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

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## Distribution Survey CEU Training Course Assignment

***The Assignment (Exam) is also available in Word on the Internet for your Convenience, please visit www.ABCTLC.com and download the assignment and e- mail it back to TLC.***

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.**

**Safety Section**

1. Unmarked utilities, unexpected rock and other nightmares are common. The greatest variable is the type of excavation or trenching will be done and how to protect yourself for a cave-in.
A. True B. False

2. Although the standard has been clarified and _____have options when meeting some of the requirements, employers must realize that the employee must be protected at all times.
A. Competent person
B. Everyone
C. Inspections
D. Protective equipment, trench conditions
E. Employers
F. None of the Above

3. Which of the following terms are essential? Everyone is required to practice once a year. Yes, once a year.
A. Competent person
B. Rescue training exercises
C. Inspections
D. Protective equipment
E. Emergency
F. None of the Above

4. Which of the following terms shall be made after every rainstorm or other hazard occurrence?
A. Competent person
B. Examinations
C. Inspections
D. Protective equipment
E. Emergency contact methods
F. None of the Above

5. Which of the following terms have to have proper protective equipment, hard-hats, reflective vests, steel-toed boots, harnesses, eye protection, hearing protection and drinking water?
A. Competent person
B. Everyone
C. Inspections
D. All employees
E. Emergency contact methods
F. None of the Above

6. During excavation work a competent person shall be on the job site at all times when personnel are working within or around the?
A. Competent person
B. Employees
C. Inspections
D. Ladder(s)
E. Excavation
F. None of the Above

7. Which of the following safety terms that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation?

A. Competent person
B. Employees
C. Inspections
D. Any other underground installation
E. Excavation work
F. None of the Above

8. Which of the following safety terms shall be taken to protect employees working in excavations, against the hazards posed by water accumulation?

A. Competent person
B. Adequate precautions
C. Inspections
D. Ladder(s)
E. Excavation work
F. None of the Above

9. Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations.

A. True B. False

10. A stairway, ladder, or ramp shall be used as a _____in trench excavations that are four (4') feet or more in depth.

A. Competent person
B. Means of access or egress
C. Inspections
D. Ladder(s)
E. Excavation work
F. None of the Above

11. Which of the following safety terms exists, the area must be continuously ventilated until the oxygen levels are above 19.5 percent?

A. Competent person
B. Employees
C. Inspections
D. Oxygen deficiency
E. Excavation(s)
F. None of the Above

12. Which of the following safety terms expresses the area shall be ventilated until the flammable gas concentration is below 20 percent of the lower flammable limit?

A. Competent person
B. Gaseous condition exists
C. Inspections
D. Oxygen deficiency
E. Excavation(s)
F. None of the Above

13. Which of the following safety terms exist or could reasonably exist, the area shall be monitored continuously to assure that employees are protected?

A. Competent person
B. Oxygen deficiency or gaseous conditions
C. Inspections
D. Oxygen deficiency
E. Excavation(s)
F. None of the Above

14. Where the stability of adjoining buildings, walls or other structures are_____, support systems such as shoring, bracing, or underpinning shall be provided?

A. Competent person
B. Endangered by excavation operations
C. Inspections
D. Oxygen deficiency
E. Excavation(s)
F. None of the Above

15. Sidewalks, pavement and appurtenant structures shall not be undermined unless a support system such as shoring is provided to protect _____ from the possible collapse of such structures.

A. Competent person
B. Employees
C. Inspections
D. Oxygen deficiency
E. Excavation(s)
F. None of the Above

**Personnel Protective Systems**

16. The competent person shall determine the need for the use of protective systems when?

A. Such conditions exist
B. Tabulated data
C. Trench excavation
D. Protective systems
E. Cave-ins
F. None of the Above

17. When sloping, benching or protective systems are required, refer to?

A. Table
B. Tabulated data
C. Trench excavation
D. Protective systems
E. Requirements in CFR 1926.652
F. None of the Above

18. Whenever support systems, _____, or other protective systems are being used, a copy of the manufacturer's specifications, recommendations, and limitations sheet shall be in written form and maintained at the job site.

A. Shield systems
B. Tabulated data
C. Trench excavation
D. Protective systems
E. Cave-ins
F. None of the Above

**Excavation Protection Systems**

19. The three basic protective systems for excavations and trenches are?

A. Table
B. Tabulated data
C. Trench excavation
D. Protective systems
E. Sloping and benching systems, shoring, and shields
F. None of the Above

20. Every employee in an excavation shall be protected from _____ by an adequate protective system.

A. Table
B. Tabulated data
C. Trench excavation
D. Protective systems
E. Cave-ins
F. None of the Above

**Sloping and Benching Systems**

21. There are four options for?

A. Sloping
B. Tabulated data
C. Trench excavation
D. Protective systems
E. Cave-ins
F. None of the Above

22. The table provided in _____of the standard may be used to determine the maximum allowable angle (after determining the soil type).

A. Appendix B
B. Tabulated data
C. Trench excavation
D. Protective systems
E. Cave-ins
F. None of the Above

23. Which of the following safety terms can be prepared by a registered professional engineer can be utilized?

A. Table
B. Tabulated data
C. Trench excavation
D. Protective systems
E. Cave-ins
F. None of the Above

24. A registered professional engineer can design a _____for a specific job.

A. Table
B. Sloping plan
C. Trench excavation
D. Protective systems
E. Cave-ins
F. None of the Above

25. Which of the following safety terms for excavations five (5) to twenty (20) feet in depth must be constructed under the instruction of a designated competent person?

A. Sloping and benching systems
B. Tabulated data
C. Trench excavation
D. Protective systems
E. Cave-ins
F. None of the Above

26. Which of the following safety terms is for excavations greater than twenty (20) feet must be designed and stamped by a registered professional engineer?

A. Sloping and benching systems
B. Tabulated data
C. Trench excavation
D. Protective systems
E. Cave-ins
F. None of the Above

**Shoring Systems**

27. Which of the following safety terms utilizes a framework of vertical members, horizontal members, and cross braces to support the sides of the excavation?

A. Shoring
B. Tabulated data
C. Trench excavation
D. Protective systems
E. Cave-ins
F. None of the Above

**Shield Systems (Trench Boxes)**

28. Which of the following safety terms is the third method of providing a safe workplace, unlike sloping and shoring, shielding does not prevent a cave-in?

A. Shielding
B. Tabulated data
C. Trench excavation
D. Protective systems
E. Cave-ins
F. None of the Above

29. Which of the following safety terms are designed to withstand the soil forces caused by a cave-in and protect the employees inside the structure?

A. Shields
B. Tabulated data
C. Trench excavation
D. Protective systems
E. Cave-ins
F. None of the Above

30. Which of the following safety terms is not covered in the OSHA Standards?

A. Sloping and benching systems
B. Tabulated data
C. Trench excavation
D. Protective systems
E. Shielding design and construction
F. None of the Above

**Safety Precautions for Shield Systems**

31. Which of the following safety terms must not have any lateral movement when installed?

A. Sloping and benching systems
B. Tabulated data
C. Trench excavation
D. Protective systems
E. Shields
F. None of the Above

32. Employees will be protected from cave-ins when entering and exiting the shield (examples - ladder within the _____ or a properly sloped ramp at the end).
A. Sloping and benching systems D. Protective systems
B. Tabulated data E. Shield
C. Trench excavation F. None of the Above

33. According to the text, employees are not allowed in the_____, removal, or during any vertical movement.
A. Sloping and benching systems D. Protective systems
B. Shield during installation E. Cave-ins
C. Trench excavation F. None of the Above

34. Which of the following safety terms can be 2 ft. above the bottom of an excavation if they are designed to resist loads?
A. Sloping and benching systems D. Protective systems
B. Shields E. Cave-ins
C. Trench excavation F. None of the Above

35. Which of the following safety terms must extend at least 18 inches above the point where proper sloping begins?
A. Sloping and benching systems D. Protective systems
B. Shield E. Cave-ins
C. Trench excavation F. None of the Above

36. Which of the following safety terms must be protected from the exposed excavation wall?
A. Sloping and benching systems D. Protective systems
B. Open end of the shield E. Cave-ins
C. Trench excavation F. None of the Above

**Personal Protective Equipment**
37. Which of the following safety terms for you to wear a hard hat, safety glasses, and work boots on the jobsite?
A. OSHA Standards D. Adequate protection systems
B. It is OSHA policy E. Personal protective equipment
C. Excavation F. None of the Above

**Excavation & Trenching Guidelines**
38. This section outlines procedures and guidelines for the protection of employees working in and around excavations and trenches. This section requires compliance with EPA standards.
A. True B. False

39. Safety compliance is recommended to ensure employee protection when working in or around excavations.
A. True B. False

40. All other employees working in and around the excavation must be trained in the recognition of hazards associated with?
A. OSHA Standards D. Adequate protection systems
B. Trenching and excavating E. Personal protective equipment
C. Excavation F. None of the Above

**Hazard Controls**

41. Before any work is performed and before any employees enter the excavation, a number of items must be checked and insured: Before any excavation, Underground installations must be determined. This can be accomplished by either contacting the local utility companies or the local "one-call' center for the area. All underground utility locations must be documented on the proper forms.

A. True B. False

42. All overhead hazards that create a hazard to employees must be removed or supported to?

A. OSHA Standards
B. Trenching and excavating
C. Eliminate the hazard
D. Adequate protection systems
E. Personal protective equipment
F. None of the Above

43. Which of the following terms if to be over 20 feet deep, it must be designed by a registered professional engineer?

A. OSHA Standard
B. Trench
C. Excavation
D. Adequate protection systems
E. Personal protective equipment
F. None of the Above

44. Which of the following terms will be utilized to protect employees, can be accomplished through sloping, shoring, or shielding?

A. Adequate protective systems
B. Soil classifications
C. Competent person
D. Trench or excavation
E. Personal protective equipment
F. None of the Above

45. The worksite must be analyzed in order to design _____and prevent cave-ins.

A. An excavation safety plan
B. Adequate measures
C. Protective systems
D. Simplified Soil Classification Systems
E. Adequate protection systems
F. None of the Above

46. Workers must be supplied with, and wear, any _____ deemed necessary to assure their protection.

A. Type A
B. Soil classifications
C. Competent person
D. Trench or excavation
E. Personal protective equipment
F. None of the Above

**Excavation Safety Plan**

47. An excavation safety plan is required in written form. This plan is to be developed to the level necessary to insure complete compliance with the _____and state and local safety standards.

