(s)
- C. Utility's plan/schedule
- D. NPDES Compliance Inspection Manual
- E. Develop a schedule for auditing the programs
- F. None of the Above

Conduct the Audit

381. 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. CMOM regulation(s)
- B. Both personnel and management
- C. NPDES permit authority
- D. Preventative operations
- E. Recurrent SSOs
- F. None of the Above

Identify Deficiencies

382. Identify any permitted discharges which have occurred in the past seven years.

- A. True
- B. False

Develop Improvement Plan

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

- A. Necessary improvements
- B. Routine operation(s)
- C. NPDES permit authority
- D. Preventative operations
- E. Recurrent SSOs
- F. None of the Above

How can SSOs be Reduced or Eliminated?

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

- A. Utility's plan/schedule
- B. MOM Programs Self-Audit
- C. SSOs
- D. Both personnel and management
- E. Capacity and/or reliability
- F. None of the Above

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

- A. Self-audit results
- B. Unpermitted discharges
- C. SSOs
- D. Raw sewage
- E. Infiltration and inflow
- F. None of the Above

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

- A. Utility's plan/schedule
- B. MOM Programs Self-Audit
- C. SSOs
- D. Reliability
- E. Preventative operations
- F. None of the Above

387. Construction of wet weather storage and treatment facilities to treat?

- A. Utility's plan/schedule
- B. MOM Programs Self-Audit
- C. SSOs
- D. Excess flows
- E. Capacity and/or reliability
- F. None of the Above

388. Which of the following terms communities should address during sewer system master planning and facilities planning, or while extending the sewer system into previously unsewered areas.

- A. Utility's plan/schedule
- B. MOM Programs Self-Audit
- C. SSOs
- D. Both personnel and management
- E. Capacity and/or reliability
- F. None of the Above

389. Which of the following terms include those occurring from unpreventable vandalism, some types of blockages, extreme rainstorms, and acts of nature such as earthquakes or floods?

- A. Utility's plan/schedule
- B. MOM Programs Self-Audit
- C. SSOs
- D. Unavoidable SSOs
- E. Capacity and/or reliability
- F. None of the Above

CMOM Audits

390. CMOM will require regular, comprehensive audits, done by each facility. These audits will help identify non-conformance to?

- A. CMOM regulation(s)
- B. Routine operation(s)
- C. NPDES permit authority
- D. Preventative operations
- E. Recurrent SSOs
- F. None of the Above

Communication/Notification

391. If an SSO occurs, sanitary sewer facilities will be required to immediately notify the NPDES permit authority, appropriate health agencies, state authorities, drinking water suppliers, and, if necessary, the general public in the risk area.

- A. True
- B. False

392. Facilities must post locations of this missing term and let the public know that the annual report is available to them.

- A. CMOM regulation(s)
- B. Routine operation(s)
- C. NPDES permit authority
- D. Preventative operations
- E. Recurrent SSOs
- F. None of the Above

Safety Chapter 6

Confined Space Entry Program

Purpose

393. The Confined Space Entry Program is provided to protect authorized employees that will enter confined spaces and may be exposed to hazardous atmosphere, engulfment in materials, conditions.

- A. True
- B. False

Scope

394. According to the text, you are required to recognize _____ associated with confined spaces.

- A. An internal configuration
- B. Hazardous atmosphere
- C. Permit-Required Confined Space
- D. Dangers and hazards
- E. Atmospheric factors and physical agents
- F. None of the Above

Confined space:

395. Is large enough or so configured that an employee can?

- A. Engulfing an entrant
- B. Bodily enter and perform work
- C. An internal configuration
- D. Recognized serious safety or health hazard
- E. Continuous employee occupancy
- F. None of the Above

396. Has limited or restricted means for entry or exit (i.e. tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have?

- A. An internal configuration
- B. Hazardous atmosphere
- C. Limited means of entry
- D. Entry or exit
- E. Atmospheric factors and physical agents
- F. None of the Above

397. Contains a material that has the?

- A. Engulfing an entrant
- B. Hazardous atmospheres
- C. Potential for engulfing an entrant
- D. Recognized serious safety or health hazard
- E. Continuous employee occupancy
- F. None of the Above

398. Has an internal configuration such that _____ could be trapped or asphyxiated by inwardly covering walls or by a floor that slopes downward and tapers to a smaller cross-section.

- A. An internal configuration
- B. Hazardous atmosphere
- C. Permit-Required Confined Space
- D. An entrant
- E. Atmospheric factors and physical agents
- F. None of the Above

399. Contains any other recognized serious safety or?

- A. Engulfing an entrant
- B. Hazardous atmospheres
- C. An internal configuration
- D. Health hazard
- E. Continuous employee occupancy
- F. None of the Above

400. Which of the following terms will be marked "Confined Space - Entry Permit Required"?

- A. An internal configuration
- B. Hazardous atmosphere
- C. Permit-Required Confined Space
- D. Entry or exit
- E. Atmospheric factors and physical agents
- F. None of the Above