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

Grading Information

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Wellfield Operator Answer Key

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Wellfield Operator 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.

Groundwater Production and Treatment System
Groundwater and Wells

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

Contaminated Wells

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

3. Groundwater is withdrawn from wells to provide water when water is pumped from the ground, which of the following terms change in response to this withdrawal?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 D. Well(s)
B. Groundwater E. Aquifer
C. Water table F. None of the Above

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

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

Aquifer

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

(S) Means answer may be plural or singular

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

7. The entire region below the water table is called the saturated zone and water in this saturated zone is called?
A. Unconfined aquifer(s) D. Well(s)
B. Groundwater E. Aquifer
C. Water table F. None of the Above

8. Which of the following terms are cracks, joints, or fractures in solid rock, through which groundwater moves?
A. Fractured aquifer(s) D. Soil moisture
B. Drinking water E. Karst
C. Water table F. None of the Above

9. Limestone is often located in which of the following terms?
A. Unconfined aquifer(s) D. Fractured aquifer(s)
B. Groundwater E. Aquifer
C. Water table F. None of the Above

10. 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

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

12. 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

13. 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

14. 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

(S) Means answer may be plural or singular

Cone of Depression

15. The movement of water from which term into a well results in the formation of a cone of depression?

A. Confined aquifer
B. An aquifer
C. Hydrologic cycle
D. Water table
E. Unconfined aquifer
F. None of the Above

16. 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
B. Groundwater
C. Gravity
D. Cone of depression
E. Well
F. None of the Above

17. 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
B. Groundwater
C. Drawdown
D. Cone of depression
E. Well
F. None of the Above

18. 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
B. Aquifer(s)
C. Hydrologic cycle
D. Water table
E. An unconfined aquifer
F. None of the Above

Where Is Ground Water Stored?

19. Areas where ground water exists in sufficient quantities to supply wells or springs are called aquifers, a term that literally means?

A. Water table
B. Groundwater
C. Water bearer
D. Cone of depression
E. Well
F. None of the Above

20. 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
B. Aquifer(s)
C. Hydrologic cycle
D. Water table
E. Unconfined aquifer
F. None of the Above

21. 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
B. Groundwater
C. An aquifer's storage capacity
D. Cone of depression
E. Well
F. None of the Above

22. There are two kinds of aquifers: confined and unconfined.

A. True B. False

23. If the aquifer is sandwiched between layers of relatively impermeable materials, it is called?

A. Confined aquifer
B. Aquifer(s)
C. Hydrologic cycle
D. Water table
E. Unconfined aquifer
F. None of the Above

24. Confined aquifers are not sandwiched between layers of relatively impermeable materials, and their upper boundaries are generally closer to the surface of the land.
A. True B. False

25. 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?
26. Groundwater 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

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

Ground-Water Quality
28. 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

29. We know that some contaminants can pass through all of these filtering layers into which term to contaminate groundwater?
A. Contaminant(s) D. Saturated zone
B. Saturated zone E. Water table
C. Karst aquifer(s) F. None of the Above

What Kinds of Substances Can Contaminate Groundwater, and Where Do They Come from?
30. Substances that can contaminate _____ 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) D. Ground-water contamination
B. Ground water E. Septic tanks, cesspools, and privies
C. Permeable zones F. None of the Above

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

Agricultural Activities

32. Agricultural activities also can make significant contributions to _____ 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

Landfills

33. A number of these sites have caused _____ and are now being cleaned up by their owners, operators, or users; state governments; or the federal government under the Superfund program.

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

Abandoned Wells

34. Which of the following terms can be another source of ground-water contamination?

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

35. If which of the following terms is abandoned without being properly sealed, however, it can act as a direct channel for contaminants to reach ground water?

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

What Can Be Done After Contamination Has Occurred?

36. In general, a community whose ground-water supply has been contaminated has five options: Contain the contaminants to prevent their migration from?