A. An excavation safety plan
B. Adequate measures
C. Protective systems
D. Simplified Soil Classification Systems
E. OSHA Excavation Safety Standard
F. None of the Above

**Soil Classification and Identification**

48. Type A soil is defined as: _____with an unconfined compressive strength of 1.5 tons per square foot or greater.

A. An excavation safety plan
B. Adequate measures
C. Protective systems
D. Simplified Soil Classification Systems
E. Cohesive soils
F. None of the Above

49. _____like caliche and hardpan are considered Type A.
A. Cemented soils D. Trench or excavation
B. Soil classifications E. Personal protective equipment
C. Competent person F. None of the Above

**Soil Test & Identification**
50. Which of the following terms and plasticity depend on the amounts of all three types and water?
A. Compatibility D. Durability
B. Reputable manufacturers E. Degree of cohesiveness
C. Cohesion tests F. None of the Above

**Backflow/Cross-Connection Section**
**What is backflow? Reverse flow condition**
51. Backflow is the undesirable reversal of flow of nonpotable water or other substances through a _____and into the piping of a public water system or consumer's potable water system.
A. Backflow D. Cross-connection
B. Backpressure E. Indirect connection
C. Backsiphonage F. None of the Above

52. Which of the following terms can result from an increase in downstream pressure, a reduction in the potable water supply pressure, or a combination of both?
A. Backflow D. Cross-connection
B. Backpressure E. Indirect connection
C. Backsiphonage F. None of the Above

53. Which of the following terms is there two forms-backpressure and backsiphonage?
A. Backflow D. Cross-connection
B. Backpressure E. Indirect connection
C. Backsiphonage F. None of the Above

54. The basic mechanism for preventing backflow is a mechanical _____, which provides a physical barrier to backflow.
A. High hazard installations D. Backflow
B. Air gap E. Device or method
C. Backflow preventer F. None of the Above

55. The principal types of mechanical backflow preventers are the reduced-pressure principle assembly, the _____, and the double check valve assembly.
A. High hazard installations D. Backflow
B. Air gap E. Device or method
C. Vacuum breaker F. None of the Above

56. Which of the following terms can occur when there is a stoppage of water supply due to nearby firefighting, a break in a water main?
A. Backflow D. Cross-connection
B. Backpressure E. Indirect connection
C. Backsiphonage F. None of the Above

57. Which of the following terms is a form of backflow caused by a downstream pressure that is greater than the upstream or supply pressure in a public water system or consumer's potable water system?
A. Backflow D. Cross-connection
B. Backpressure E. Indirect connection
C. Backsiphonage F. None of the Above

58. Which of the following terms is a form of backflow caused by a negative pressure in a public water system or consumer's potable water system?
A. Backflow D. Cross-connection
B. Backpressure E. Indirect connection
C. Backsiphonage F. None of the Above

**Types of Backflow Prevention Methods and Assemblies**
59. Which of the following terms must either be physically disconnected or have an approved backflow prevention device installed to protect the public water system?
A. Backflow D. Cross-connection
B. Backpressure E. Indirect connection
C. Backsiphonage F. None of the Above

60. The type of device selected for a particular installation depends on several factors.
A. True B. False

61. When the airflow is restricted, such as the case of an air gap located near a wall, the _____ separation must be increased.
A. Open receiving vessel D. Air gap
B. Backflow preventer E. Air break
C. Barrier to backflow F. None of the Above

62. An air gap is a physical disconnection between the free flowing discharge end of a potable water pipeline and the top of an?
A. Open receiving vessel D. Air gap
B. Backflow preventer E. Air break
C. Barrier to backflow F. None of the Above

63. Which of the following terms must be at least two times the diameter of the supply pipe and not less than one inch?
A. Open receiving vessel D. Air gap
B. Backflow preventer E. Air break
C. Barrier to backflow F. None of the Above

64. According to the text, an air break is a physical separation between the free flowing discharge end of a potable water supply pipeline, and the overflow rim of an open or non-pressure receiving vessel.
A. True B. False

65. According to the text, air gap separations must be vertically orientated a distance of at least twice the inside diameter of the supply, but never less than?
A. 1 inch D. Backflow
B. 2 inches E. Depends
C. 3 inches F. None of the Above

66. An obstruction around or near an _____ may restrict the flow of air into the outlet pipe and nullify the effectiveness of the air gap to prevent backsiphonage.
A. High hazard installations
B. Backflow preventer
C. Barrier to backflow
D. Air gap
E. Air break
F. None of the Above

67. An air gap is acceptable for _____ and is theoretically the most effective protection.
A. High hazard installations
B. Backflow preventer
C. Barrier to backflow
D. Low pollutional hazards
E. High pollutional concerns
F. None of the Above

**Vacuum Breakers**

68. Which of the following terms can have two types: atmospheric and pressure?
A. Downstream piping
B. Atmospheric vacuum breakers
C. Vacuum breaker(s)
D. Hazard application(s)
E. Backflow preventor(s)
F. None of the Above

69. Both vacuum breakers devices primary purpose is to protect the water system from cross connections due to submerged inlets, such as irrigation systems and tank applications.
A. True B. False

70. The difference between the two types them is that the pressure vacuum breaker is spring loaded to assist the device's opening.
A. True B. False

**Water Distribution System Design and Valves**

71. One purpose of installing shutoff valves in water mains at various locations within the distribution system is to allow sections of the system to be _____ or provide maintenance without significantly curtailing service over large areas.
A. Feeders as practical
B. Adjust the pressure
C. Open or close the valve
D. Curtail the service
E. Taken out of service for repairs
F. None of the Above

72. According to the text, at intersections of distribution mains, the number of valves required is normally one less than the number of?
A. Ties
B. Depends
C. Radiating mains
D. Throttling purposes
E. Standardizes
F. None of the Above

73. All buried small- and medium-sized valves should be installed in the sidewalk.
A. True B. False

74. For large shutoff valves, it may be necessary to surround the valve operator or entire valve within a vault or manhole to allow?
A. Principally
B. Dependability
C. Repair or replacement
D. Minimum flow restriction
E. Stops or allows
F. None of the Above

**Gate Valves**

75. In the distribution system, gate valves are used when a straight-line flow of fluid and?

A. Principally
B. Dependability
C. Repair or replacement
D. Minimum flow restriction
E. Stops or allows
F. None of the Above

76. In the distribution system, or on a residential job, gate valves are so-named because the part that either _____ flow through the valve acts somewhat like a gate.

A. Fully drawn up
B. Dependability
C. Repair or replacement
D. Minimum flow restriction
E. Stops or allows
F. None of the Above

77. If the valve is wide open, the gate is _____ into the valve bonnet.

A. Fully drawn up
B. Dependable
C. Repair or replacement
D. Minimum flow restriction
E. Stops or allows
F. None of the Above

78. Gate valves are not suitable for?

A. Copper lines
B. Dependability
C. PRV
D. Throttling purposes
E. Pressure drops
F. None of the Above

79. The control of flow is easy because of the gate valve's design.

A. True
B. False

**Ball Valves**

80. Most ball valves require only a 180-degree turn to either completely open or close the valve.

A. True
B. False

81. According to the text, some ball valves are operated by planetary gears.

A. True
B. False

82. Ball valves should be either fully-on or fully-off, some ball valves also contain a swing check located within the ball to give the valve a check valve feature.

A. True
B. False

**Valve Exercising**

83. Valve exercising should be done to locate inoperable due to freezing or build-up of rust or corrosion and done once per year to detect _____ and to prevent valves from becoming

A. Malfunctioning valves
B. Dependability
C. Repair or replacement
D. Minimum flow restriction
E. Stops or allows
F. None of the Above

84. A valve inspection should include drawing valve location maps to show distances to the _____ from specific reference.

A. Valve(s)
B. Stoneline
C. Monument
D. House
E. Telephone pole
F. None of the Above

85. Service connections are used to _____ or other plumbing systems to the distribution system mains.

A. Be isolated
B. Connect individual buildings
C. By laying out
D. Limits the expansion
E. Decreases in size
F. None of the Above

**If Excessive Torque is Needed to Work the Valve**

86. One cause of a valve failing to open are variations in the temperature and/or pressure of the?

A. High pressure side
B. Working fluid
C. Closing torque applied
D. Valve sealing surfaces
E. Length of exposure
F. None of the Above

87. Depending on the seat and wedge material, _____ and closing torque applied, thermal binding can occur in high temperature situations.

A. High pressure side
B. Working fluid
C. Closing torque applied
D. Valve sealing surfaces
E. Length of exposure
F. None of the Above

88. Over-pressurization is when a valve can _____ when high pressure enters the cavity and has no way to escape.

A. Over-pressurization
B. Positive pressure differential
C. Lock in the closed position
D. Lock in the open position
E. Break
F. None of the Above

89. According to the text, a single direction sealing gate valve has a nameplate on the side of the valve that has a relief hole or pressure equalizer.

A. True B. False

90. Tuberculation corrosion is caused by chemical changes produced by?

A. Closed position
B. Hard water
C. Chemical changes
D. Electricity or electrolysis
E. Positive pressure differential
F. None of the Above

91. Corrosion will increase the C-Factor and the carrying capacity in a pipe.

A. True B. False

**Knife Gate Valve**

92. Install the Knife Gate valve so that the arrows on both sides of the body are in the direction of?

A. Positive pressure differential
B. Handwheel pointing up
C. Connect individual buildings
D. Direction of the service
E. Bonnet
F. None of the Above

**Common Rotary Valves**

93. Globe valve, is a rotary valve and are rare to find in most distribution systems, but can be found at treatment plants.

A. True B. False

94. Most Globes have compact OS & Y type, bolted bonnet, rising stems, with renewable seat rings.

A. True B. False

95. According to the text, globe valves should usually be installed with the inlet below the bonnet.
A. True B. False

96. For light throttling service, the valve may be installed so that the flow enters over the bottom of the seat and goes up through it.
A. True B. False

97. The globe valve may be installed in other orientations, but any deviation from vertical is a compromise.
A. True B. False

**System Layouts - Tree System**

98. The Tree system consists of a single main that _____ as it leaves the source and progresses through the area originally served.
A. Be isolated
B. Connect individual buildings
C. By laying out
D. Limits the expansion
E. Decreases in size
F. None of the Above

99. Smaller pipelines _____the main and divide again, much like the trunk and branches of a tree.
A. Branch off
B. Are manifolded to
C. Connect
D. Limit the expansion
E. Decrease
F. None of the Above

100. According to the text, there are several advantages gained by laying out water mains in a loop or grid, with feeder and distributor mains interconnecting at roadway intersections and other regular intervals.
A. True B. False

**Friction Loss**

101. The damaged section can be isolated and the remainder of the system will still carry pressure, water will not be distributed if a single section fails.
A. True B. False

102. During periods of peak fire flow demand, there will be less impact from _____ in water mains as the velocity within any given section of main.
A. Carrying capacity
B. Friction loss
C. Pressure
D. Static pressure
E. Total pressure
F. None of the Above

**Types of Pipes Used in the Water Distribution Field - Plastic Pipe (PVC)**

103. Plastic pipe has seen extensive use available in different lengths and sizes; it is lighter than steel or copper and requires no special tools to install.
A. True B. False

104. Plastic pipe has complete resistance to corrosion; and, in addition, it can be installed aboveground or below ground, has several advantages over metal pipe: it is flexible; it has superior resistance to?
A. Ease of installation
B. An excellent combination
C. Chemical resistance
D. Rupture from freezing
E. Complete resistance to corrosion
F. None of the Above

105. PVC pipes are made of tough, strong thermoplastic material that has _____ of physical and chemical properties.
A. Ease of installation
B. An excellent combination
C. Chemical resistance
D. Array
E. Complete resistance to corrosion
F. None of the Above

106. PVC's chemical resistance and _____ make it an excellent material for application in various mechanical systems.
A. Ease of installation
B. Greater resistance
C. Chemical resistance
D. Design strength
E. Complete resistance to corrosion
F. None of the Above

107. According to the text, often polyvinyl chloride is further chlorinated to obtain a stiffer design, a higher level of impact resistance, and a _____ to extremes of temperature.
A. Ease of installation
B. Greater resistance
C. Chemical resistance
D. Design strength
E. Complete resistance to corrosion
F. None of the Above

108. A CPVC pipe can be used only in cold-water systems with temperatures up to 110°F.
A. True
B. False

109. Which of the following terms and economy makes plastic pipe popular for use in either water distribution and supply systems or sewer drainage systems?
A. Ease of installation
B. Working pressure
C. Chemical resistance
D. Stamped on the outside
E. Complete resistance to corrosion
F. None of the Above

110. You will want to date and collect coupons or tap cut-outs to determine the condition of the pipe or?
A. Ease of installation
B. Measure the corrosion
C. Chemical resistance
D. Measure the shock load
E. Determine the C Factor
F. None of the Above

**Plastic Pipe (PVC)**

111. A main advantage of PVC piping is its lightweight, allowing for?
A. Easy installation
B. Measure the corrosion
C. Chemical resistance
D. Measure the shock load
E. Determine the C Factor
F. None of the Above

112. Since PVC is non-metallic, a tracer wire must be installed with the PVC water main so that it can be located after burial.
A. True
B. False

113. The National Sanitation Foundation currently lists most brands of PVC pipe as being acceptable for potable water use, this information should be stamped on the outside of the pipe, along with _____ and temperature, diameter and pipe manufacturer.
A. Ease of installation
B. Working pressure
C. Chemical resistance
D. Date and time
E. Expiration
F. None of the Above

114. PVC pipe will have the highest C Factor of all the above pipes, the higher the C factor the?
A. Long life
B. Rougher the interior
C. Been in use for a long time
D. Smoother the pipe
E. Ability to withstand shock loads
F. None of the Above

**Cast Iron (CIP)**

115. CIP can be found in diameters from 3" to 48".
A. True B. False

116. Advantages of CIP are its long life, ability to withstand shock loads and to withstand working pressures up to 120 psi.
A. True B. False

117. DIP can be purchased in 4" to 45" diameters and lengths of 18' to 20'.
A. True B. False

118. DIP was developed to _____ associated with cast iron pipe.
A. Overcome the breakage problems
B. Withstand shock loads
C. Extend the life
D. Provide a High C Factor
E. Be nearly indestructible
F. None of the Above

119. DIP's main advantage is that it is _____by internal or external pressures.
A. Overcome the breakage problems
B. Withstand shock loads
C. Extend the life
D. Provide a High C Factor
E. Nearly indestructible
F. None of the Above

120. It is sometimes protected from highly corrosive soils by wrapping the pipe in plastic sheeting prior to installation, this practice can greatly _____of this type of pipe.
A. Overcome the breakage problems
B. Withstand shock loads
C. Extend the life
D. Provide a High C Factor
E. Be nearly indestructible
F. None of the Above

121. Steel pipe is available in various diameters and in 20' or 21' lengths; its main advantage is the ability to form it into a variety of shapes.
A. True B. False

122. Steel pipe's advantage is that it is able withstand corrosion by both soil and water.
A. True B. False

123. Steel pipe is usually galvanized or dipped in coal-tar enamel and wrapped with coal-tar impregnated felt to reduce?
A. Corrosion problems
B. Bending
C. Costs
D. Good yielding
E. Confusion with other pipes
F. None of the Above

124. From a health standpoint coal-tar products are undergoing scrutiny and it is recommended that the appropriate regulatory agencies be contacted prior to use of this material.
A. True B. False

125. ACP is available in diameters from 3" to 36" and in 13' lengths.
A. True B. False

126. ACP main advantages are its ability to _____ and its excellent hydraulic flow characteristics due to its smoothness.
A. Withstand corrosion D. Transfer less friction
B. Lower C factor E. Brittle and is easily broken
C. Withstand corrosion F. None of the Above

127. ACP main disadvantage is that it is _____ during construction or by shock loading.
A. Very light weight D. Transfer less friction
B. Lower C factor E. Brittle and is easily broken
C. Unable to withstand corrosion F. None of the Above

128. According to the text, ACP has some concern regarding the possible release of asbestos fibers in corrosive water and there has much debate over the health effects of ingested asbestos.
A. True B. False

129. Precautionary measures must be taken to protect water utility workers when cutting, tapping or otherwise handling this type of pipe.
A. True B. False

130. Galvanized pipe is commonly used for the water distributing pipes inside a building to supply hot and cold water to?
A. The fixtures D. To copper fittings
B. Water distributing pipes E. The water heater
C. Inside and outside F. None of the Above

131. Galvanized pipe is manufactured in 21-ft lengths and is coated with zinc the outside only.
A. True B. False

132. Pipe sizes are based on nominal inside diameters, these diameters vary with the thickness of the pipe.
A. True B. False

133. According to the text, outside pipe diameters remain constant so that pipe can be?
A. Hooked to Cpex D. Soldered to copper fittings
B. Flanged E. Threaded for standard fittings
C. Connected to Sharkbites F. None of the Above

134. According to the text, copper is one of the least widely used materials for tubing, this is because it does not rust and is highly resistant to any bending.
A. True B. False

135. K pipe has the thickest walls.
A. True B. False

136. Copper pipe M has the thinnest walls.
A. True B. False

137. Soldering allows all the tubing and fittings to be set in place before the joints are finished.
A. True B. False

138. Type K copper tubing is available in either rigid or flexible and is primarily used for _____in the water distribution systems.
A. Exposed lines D. Straight lengths
B. Underground service E. DVW
C. Rigid (hard temper) F. None of the Above

139. Hard temper tubing is available in 40- or 60-ft coils, while soft tubing comes in 12- and 20-ft straight lengths.
A. True B. False

140. Type L copper tubing is also available in either hard or soft temper and either in coils or?
A. Exposed lines D. Straight lengths
B. Widely used E. Water distribution systems
C. Easier installation F. None of the Above

141. According to the text, soft temper tubing is often used as replacement plumbing because of the tube's flexibility, which allows?
A. Exposed lines D. Straight lengths
B. Widely used E. Water distribution systems
C. Easier installation F. None of the Above

142. Type L copper tubing is widely used in?
A. Exposed lines D. Straight lengths
B. Widely used E. Water distribution systems
C. Easier installation F. None of the Above

143. Type M copper tubing is made in hard temper only and is available in straight lengths of 12 and 20 ft. It has a thin wall and is used for?
A. Branch supplies D. Straight lengths
B. Widely used E. Water distribution systems
C. Easier installation F. None of the Above

144. Type M copper tubing is also used for chilled water systems, for exposed lines in hot-water heating systems, and for?
A. Branch supplies D. Straight lengths
B. Widely used E. Drainage piping

**Waterborne Pathogens and Disease Section**
145. Bacteria, viruses and protozoan that cause disease are known as pathogens.
A. True B. False

146. Most pathogens are generally associated with diseases that _____and affect people in a relatively short amount of time, generally a few days to two weeks.
A. Limits the treatment process D. Will cause fatalities
B. Are mild in nature E. Limit the travel of pathogens
C. Cause intestinal illness F. None of the Above

**How Diseases are Transmitted.**

147. Waterborne pathogens are primarily spread by the?_____.

A. Fecal-oral, or feces-to-mouth, route
B. Dermal to fecal route
C. Oral to fecal route
D. Influenza route
E. Waterborne mishaps
F. None of the Above

148. When infected humans or animals pass the bacteria, viruses, and _____in their stool, pathogens may get into water and spread disease.

A. Fecal Coliform and E coli
B. Protozoa
C. Macroorganisms
D. Cryptosporidiosis
E. Bioslime
F. None of the Above

149. For another person to become infected, he or she must take the pathogen in through the mouth.

A. True B. False

150. _____ means that in nature, it is different from other types of pathogens such as the viruses that cause influenza (the flu) or the bacteria that cause tuberculosis.

A. Fecal Coliform and E coli
B. Giardia lamblia
C. Microorganism(s)
D. Waterborne Pathogen(s)
E. Coliform bacteria
F. None of the Above

151. According to the text, _____are spread by secretions that are coughed or sneezed into the air by an infected person.

A. Fecal Coliform and E coli
B. Giardia lamblia
C. Microorganisms
D. Influenza virus and tuberculosis bacteria
E. Coliform bacteria
F. None of the Above

**Microbes**

152. Coliform bacteria are common in the environment and are considered harmful.

A. True B. False

153. The presence of these bacteria in drinking water indicates that water may be contaminated with germs that can cause disease.