A. Aquifer
B. Contamination
C. Toxic chemicals
D. Supplies of clean ground water
E. Their source
F. None of the Above

37. According to the text, withdraw the pollutants from the?

A. Aquifers
B. Contamination
C. Toxic chemicals
D. Supplies of ground water
E. Wellhead protection program(s)
F. None of the Above

38. According to the text, treat the missing term where it is withdrawn or at its point of use.

A. Aquifer
B. Contamination
C. Toxic chemicals
D. Ground water
E. Wellhead protection program(s)
F. None of the Above

39. Rehabilitate the missing term by either immobilizing or detoxifying the contaminants while they are still in the aquifer.

A. Aquifer
B. Contamination
C. Toxic chemicals
D. Supplies of clean ground water
E. Wellhead protection program(s)
F. None of the Above

40. According to the text, abandon the use of the aquifer and find?
A. Aquifer
B. Contamination
C. Alternative sources of water
D. Ground water
E. Wellhead protection program(s)
F. None of the Above

Are There Federal Laws or Programs to Protect Ground Water?

41. The U.S. Environmental Protection Agency is responsible for federal activities relating to the quality of ground water.
A. True B. False

42. Which of the following terms authorizes EPA to set standards for maximum levels of contaminants in drinking water, regulate the underground disposal of wastes in deep wells, designate areas that rely on a single aquifer for their water supply?
A. The Clean Water Act
B. EPA's groundwater
C. Alternative sources of water
D. The Safe Drinking Water Act
E. The Resource Conservation and Recovery Act
F. None of the Above

43. Which of the following terms regulates the storage, transportation, treatment, and disposal of solid and hazardous wastes?
A. The Clean Water Act
B. EPA's groundwater
C. Alternative sources of water
D. The Safe Drinking Water Act
E. The Resource Conservation and Recovery Act
F. None of the Above

44. According to the text, the Comprehensive Environmental Response, Compensation, and Liability Act authorizes the government to clean up contamination caused by chemical spills or hazardous waste sites that could pose threats to the environment, and whose 1986 amendments include provisions authorizing citizens to sue violators of the law and establishing?
A. The Clean Water Act
B. EPA's groundwater
C. Alternative sources of water
D. The Safe Drinking Water Act
E. Community right-to-know
F. None of the Above

45. The Federal Insecticide, Fungicide, and Rodenticide Act, which authorizes which term to control the availability of pesticides that have the ability to leach into ground water?
A. The Clean Water Act
B. EPA
C. Alternative sources of water
D. The Safe Drinking Water Act
E. The Resource Conservation and Recovery Act
F. None of the Above

46. Which of the following terms which authorizes EPA to control the manufacture, use, storage, distribution, or disposal of toxic chemicals that have the potential to leach into ground water?
A. The Clean Water Act
B. The Toxic Substances Control Act
C. Alternative sources of water
D. The Safe Drinking Water Act
E. Resource Conservation and Recovery Act
F. None of the Above

47. Which of the following terms authorizes EPA to make grants to the states for the development of ground-water protection strategies and authorizes a number of programs to prevent water pollution from a variety of potential sources?
A. The Clean Water Act
B. EPA's groundwater
C. Alternative sources of water
D. The Safe Drinking Water Act
E. The Resource Conservation and Recovery Act
F. None of the Above

Water Well Reports and Hydrogeology
Hydrogeologic Data
48. For hydrogeologists to make reliable assessments about the current and future status of ground water, they need to know where ground water occurs in the subsurface, what the properties are of the various geologic units below the surface, and how fast and in what direction ground water is moving.
A. True B. False

Depth to the Aquifer
49. 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
50. 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

51. 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

52. 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)
53. 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

54. Which of the following terms has units of feet, and generally corresponds to the elevation of water in the well?
A. Aquifer (porosity)
B. Hydraulic head
C. Geologic materials
D. Amount of recharge to the aquifer
E. Ground water
F. None of the Above

55. Hydraulic head is the driving force for ground water movement either in a horizontal or vertical direction.
A. True B. False

56. Which of the following terms moves from where the head is higher to where the head is lower?
A. Hydraulic head
B. An aquifer
C. Ground water
D. Hydraulic conductivity
E. Permeability, or hydraulic conductivity
F. None of the Above

Aquifer Porosity (n)

57. 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)

58. 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

59. 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?