A. True B. False

154. Microbes in human wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms and are caused by?

A. Fecal Coliform and E coli
B. Giardia lamblia
C. Microorganisms
D. Cryptosporidiosis
E. Coliform bacteria
F. None of the Above

155. What is the bacteria whose presence indicates that the water may be contaminated with human or animal wastes?

A. Fecal Coliform and E coli
B. Protozoa
C. Thermophilic
D. Bac-T
E. Coliforinia bacteria
F. None of the Above

156. What is the parasite that enters lakes and rivers through sewage and animal waste? It causes cryptosporidiosis, a mild gastrointestinal disease?
A. Fecal Coliform and E coli
B. Giardia lamblia
C. Microorganisms
D. Cryptosporidiosis
E. Cryptosporidium
F. None of the Above

157. Giardia lamblia is a parasite that enters lakes and rivers through sewage and animal waste. It causes?
A. Fecal Coliform and E coli
B. Gastrointestinal illness
C. Microorganisms
D. Cryptosporidiosis
E. Coliform bacteria
F. None of the Above

**Repeat Sampling**

158. Repeat sampling replaces the old check sampling with a more comprehensive procedure to try to _____areas in the system.
A. Double check the routine sample
B. Identify problem
C. Originate the sampling location
D. Sample
E. Calculate MCL compliance
F. None of the Above

159. According to the text, whenever a Routine Sample is total coliform or fecal coliform present, a set of repeat samples must be collected within how many hours after being notified by the laboratory.
A. 12
B. 24
C. 48
D. 10
E. 2
F. None of the Above

160. Repeat samples must be collected from:
The original sampling location of the?
A. Routine sample
B. Surface water
C. Coliform present sample
D. Sample
E. MCL area
F. None of the Above

161. Within five (5) service connections upstream from the?
A. Routine sample
B. Surface water
C. Original sampling location
D. Sample
E. MCL location
F. None of the Above

162. Within five (5) service connections downstream from the?
A. Routine sample site
B. Surface water location
C. Original sampling location
D. Sample area
E. MCL compliance area
F. None of the Above

163. Samples should be taken elsewhere in the _____or at the wellhead, if necessary.
A. Sewage system
B. Surface system
C. Sampling location
D. Distribution system
E. MCL compliance calculation
F. None of the Above

164. In a very small system if the system has only_____, the repeat samples must be collected from the same sampling location over a four-day period or on the same day.
A. Routine water
B. Surface water
C. One sampling location
D. One service connection
E. MCL compliance zone
F. None of the Above

165. If a repeat sample is necessary, all repeat samples are included in the?
A. Routine sample
B. Surface water
C. Original sampling location
D. Sample
E. MCL compliance calculation
F. None of the Above

166. Generally speaking, and depending on your State, if a system which normally collects fewer than five (5) routine samples per month has a coliform present sample; it must collect five (5) routine samples the following _____regardless of whether a MCL violation occurred or if repeat sampling was coliform absent.
A. Week
B. Hour
C. Immediately
D. Day
E. Month or quarter
F. None of the Above

**Positive or Coliform Present Results**
167. According to the text, if you are notified of a positive test result you need to contact either the Drinking Water Program or your local county health department within 24 hours, or by the next business day after the?
A. Results are reported to you
B. Positive violation
C. Repeat sampling immediately
D. Sample violation
E. MCL compliance violation
F. None of the Above

168. Ideally speaking, your Drinking Water Program Agency should contract with health departments to provide _____to water systems.
A. Assistance
B. Harassment
C. Hostility
D. Sample help
E. Compliance calculation
F. None of the Above

169. Hopefully after you have contacted an agency for assistance, you will be instructed as to the proper repeat sampling procedures and possible corrective measures for solving the problem. It is very important to initiate the _____as the corrective measures will be based on those results.
A. Storage and distribution
B. Repeat sampling immediately
C. Upgrading of the wellhead area
D. Perform routine procedures
E. Corrective measures
F. None of the Above

**Some examples of typical corrective measures to coliform problems are:**
170. Shock chlorination of a ground water well. The recommended dose of 5% household bleach is 2 cups per 100 gallons of water in the well. This should be done anytime the bell is opened for repair (pump replacement, etc.). If you plan to_____, calculate the total gallonage of storage and distribution.
A. Shock the entire system
B. Repeat sampling immediately
C. Drink the water
D. Perform routine cleaning
E. Perform corrective measures
F. None of the Above

171. Which term is to meet current construction standards as set your state environmental or health agency?
A. Install storage tanks
B. Repeat sampling immediately
C. Upgrade the wellhead area
D. Perform routine cleaning
E. Install air gaps
F. None of the Above

172. If you_____, review your operation and be sure to maintain a detectable residual (0.2 mg/l free chlorine) at all times in the distribution system.

A. Break out
B. Repeat sampling
C. Upgrade the wellhead area
D. Continuously chlorinate
E. Corrective measures
F. None of the Above

**Heterotrophic Plate Count HPC**

173. Heterotrophic Plate Count (HPC) --- formerly known as the Standard Plate Count, is a procedure for estimating the number of live heterotrophic bacteria and measuring changes during water treatment and distribution in water or in swimming pools.

A. True B. False

174. Colonies may arise from pairs, chains, clusters, or single cells, all of which are included in the which term?

A. Coliform bacteria units
B. MCLs units
C. Standards
D. HPC units
E. Colony-forming units
F. None of the Above

**Total Coliforms**

175. This MCL is based on the presence of total coliforms, and compliance is on a daily or weekly basis, depending on your water system type and state rule.

A. True B. False

176. For systems that collect fewer than _____ samples per month, no more than one sample per month may be positive. In other words, the second positive result (repeat or routine) in a month or quarter results in a MCL violation.

A. 5
B. 10
C. 100
D. 200
E. 40
F. None of the Above

177. For systems which collect _____ or more samples per month, no more than five (5) percent may be Positive, check with your state drinking water section or health department for further instructions.

A. 5
B. 10
C. 100
D. 200
E. 40
F. None of the Above

**Acute Risk to Health (Fecal coliforms and E. coli)**

178. Which term is used if a human health violation occurs if either one of the following happens: (Questions # 179-182)

A. Routine analysis
B. Drinking violation
C. Acute risk
D. Human health violation
E. Fecal coliform or E. coli is present
F. None of the Above

179. A routine analysis shows total coliform present and is followed by a repeat analysis which indicates _____.

A. Routine analysis
B. Drinking violation
C. Water penalty
D. Human health violation
E. Fecal coliform or E. coli present
F. None of the Above

180. A routine analysis shows total and _____ is followed by a repeat analysis that indicates total coliform present.
A. Routine analysis
B. Drinking water violation
C. MCL violation
D. Human health violations
E. Fecal coliform or E. coli present
F. None of the Above

181. A(n) _____requires the water system to provide public notice via radio and television stations in the area.
A. Routine analysis violation
B. Drinking water rule violation
C. MCL violation
D. Human health violation
E. Acute health risk violation
F. None of the Above

182. According to the text, the type of contamination can pose an immediate threat to human health and notice must be given as soon as possible, but no later than 24 hours after notification from your laboratory of the test results.
A. True B. False

**Public Notice**
183. A public notice is required to be issued by a water system whenever it fails to comply with an applicable MCL or_____, or fails to comply with the requirements of any scheduled variance or permit.
A. Routine analysis
B. Drinking water rule
C. Treatment technique
D. Human health violation
E. Fecal coliform or E. coli present
F. None of the Above

**The following are acute violations:**
184. Which is violation of nitrate?
A. Presence
B. MCL
C. MCLG
D. Count(s)
E. Acute violation(s)
F. None of the Above

185. Concerning total coliforms - when fecal coliforms or E. coli are present in the distribution system and is a violation of the?
A. Presence
B. MCL
C. MCLG
D. Count (s)
E. Acute violations
F. None of the Above

186. Any outbreak of _____, as defined by the rules.
A. Total coliforms
B. MCL
C. Waterborne disease
D. Radioactive bacteria
E. Acute violations
F. None of the Above

**Groundwater Production and Treatment System**
**Groundwater and Wells**
187. According to the text, toxic material spilled or dumped near a well can leach into which of the following terms and contaminate the groundwater drawn from that well?
A. Unconfined aquifer(s)
B. Groundwater
C. Water table
D. Well(s)
E. Aquifer
F. None of the Above

**Contaminated Wells**

188. Which of the following terms can be tested to see what chemicals may be in the well and if they are present in dangerous quantities?

A. Wells
B. Drinking water
C. Water table
D. Soil moisture
E. Karst
F. None of the Above

189. Groundwater is withdrawn from wells to provide water when water is pumped from the ground, which of the following terms change in response to this withdrawal?

A. Dynamics of groundwater flow
B. Groundwater
C. Water table
D. Well(s)
E. Aquifer
F. None of the Above

190. Which of the following terms flows slowly through water-bearing formations at different rates?

A. Well
B. Drinking water
C. Water table
D. Soil moisture
E. Groundwater
F. None of the Above

**Aquifer**

191. Many terms are used to describe the nature and extent of the groundwater resource, the level below which all the spaces are filled with water is called the?

A. Unconfined aquifer(s)
B. Groundwater
C. Water table
D. Well(s)
E. Aquifer
F. None of the Above

192. Above the water table lies the?

A. Unsaturated zone
B. Drinking water
C. Water table
D. Soil moisture
E. Karst
F. None of the Above

193. The entire region below the water table is called the saturated zone and water in this saturated zone is called?

A. Unconfined aquifer(s)
B. Groundwater
C. Water table
D. Well(s)
E. Aquifer
F. None of the Above

194. Which of the following terms are cracks, joints, or fractures in solid rock, through which groundwater moves?

A. Fractured aquifer(s)
B. Drinking water
C. Water table
D. Soil moisture
E. Karst
F. None of the Above

195. Limestone is often located in which of the following terms?

A. Unconfined aquifer(s)
B. Groundwater
C. Water table
D. Fractured aquifer(s)
E. Aquifer
F. None of the Above

196. Which of the following terms such as sandstone may become so highly cemented or recrystalized that all of the original space is filled. In this case, the rock is no longer a porous medium?
A. Unconfined aquifer(s) D. Fractured aquifer(s)
B. Groundwater E. Aquifer
C. Porous media F. None of the Above

197. Clay has many spaces between its grains, but the spaces are not large enough to permit free movement of water.
A. True B. False

198. Which of the following terms usually flows downhill with the slope of the water table?
A. Well D. Soil moisture
B. Drinking water E. Groundwater
C. Water table F. None of the Above

199. Which of the following terms flow in the aquifers underlying springs or surface drainage basins, and does not always mirror the flow of water on the surface?
A. Well D. Soil moisture
B. Drinking water E. Groundwater
C. Water table F. None of the Above

200. Which of the following terms may move in different directions below the ground than the water flowing on the surface?
A. Well D. Soil moisture
B. Drinking water E. Groundwater
C. Water table F. None of the Above

201. Unconfined aquifers are those that are bounded by the water table. Some aquifers lie beneath layers of impermeable materials.
A. True B. False

202. A well in such an aquifer is called an artesian well.
A. True B. False

203. Which of the following terms is the level to which the water in an artesian aquifer will rise?
A. Unconfined aquifer(s) D. Well(s)
B. Piezometric surface E. Aquifer
C. Water table F. None of the Above

**Cone of Depression**
204. When pumping begins, water begins to flow towards the well in contrast to the natural direction of groundwater movement.
A. True B. False

205. The movement of water from _____ into a well results in the formation of a cone of depression.
A. Confined aquifer D. Water table
B. An aquifer E. Unconfined aquifer
C. Hydrologic cycle F. None of the Above

206. Which of the following terms describes a three-dimensional inverted cone surrounding the well that represents the volume of water removed as a result of pumping?
A. Water table D. Cone of depression
B. Groundwater E. Well
C. Gravity F. None of the Above

207. Which of the following terms is the vertical drop in the height between the water level in the well prior to pumping and the water level in the well during pumping?
A. Water table D. Cone of depression
B. Groundwater E. Well
C. Drawdown F. None of the Above

208. When a well is installed in this missing term, water moves from the aquifer into the well through small holes or slits in the well casing or, in some types of wells, through the open bottom of the well?
A. Confined aquifer D. Water table
B. Aquifer(s) E. An unconfined aquifer
C. Hydrologic cycle F. None of the Above

**Where Is Ground Water Stored?**
209. Areas where ground water exists in sufficient quantities to supply wells or springs are called aquifers, a term that literally means?
A. Water table D. Cone of depression
B. Groundwater E. Well
C. Water bearer F. None of the Above

210. Which of the following terms store water in the spaces between particles of sand, gravel, soil, and rock as well as cracks, pores, and channels in relatively solid rocks?
A. Confined aquifer D. Water table
B. Aquifer(s) E. Unconfined aquifer
C. Hydrologic cycle F. None of the Above

211. Which of the following terms is controlled largely by its porosity, or the relative amount of open space present to hold water?
A. Water table D. Cone of depression
B. Groundwater E. Well
C. An aquifer's storage capacity F. None of the Above

212. There are two kinds of aquifers: confined and unconfined.
A. True B. False

213. Which of the following terms are frequently found at greater depths than unconfined aquifers?
A. Confined aquifer(s) D. Water table
B. Aquifer(s) E. Unconfined aquifer
C. Hydrologic cycle F. None of the Above

**Does Ground Water Move?**
214. Ground water can move sideways as well as up or down. This movement is in response to gravity, differences in elevation, and?
A. Synthetic organic chemical(s) D. Ground-water contamination
B. Differences in pressure E. Septic tanks, cesspools, and privies
C. Permeable zones F. None of the Above

215. Ground water can move even more rapidly in karst aquifers, which are areas in which missing term and similar rocks where fractures or cracks have been widened by the action of the ground water to form sinkholes, tunnels, or even caves?

A. Contaminant(s)
B. Saturated zone
C. Karst aquifer(s)
D. Water soluble limestone
E. Serious contamination source(s)
F. None of the Above

**Ground-Water Quality**

216. The layers of soil and particles of sand, gravel, crushed rocks, and larger rocks were thought to act as filters, trapping contaminants before they could reach the ground water.

A. True B. False

**How Does Ground Water Become Contaminated?**

217. Ground-water contamination can originate on the surface of the ground, in the ground above the water table, or in the ground below the?

A. Synthetic organic chemical(s)
B. Ground water
C. Permeable zones
D. Ground-water contamination
E. Water table
F. None of the Above

218. If the contaminant is introduced directly into the area below _____, the primary process that can affect the impact of the contaminant is dilution by the surrounding ground water.

A. Contaminant(s)
B. Saturated zone
C. Karst aquifer(s)
D. Saturated zone
E. Water table
F. None of the Above

**What Kinds of Substances Can Contaminate Groundwater, and Where Do They Come from?**

219. Substances that can contaminate this missing term can be divided into two basic categories: substances that occur naturally and substances produced or introduced by man's activities.

A. Synthetic organic chemical(s)
B. Ground water
C. Permeable zones
D. Ground-water contamination
E. Septic tanks, cesspools, and privies
F. None of the Above

220. A significant number of today's ground-water contamination problems stem from man's activities and can be introduced into ground water from?

A. Contaminant(s)
B. Saturated zone
C. A variety of sources
D. Iron, calcium, and selenium
E. Serious contamination source(s)
F. None of the Above

221. Agricultural activities also can make significant contributions to this missing term contamination with the millions of tons of fertilizers and pesticides spread on the ground and from the storage and disposal of livestock wastes.

A. Synthetic organic chemical(s)
B. Ground water
C. Permeable zones
D. Ground-water
E. Septic tanks, cesspools, and privies
F. None of the Above

**Depth to the Aquifer**

222. It is important to know the type of geologic materials that occur from the surface down to the top of the?

A. Aquifer
B. Hydraulic head
C. Geologic materials
D. Amount of recharge to the aquifer
E. Ground water
F. None of the Above

**Nature of the Aquifer**

223. An unconfined aquifer has which missing term as its upper surface; there are no significant low-permeability layers between the water table and the surface?

A. Hydraulic head
B. Water table
C. A confined aquifer
D. Hydraulic conductivity
E. Permeability, or hydraulic conductivity
F. None of the Above

224. According to the text, the top of the aquifer, can rise or fall depending on water use and amount of recharge to the aquifer and is called?

A. Aquifer (porosity)
B. Hydraulic head
C. Geologic materials
D. Water table
E. Ground water
F. None of the Above

225. Which of the following terms has a low-permeability geologic formation as its upper boundary?

A. Hydraulic head
B. An aquifer
C. A confined aquifer
D. Hydraulic conductivity
E. Permeability, or hydraulic conductivity
F. None of the Above

**Hydraulic Head (h)**

226. According to the text, the hydraulic head is a measure of the water at a certain depth possesses because of its elevation and the pressure exerted through the weight of the water above it.

A. True B. False

227. Hydraulic head is the driving force for ground water movement either in a horizontal or vertical direction.

A. True B. False

**Aquifer Porosity (n)**

228. The volume of open space relative to the _____and the degree to which these pore spaces are interconnected controls the volume of water in the aquifer and the amount of water that can be reasonably withdrawn from the aquifer.

A. Total volume of the aquifer (porosity)
B. Hydraulic head
C. Geologic materials
D. Amount of recharge to the aquifer
E. Ground water
F. None of the Above

**Permeability of the Aquifer (K)**

229. Which of the following terms or the permeability of the aquifer is a measure of how fast ground water can move through the aquifer?

A. Hydraulic head
B. An aquifer
C. A confined aquifer
D. Conductivity
E. Hydraulic conductivity
F. None of the Above

230. Which of the following terms has units of distance/time, e.g., feet/day, although it does not represent an actual speed?

A. Hydraulic head
B. An aquifer
C. A confined aquifer
D. Hydraulic conductivity
E. Permeability
F. None of the Above

**In What Direction Is Groundwater Flowing?**

231. The direction of ground water flow is from higher to lower?

A. Aquifer (porosity)
B. Hydraulic head
C. Geologic materials
D. Amount of recharge to the aquifer
E. Ground water
F. None of the Above

232. Which of the following terms can be measured by lowering a probe through the observation port of a number of wells, all within the same relative time period?

A. Hydraulic head
B. An aquifer
C. A confined aquifer
D. Hydraulic conductivity
E. Permeability, or hydraulic conductivity
F. None of the Above

**What Is the Drawdown Associated with Pumping of a Well?**

233. There is a relation between the pumping rate of the well, the transmissivity of the aquifer, the distance between wells, this missing term, and the duration of the pumping event.

A. Aquifer (porosity)
B. Hydraulic head
C. Geologic materials
D. Amount of recharge to the aquifer
E. Storage coefficient of the aquifer
F. None of the Above

**Depth to First Water-Bearing Zone**

234. Some report the depth at which water is first encountered in?

A. The drill hole
B. SWL
C. The yield
D. Recharge and discharge zone(s)
E. Hydrogeologic investigation(s)
F. None of the Above

**Static Water Level**

235. The driving force for ground water movement is the hydraulic head, and the _____ is a measure of that force.

A. Static water level (SWL)
B. Data on the well report
C. Local ground water systems
D. Perforated portions of cased wells
E. Weak (fractured) zones
F. None of the Above

236. Identifying where one aquifer ends and another begins is key to identifying the source of the yield for individual wells. Although this often can be determined by careful review of the lithologic log provided by the well constructor, the transition from one aquifer to the next can be indicated by a marked change in the recharge and discharge zones

A. True B. False

237. Which of the following terms is a better indicator that a different aquifer has been encountered than the lithologic description?

A. Drill hole
B. SWL
C. The yield
D. Recharge and discharge zone(s)
E. Hydrogeologic investigation(s)
F. None of the Above

238. Which of the following terms have important implications in ground water protection and identifying the relation between area ground water and local streams?

A. Weak (fractured) zones
B. SWL
C. The yield
D. Recharge and discharge zone(s)
E. Hydrogeologic investigation(s)
F. None of the Above

**Water-Bearing Zones**

239. In some cases, the screened or perforated portions of cased wells provide a clue, but all too often, the screened interval is either significantly less than the actual static water level.

A. True B. False

240. Arriving at accurate estimates of aquifer parameters or calculating ground water velocity requires us to know the thickness of the?

A. Water-bearing zone(s)
B. SWL
C. Yield
D. Recharge and discharge zone(s)
E. Hydrogeologic investigation(s)
F. None of the Above

**Lithologic Log**

241. The well log portion of the well report describes what the driller encountered in the subsurface.

A. True B. False

**Contributions of Well Constructors to Hydrogeology**

242. This document stresses the importance of data that is recorded on well reports and how that data influences hydrogeologic investigations.

A. True B. False

243. Well constructors can provide important contributions to the science by making careful observations and measurements when recording that data on the?

A. Static water level
B. Well report
C. Local ground water systems
D. Perforated portions of cased wells
E. Weak (fractured) zones
F. None of the Above

**How Wells Are Drilled**

244. A few examples of today's more common well drilling methods include rotary, auger, and cable tool with?

A. Many variations of each
B. Typical drilling fluid(s)
C. Advanced methods
D. A highly trained and skilled driller
E. Today's more common well drilling methods
F. None of the Above

245. Drilling fluids are often used during drilling in order to keep the borehole open while drilling is done.

A. True B. False

246. Typical drilling fluids may be water, mud, air, chemical or natural additives, or combinations of each.

A. True B. False

**Basic Rotary Drilling Methods**

247. Rotary drilling utilizes two methods that include: direct and reverse mud rotary, direct air rotary, and?

A. Rotary drilling
B. Typical drilling fluid(s)
C. Advanced methods
D. Drill through casing driver methods
E. Today's more common well drilling methods
F. None of the Above

**The Rotary Drill String**

248. Rotary drilling methods use a drill string, which typically consists of a bit, collar, drill pipe and?
A. The drill collar D. Shock absorber (floating sub)
B. Drag bit(s) E. A kelly
C. Roller bit(s) F. None of the Above

249. Which of the following terms is a section of heavy walled pipe that can be hexagonal, square, or rounded with grooves?
A. The flighting D. A kelly
B. The plug E. The cutting head
C. The bucket F. None of the Above

250. Which of the following terms is several feet longer than the drill pipe being used and fits into the table drive much like the splines on a drive shaft fit into a transmission?
A. Drilling method D. A sub
B. The Kelly E. Rotary bit
C. The table drive F. None of the Above

251. Some rotary rigs use a top drive to turn _____ and are like a drill press.
A. The drill collar D. Shock absorber (floating sub)
B. Drag bit(s) E. The drill string
C. Roller bit(s) F. None of the Above

252. Drill pipe can be used in various lengths but are typically 20-foot sections and may be connected to the drive unit with?
A. Drilling method D. A sub
B. The Kelly E. Rotary bit
C. The table drive F. None of the Above

253. A sub is a length of pipe used to connect pipes and/or act as shock absorber (between the drill pipes and drive unit, at the end of the drill pipe is?
A. The drill collar D. Shock absorber
B. Drag bit(s) E. The kelly
C. Roller bit(s) F. None of the Above

254. Which of the following terms or stabilizer is typically very heavy and is often gauged close to the diameter of the bit being used?
A. Drilling method D. The drill collar
B. The Kelly E. Rotary bit
C. The table drive F. None of the Above

255. Which of the following terms aids in maintaining a consistent borehole diameter and primarily helps to prevent borehole deviation?
A. The drill collar D. Shock absorber (floating sub)
B. Drag bit(s) E. The kelly
C. Roller bit(s) F. None of the Above

256. Several types of bits may be used; such as drag bits or?
A. The flighting
B. The plug
C. Roller bits
D. A telescoping kelly
E. The cutting head
F. None of the Above

257. Which of the following terms are used in unconsolidated to semi-consolidated sand, silt, and clay-rich formations?
A. The drill collar
B. Drag bit(s)
C. Roller bit(s)
D. Shock absorber (floating sub)
E. The kelly
F. None of the Above

**Chlorine Section**
**Pathophysiology**
258. As far as chlorine safety and respiratory protection, the intermediate _____of chlorine accounts for its effect on the upper airway and the lower respiratory tract.
A. Generation of free oxygen radicals
B. Vapor from Chlorine gas
C. Effects of Hydrochloric acid
D. Water solubility
E. The odor threshold for chlorine
F. None of the Above

259. According to the text, respiratory exposure to _____ may be prolonged because its moderate water solubility may not cause upper airway symptoms for several minutes.
A. Hydrochloric acid
B. Chlorine gas
C. The gas
D. The chemical species produced
E. Plasma exudation
F. None of the Above

260. Because chlorine gas is so dangerous, the odor threshold for chlorine is approximately?
A. 1 parts per million (ppm)
B. 3 parts per million (ppm)
C. 10 parts per million (ppm)
D. 3-5 parts per million (ppm)
E. 0.3-0.5 parts per million (ppm)
F. None of the Above

**Mechanism of Activity**
261. The mechanisms of cellular injury are believed to result from the oxidation of functional groups in cell components, from reactions with tissue water to form_____, and from the generation of free oxygen radicals.
A. Generation of free oxygen radicals
B. Chlorine acid
C. Hydrochloric acid
D. A caustic effect
E. Hypochlorous and hydrochloric acid
F. None of the Above

262. Chlorine gas feeds out of the cylinder through a gas regulator. The cylinders are on a scale that operators use to measure the amount used each day.
A. True B. False

263. Chlorine gas should be stored in vented rooms that have panic bar equipped doors.
A. True B. False

**Solubility Effects**
264. Which of the following terms is highly soluble in water?
A. Hydrochloric acid
B. H2SO4
C. Hypochloric acid
D. Sodium hypochlorite solution
E. Sulfuric Acid
F. None of the Above

265. Because it is highly water soluble, Hypochlorous acid has an injury pattern similar to?
A. Hydrochloric acid
B. H2SO4
C. Hypochloric acid
D. Sodium hypochlorite solution
E. Sulfuric Acid
F. None of the Above

266. Which of the following terms may account for the toxicity of elemental chlorine and hydrochloric acid to the human body?
A. Hydrochloric acid
B. H2SO4
C. Hypochloric acid
D. Hypochlorous acid
E. Sulfuric Acid
F. None of the Above

**Early Response to Chlorine Gas**

267. If you mix ammonia with chlorine gas, this compound reacts to form?
A. Hypochlorous acid
B. Chlorine gas
C. Hydrochloric acid
D. Sulfuric acid
E. Chloramine gas
F. None of the Above

268. Chlorine is a highly reactive gas.
A. True B. False

269. According to the text, treatment plants use _____to reduce water levels of microorganisms that can spread disease to humans.
A. HCl
B. HOCl
C. High chlorine concentrations
D. Chlorine
E. The hypochlorite ion (OCl-)
F. None of the Above

270. Chlorine gas is greenish yellow in color and very toxic.
A. True B. False

271. Chlorine gas is sold as a compressed liquid, which is amber in color.
A. True B. False

272. Different amounts of chlorine gas are used depending on the quality of water that needs to be treated. If the water quality is good, a higher concentration of chlorine gas will be required to disinfect the water if the contact time cannot be increased.
A. True B. False

**Chemistry of Chlorination**

273. The hypochlorite ion is a much weaker disinfecting agent than Hypochlorous acid, about 100 times less effective.
A. True B. False

274. According to the text, pH and temperature affect the ratio of hypochlorous acid to hypochlorite ions. As the temperature is decreased, the _____increases.
A. Reduction Ratio
B. CT actual
C. Free chlorine residual
D. "CT" disinfection concept
E. Ratio of hypochlorous acid
F. None of the Above

275. Under normal water conditions, hypochlorous acid will also chemically react and break down into the hypochlorite ion.
A. True B. False

276. Temperature plays a small part in the acid ratio. Although the ratio of _____is greater at lower temperatures, pathogenic organisms are actually harder to kill.
A. Hypochlorous acid D. Total chlorine
B. The amount of chlorine E. pH value and temperature
C. Chlorine Demand F. None of the Above

277. If all other things were equal, _____ and a lower pH are more conducive to chlorine disinfection.
A. Lower pH D. Lower water temperature
B. Hypochlorous acid E. The hypochlorite ion
C. Higher water temperatures F. None of the Above

278. Hypochlorous acid is a strong acid but a weak disinfecting agent. The amount of hypochlorous acid depends on the pH and temperature of the water.
A. True B. False

**Types of Residual**
279. Which of the following answers is all the chlorine that is available for disinfection?
A. Chlorine residual D. Break-point chlorination
B. Chlorine demand E. Total chlorine
C. Free chlorine F. None of the Above

280. Total chlorine residual = free +_____.
A. Chlorine residual D. Combined chlorine residual
B. Chlorine demand E. Total chlorine residual
C. Free chlorine F. None of the Above

**Chlorination Equipment Requirement Section**
281. A chlorine room is where chlorine gas cylinders and/or ton containers are?
A. Under pressure D. At the point of solution application
B. In this stage E. Dosing enough chlorine
C. Stored F. None of the Above

282. Which of the following shall also be located inside the chlorine room?
A. Gas vacuum line D. Mechanical gas proportioning equipment
B. Vacuum regulators E. Injectors
C. Manual chlorine feed systems F. None of the Above

283. Which of the following, which is the mechanical gas proportioning equipment, may or may not be located inside the chlorine room?
A. Gas vacuum line D. The chlorinator
B. Vacuum regulators E. Injectors
C. Manual chlorine feed systems F. None of the Above

284. Which of the following should be located to minimize the length of pressurized chlorine solution lines?
A. Gas vacuum line D. Mechanical gas proportioning equipment
B. Vacuum regulators E. Injectors
C. Manual chlorine feed systems F. None of the Above

285. Which of the following shall be included in the gas vacuum line between the vacuum regulator(s) and the chlorinator(s) to ensure that pressurized chlorine gas does not enter the gas vacuum lines leaving the chlorine room?

A. Gas vacuum line
B. A gas pressure relief system
C. Manual chlorine feed systems
D. Mechanical gas proportioning equipment
E. Post chlorination
F. None of the Above

286. Which of the following shall have positive shutdown in the event of a break in the downstream vacuum lines?

A. Gas vacuum line
B. A gas pressure relief system
C. Manual chlorine feed systems
D. Mechanical gas proportioning equipment
E. The vacuum regulating valve(s)
F. None of the Above

287. Anti-siphon valves shall be incorporated in the _____or in the discharge piping.

A. Gas vacuum line
B. A gas pressure relief system
C. Manual chlorine feed systems
D. Mechanical gas proportioning equipment
E. Pump heads
F. None of the Above

288. Which of the following shall have the capacity to dose enough chlorine to overcome the demand and maintain the required concentration of the "free" or "combined" chlorine.

A. The chlorinator
B. Constant flow rate(s)
C. Uninterrupted chlorination
D. Automatic proportional controlled
E. Constant pre-established dosage
F. None of the Above

289. Which of the following shall be automatic proportional controlled, automatic residual controlled, or compound loop controlled?

A. A chlorine feed system
B. Constant flow rate(s)
C. Uninterrupted chlorination
D. Automatic proportional controlled
E. Constant pre-established dosage
F. None of the Above

290. Which piece of chlorination equipment adjusts the chlorine feed rate automatically in accordance with the flow changes to provide a constant pre-established dosage for all rates of flow?

A. Manual chlorine feed systems
B. Constant flow rate(s)
C. Uninterrupted chlorination
D. Automatic proportional controlled
E. Constant pre-established dosage
F. None of the Above

291. Which piece if chlorination equipment, the feed rate of the chlorinator is controlled by a flow proportional signal and a residual analyzer signal to maintain particular chlorine residual in the water?

A. Gas vacuum line
B. Compound loop control system
C. Manual chlorine feed systems
D. Mechanical gas proportioning equipment
E. After post chlorination
F. None of the Above

292. Which piece if chlorination equipment may be installed for groundwater systems with constant flow rates?

A. Manual chlorine feed systems
B. Constant flow rate(s)
C. Uninterrupted chlorination
D. Automatic proportional controlled
E. Constant pre-established dosage
F. None of the Above

**Standby Provision**

293. As a safeguard against_____ , standby chlorination equipment having the capacity to replace the largest unit shall be provided.

A. Flow change(s)
B. Constant flow rate(s)
C. Uninterrupted chlorination
D. Malfunction and/or shut-down
E. Constant pre-established dosage
F. None of the Above

294. For uninterrupted chlorination, _____shall be equipped with an automatic changeover system. In addition, spare parts shall be available for all chlorinators.

A. Flow change(s)
B. Constant flow rate(s)
C. Gas chlorinators
D. Automatic proportional controlled
E. Constant pre-established dosage
F. None of the Above

295. Scales for weighing cylinders shall be provided at all plants using chlorine gas to permit an accurate reading of total daily weight of chlorine used.

A. True B. False

**Securing Cylinders**

296. All chlorine cylinders shall be securely positioned to safeguard against movement. Tag the cylinder "empty" and store flat and chained. Ton containers may be stacked.

A. True B. False

**Chlorine Leak Detection**

297. Which of the following related chlorine alarm equipment shall be installed at all water treatment plants using chlorine gas? Leak detection shall be provided for the chlorine rooms.

A. Caustic soda solution reaction tanks
B. Corrosion resistant
C. Securely positioned
D. Automatic chlorine leak detection
E. Chlorine room ventilation system
F. None of the Above

298. Which of the following related chlorine alarm equipment should be connected to a remote audible and visual alarm system and checked on a regular basis to verify proper operation.

A. The chlorinator
B. The facility
C. All chlorine cylinders
D. The chlorine gas leakage
E. Chlorine leak detection equipment
F. None of the Above

299. Which of the following related chlorine alarm equipment shall not automatically activate the chlorine room ventilation system in such a manner as to discharge chlorine gas.

A. Caustic soda solution reaction tanks
B. Corrosion resistant
C. Leak detection equipment
D. Automatic chlorine leak detection
E. Chlorine room ventilation system
F. None of the Above

300. During an emergency, if the chlorine room is occupied, the chlorine gas leakage shall be contained within the chlorine room itself in order to facilitate a proper method of clean-up.

A. True B. False

**Chlorine Room Design Requirements**

301. Where gas chlorination is practiced, the gas cylinders and/or the ton containers up to the vacuum regulators shall be housed in a gas-tight, well illuminated, corrosion resistant and?

A. Mechanically ventilated enclosure
B. Corrosion resistant
C. Securely positioned
D. Automatic chlorine leak detection
E. Chlorine room ventilation system
F. None of the Above

302. The chlorinator may or may not be located inside?
A. The chlorinator
B. The facility
C. All chlorine cylinders
D. The chlorine room
E. Chlorine leak detection equipment
F. None of the Above

**Ventilation**

303. Which chlorine safety related equipment term shall have entirely separate exhaust ventilation systems capable of delivering one (1) complete air change per minute during periods of chlorine room occupancy only?
A. Shut off
B. The chlorine room
C. The room
D. Automatic chlorine leak detection
E. Chlorine room ventilation system
F. None of the Above

304. Which chlorine safety related equipment term should be louvered near the ceiling, the air being of such temperature as to not adversely affect the chlorination equipment?
A. The ceiling
B. The chlorine room
C. Air inlets
D. Automatic chlorine leak detection
E. Chlorine room ventilation system
F. None of the Above

305. Which chlorine safety related equipment term should be outside the room at all entrance or viewing points, and a clear wire-reinforced glass window shall be installed in such a manner as to allow the operator to inspect from the outside of the room?
A. Gas chlorine room
B. The chlorine room
C. Chlorine room ventilation system
D. Automatic chlorine leak detection
E. Separate switches for fans and lights
F. None of the Above

**Heating**

306. Chlorine rooms shall have_____, if a forced air system is used to heat the building.
A. Gas chlorine room
B. Separate heating systems
C. The room
D. Automatic chlorine leak detection
E. Chlorine room ventilation system
F. None of the Above

307. Which chlorine safety related equipment term shall be protected to ensure that the chlorine maintains its gaseous state when entering the chlorinator.
A. Cylinders or containers
B. Corrosion resistant
C. Securely positioned
D. Automatic chlorine leak detection
E. Chlorine room ventilation system
F. None of the Above

**Storage of Chlorine Cylinders**

308. If necessary, _____may be provided to simply store the chlorine gas cylinders, with no connection to the line. The chlorine cylinder storage room shall have access either to the chlorine room or from the plant exterior, and arranged to prevent the uncontrolled release of spilled gas.
A. Cylinders or containers
B. The outside of the room
C. A separate storage room
D. Uncontrolled release of spilled gas
E. Air inlets
F. None of the Above

309. Which chlorine safety related equipment term shall have provision for ventilation at thirty air changes per hour?
A. A panic button
B. The chlorine room
C. Scrubber(s)
D. The chlorine gas storage room
E. The chlorine cylinder storage room
F. None of the Above

310. Sometimes entry in very large facilities, may be through a vestibule from outside in to?
A. Cylinders or containers access
B. The outside of the room
C. Chlorine rooms
D. Uncontrolled release of spilled gas
E. Air inlets
F. None of the Above

**Scrubbers**

311. According to the text, facilities located within residential or densely populated areas, consideration shall be given to provide scrubbers for?
A. A panic button
B. The chlorine room
C. Scrubber(s)
D. The chlorine gas storage room
E. The chlorine cylinder storage room
F. None of the Above

312. Chlorine combines with a wide variety of materials. These side reactions complicate the use of chlorine for disinfecting purposes. Their _____must be satisfied before chlorine becomes available to accomplish disinfection.
A. Combined residual
B. Free chlorine residual
C. Demand for chlorine
D. Total chlorine
E. Free chlorine
F. None of the Above

313. Which term means the amount of chlorine required to produce a residual of 0.1 mg/l after a contact time of fifteen minutes as measured by Iodometric method of a sample at a temperature of twenty degrees in conformance with Standard methods?
A. Combined residual
B. Free chlorine residual
C. Chlorine Demand
D. Total chlorine
E. Break point chlorination
F. None of the Above

**Chlorine's Gas Appearance and Odor**

314. Chlorine is a greenish-yellow gas it will condense to an amber liquid at approximately _____F or at high pressures.
A. 32 degrees
B. – 100 degrees
C. 129 degrees
D. 29 degrees
E. -29.2 degrees
F. None of the Above

315. Prolonged exposures to chlorine gas may result in?
A. Exposure to chlorine
B. Odor thresholds
C. A corrosive material
D. Olfactory fatigue
E. Moisture, steam, and water
F. None of the Above

**Chlorine Exposure Limits**

316. OSHA PEL?
A. 10 PPM
B. 1 PPM
C. 00.1 PPM
D. 1,000 PPM
E. 100 PPM
F. None of the Above

317. Physical and chemical properties: A yellowish green, nonflammable and liquefied gas with an unpleasant and irritating smell.
A. Cl3
B. Chlorine
C. HOCl and OCl-
D. Combined Available Chlorine
E. Monochloramine
F. None of the Above

318. This can be readily compressed into a clear, amber-colored liquid, a _____, and a strong oxidizer.
A. Cl2 D. Combined Available Chlorine
B. Cl E. Noncombustible gas
C. HOCl and OCl- F. None of the Above

319. Solid chlorine is about _____ times heavier than water and gaseous chlorine is about 2.5 times heavier than air.
A. 1.5 D. 2.5
B. 1.0 E. 3.0
C. 0.5 F. None of the Above

320. Cl2's IDLH?
A. 10 PPM D. 1,000 PPM
B. 1 PPM E. 100 PPM
C. 00.1 PPM F. None of the Above

321. Cl2's Fatal Exposure Limit?
A. 10 PPM D. 1,000 PPM
B. 1 PPM E. 100 PPM
C. 00.1 PPM F. None of the Above

322. The current Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) for chlorine is 10 PPM (3 milligrams per cubic meter (mg/m (3))) as a ceiling limit. A worker's exposure to chlorine shall at no time exceed this ceiling level.
A. True B. False

323. When using chlorine gas: In addition to protective clothing and goggles, chlorine gas should be used only in a well-ventilated area so that _____ cannot concentrate.
A. Chlorine exposure D. Any leaking gas
B. Connection E. Several safety precautions
C. Leak area F. None of the Above

324. HOCl and OCl-: The OCL- is the hypochlorite ion and both of these species are known as free available chlorine, they are the two main chemical species formed by chlorine in water and they are known collectively as _____and the_____.
A. Hypochlorous acid, Cl2 D. Combined Available Chlorine, Total
B. Hypochlorous acid, Hypochlorite ion E. Monochloramine, Cl2
C. HOCl2 and OCl2 F. None of the Above

325. Which of the following terms when added to water, rapidly hydrolyzes, the chemical equations best describe this reaction is Cl2 + H2O --> H+ + Cl- + HOCl?
A. Chlorine gas D. Combined Available Chlorine
B. Cl E. Monochloramine
C. HOCl and OCl- F. None of the Above

326. Which of the following substances is the most germicidal of the chlorine compounds with the possible exception of chlorine dioxide?
A. Hydrochlorous acid D. Combined Available Chlorine
B. Sulfuric acid E. Monochloramine
C. Hypochlorous acid F. None of the Above

327. Yoke-type connectors should be used on a _____assuming that the threads on the valve may be worn.
A. Chlorine regulator
B. Connection
C. Leak area
D. Protective bonnet
E. Chlorine cylinder's valve
F. None of the Above

328. What is the Atomic number of chlorine?
A. 17 7
B. 17
C. 0.17
D. 17 PPM
E. 23
F. None of the Above

329. _____is the elemental symbol and _____ is the chemical formula.
A. Cl, Cl2
B. Cl2, Cl
C. HOCl and OCl-
D. Chlorine, Cl2
E. Cl2, ClH4
F. None of the Above

330. Monochloramine, _____, and trichloramine are also known as Combined Available Chlorine. Cl2 + NH4.
A. Cl2
B. Dichloramine
C. HOCl and OCl-
D. Combined Available Chlorine
E. Monochloramine
F. None of the Above

**Pump, Motor and Hydraulic Section - Hydraulic Principles Section**

331. 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

332. 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

333. 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

334. 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

335. 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

336. Which of the following terms is about the pressures exerted by a fluid at rest?
A. Pressure D. Hydraulics
B. Hydrostatics E. Flow
C. Hydrokinetics F. None of the Above

337. Which of the following terms is an excellent example of deductive mathematical physics, and in which the predictions agree closely with experiment?
A. Pressure D. Hydraulics
B. Hydrostatics E. Flow
C. Hydrokinetics F. None of the Above

338. Which of the following terms is stated that in a fluid is a substance that cannot resist a shearing stress, so that pressures are normal to confining surfaces?
A. Pressure D. Hydraulics
B. Hydrostatics E. Flow
C. Hydrokinetics F. None of the Above

339. 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

**Barometric Loop**
340. 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

341. Which of the following terms could be measured an absolute scale, pounds per square inch absolute, or gauge scale?
A. Static pressure D. Sea level
B. Pressure E. Atmospheric pressure
C. Gauge pressure F. None of the Above

342. Absolute pressure is equal to gauge pressure plus the atmospheric pressure.
A. True B. False

343. 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

344. The barometric loop is a loop in the piping system that effectively protects against backpressure.
A. True B. False

345. The barometric loop may not be used to protect against backsiphonage.
A. True B. False

346. 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

347. Which of the following terms at sea level is 14.7 psai?
A. Static pressure D. Sea level
B. Pressure E. Atmospheric pressure
C. Gauge pressure F. None of the Above

348. Which of the following terms is the total pressure?
A. Static pressure D. Sea level
B. Absolute pressure E. Atmospheric pressure
C. Gauge pressure F. None of the Above

349. 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

**Pumps**
350. Pumps are excellent examples of?
A. Hydrostatics D. Multi-stage pumps
B. Quasi-static E. Complicated part
C. Oscillating diaphragm F. None of the Above

351. Pumps are of two general types, _____ or positive displacement pumps, and pumps depending on dynamic forces, such as centrifugal pumps.
A. Hydrostatic D. Hydrostatic considerations
B. Quasi-static E. Complicated part
C. Oscillating diaphragm F. None of the Above

352. Positive displacement pumps have a piston (or equivalent) moving in a closely-fitting cylinder and forces are exerted on the fluid by motion of the piston.
A. True B. False

353. More complicated pumps have valves check valves that open to allow _____, and close automatically to prevent reverse flow.
A. Pistons D. Passage in one direction
B. Diaphragms E. Lift pumps
C. Discharged fluid F. None of the Above

354. There are many kinds of_____, and can be the most trouble-prone and complicated part of a pump.
A. Rotors D. Air space
B. Force pumps E. Valves
C. Inlets F. None of the Above

355. According to the text, the force pump has _____in the cylinder, one for supply and the other for delivery.
A. Two check valves D. Cylinders
B. Diaphragms E. Lift pumps
C. Rotors F. None of the Above

356. The supply valve opens when the cylinder_____, the delivery valve when the cylinder volume decreases.
A. Rotor D. Air space
B. Force pump E. Volume increases
C. Volume decreases F. None of the Above

357. According to the text, the lift pump has a _____and a valve in the piston that allows the liquid to pass around it when the volume of the cylinder is reduced.
A. Supply valve D. Cylinder
B. Diaphragm E. Lift pumps
C. Discharged fluid F. None of the Above

358. The delivery in this case is from the upper part of the_____, which the piston does not enter.
A. Rotor D. Air space
B. Force pump E. Cylinder
C. Volume decreases F. None of the Above

359. Diaphragm pumps are force pumps in which the oscillating diaphragm takes the place of the piston.
A. True B. False

**Pump Categories**
360. 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) D. Diaphragm pump(s)
B. Impeller blade(s) E. Cylindrical pump housing
C. Delivery force F. None of the Above

361. Pump operation like with a centrifugal pump — pressure is not referred to in pounds per square inch but rather as the equivalent in elevation, called?
A. Inward force D. Center of the impeller
B. Head E. Incompressible fluid
C. Viscous drag pump F. None of the Above

362. According to the text, pumps may be classified because of the application they serve.
A. True B. False

363. According to the text, all pumps may be divided into two major categories: (1) dynamic and (2)?
A. Centrifugal D. Diaphragm
B. Impeller E. Rotary
C. Displacement F. None of the Above

**Basic Water Pump**
364. According to the text, the centrifugal pumps work by spinning water around in a circle inside a?
A. Vortex D. Center of the impeller
B. Cylinder E. Cylindrical pump housing
C. Viscous drag pump F. None of the Above

365. The pump makes the water spin by pulling it with an impeller.
A. True B. False

366. 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

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

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

369. As the water slows down and its kinetic energy decreases, that water's pressure potential energy increases.
A. True B. False

370. 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

371. The impeller blades cause the water to move faster and faster.
A. True B. False

372. The impellers may be of either a semi-open or closed type.
A. True B. False

373. According to the text, without an inward force, an object will travel in a straight line and will not complete the?
A. Circle D. Center of the impeller
B. Pump pushes E. Incompressible fluid
C. Viscous drag pump F. None of the Above

374. In a centrifugal pump, the inward force is provided by high-pressure water near the outer edge of the?
A. Centrifugal pump(s) D. Diaphragm pump(s)
B. Impeller blade(s) E. Cylindrical pump housing
C. Pump housing F. None of the Above

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

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

**Venturi (Bernoulli's law):**
377. A venturi is a pipe that has a gradual restriction that opens up into a gradual enlargement.
A. True B. False

**Types of Water Pumps**
378. The water production well industry almost exclusively uses Turbine pumps, which are a type of centrifugal pump.
A. True B. False

379. The shaft turns the impellers within the pump housing while the?
A. Spider bearing(s) D. Water moves up the column
B. Horsepower turns the shaft E. Desired pumping rate is obtained
C. Impeller(s) F. None of the Above

380. The rotating shaft in a line shaft turbine is housed within the column pipe that delivers the water to the surface.
A. True B. False

381. The size of the _____are selected based on the desired pumping rate and lift requirements.
A. Spider bearing(s) D. Column, impeller, and bowls
B. Horsepower E. Desired pumping rate
C. Impeller(s) F. None of the Above

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

383. The water passing through the column pipe serves as the lubricant for the bearings.
A. True B. False

384. 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) D. Roller bearings
B. Keyway E. Lantern rings
C. Impeller(s) F. None of the Above

385. Some vertical turbines are lubricated by oil rather than water. These pumps are essentially the same as_____; only the drive shaft is enclosed within an oil tube.
A. Oil tube D. Single or multiple bowls
B. Water lubricated units E. Pump's lifting capacity
C. Column pipe F. None of the Above

386. The oil tube is suspended within the column by_____, while the line shaft is supported within the oil tube by brass or redwood bearings.
A. Oil tube D. Single or multiple bowls
B. Spider flanges E. Pump's lifting capacity
C. Column pipe F. None of the Above

387. A continuous supply of _____the drive shaft as it proceeds downward through the oil tube.
A. Spider bearing(s) D. Turbine pump(s)
B. Oil lubricates E. Desired pumping rate
C. Impeller(s) F. None of the Above

388. A small hole located at the top of the _____allows excess oil to enter the well. This results in the formation of an oil film on the water surface within oil-lubricated wells.
A. Pump bow unit D. Single or multiple bowls
B. Drive shaft E. Pump's lifting capacity
C. Column pipe F. None of the Above

389. Careful operation of oil lubricated turbines is needed to ensure that the pumping levels do not drop enough to allow oil to enter the pump.
A. True B. False

**Common Hydraulic Terms**
390. 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 D. Hydraulics
B. Head, static E. Hydrokinetics
C. Head F. None of the Above

391. Which of the following definitions is often used to indicate gauge pressure?
A. Head, Friction D. Hydraulics
B. Head, static E. Hydrokinetics
C. Head F. None of the Above

392. Which of the following definitions is when the pressure is equal to the height times the density of the liquid?
A. Head, Friction D. Hydraulics
B. Head, static E. Hydrokinetics
C. Head F. None of the Above

393. Which of the following definitions is required to overcome the friction at the interior surface of a conductor and between fluid particles in motion?
A. Head, Friction D. Hydraulics
B. Head, static E. Hydrokinetics
C. Head F. None of the Above

394. Which of the following definitions varies with flow, size, type, and conditions of conductors and fittings, and the fluid characteristics?
A. Head, Friction D. Hydraulics
B. Head, static E. Hydrokinetics
C. Head F. None of the Above

395. Which of the following definitions is the pressure in a fluid at rest?
A. Pressure, Atmospheric D. Pressure, Gauge
B. Pressure, Static E. Pascal's Law
C. Hydraulics F. None of the Above

396. Which of the following definitions is the height of a column or body of fluid above a given point?
A. Head, Friction D. Hydraulics
B. Head, static E. Hydrokinetics
C. Head F. None of the Above

397. Which of the following definitions is the pressure exerted by the atmosphere at any specific location?
A. Pressure, Atmospheric D. Pressure, Gauge
B. Pressure, Static E. Pascal's Law
C. Hydraulics F. None of the Above

**General Pumping Fundamentals**
398. Here are the important points to consider about suction piping when the liquid being pumped is below the level of the pump: Sometimes suction lift is also referred to as 'positive suction head'.
A. True B. False

399. According to the text, suction lift is when the level of water to be pumped is below the?
A. Impeller D. Centerline of the pump
B. Suction E. Bellows
C. Lift water F. None of the Above

400. The suction side of pipe should be one diameter smaller than the pump inlet.
A. True B. False