60. If several wells produce from the same aquifer, we can estimate the direction of ground water flow.

A. True B. False

61. 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

62. 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?

63. There is a relation between the pumping rate of the well, the transmissivity of the aquifer, the distance between wells, _____, 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

64. 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

65. 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

66. 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

67. A progressive change in the perforated portions of cased wells can indicate to the hydrogeologist that the area represents a recharge zone or a discharge zone.

A. True B. False

68. 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

69. 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

70. 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

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

A. True B. False

72. Clear descriptions of the material drilled through the relative proportions of silt/clay in the sand units, the locations of weak zones in bedrock, whether a clay unit contains lenses or layers of sand, etc., allow the hydrogeologist to better estimate the potential permeability of?

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

Contributions of Well Constructors to Hydrogeology

73. 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

74. 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

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

A. True B. False

76. Which of the following terms stabilize the hole and aid in the removal of cuttings?

A. The flighting
B. Drilling fluids
C. The bucket
D. A telescoping kelly
E. The cutting head
F. None of the Above

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

A. True B. False

78. Air rotary with this term is particularly suited for hard rock drilling, while mud rotary is better suited for drilling in sediment.

A. Downhole hammer
B. The Kelly
C. The table drive
D. A sub
E. Rotary bit
F. None of the Above

Basic Rotary Drilling Methods

79. Rotary drilling utilizes two methods which 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

80. Rotary drilling methods use a drill string, which typically consists of a bit, collar, drill pipe and?

A. The drill collar
B. Drag bit(s)
C. Roller bit(s)
D. Shock absorber (floating sub)
E. A kelly
F. None of the Above

81. Which of the following terms is a section of heavy walled pipe that can be hexagonal, square, or rounded with grooves?

A. The flighting
B. The plug
C. The bucket
D. A kelly
E. The cutting head
F. None of the Above

82. 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
B. The Kelly
C. The table drive
D. A sub
E. Rotary bit
F. None of the Above

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

84. 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
B. The Kelly
C. The table drive
D. A sub
E. Rotary bit
F. None of the Above

85. 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
B. Drag bit(s)
C. Roller bit(s)
D. Shock absorber
E. The kelly
F. None of the Above

86. 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
B. The Kelly
C. The table drive
D. The drill collar
E. Rotary bit
F. None of the Above

87. Which of the following terms aids in maintaining a consistent borehole diameter and primarily helps to prevent borehole deviation?
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

88. 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

89. Roller bits, such as this term, typically utilize interlocking teeth or buttons on individual rotating cones to cut, crush, or chip through the formation.
A. The flighting
B. The plug
C. The bucket
D. The common tri-cone bit
E. The cutting head
F. None of the Above

90. Roller bits can be used in consolidated formations and even hard rock applications if equipped with carbide buttons. These types of bits are often referred to as?
A. The drill collar
B. Drag bit(s)
C. Roller bit(s)
D. Shock absorber (floating sub)
E. Roller button bits
F. None of the Above

91. Which of the following terms are bits that can be used to enlarge, straighten, or clean an existing borehole?
A. Drilling method
B. The Kelly
C. The table drive
D. Reamers
E. Rotary bit
F. None of the Above

92. Which of the following terms are used to enlarge deeper sections of an existing borehole without requiring the enlargement of the entire upper well bore?
A. The drill collar
B. Drag bit(s)
C. Roller bit(s)
D. Shock absorber (floating sub)
E. Under reamers
F. None of the Above

93. Under reaming involves the projection of _____ beneath permanently installed casing in loosely consolidated sediments.
A. Cutting blades
B. The Kelly
C. The table drive
D. A sub
E. Rotary bit
F. None of the Above

Direct Rotary Method

94. Down-force exerted by the drilling rig and/or the weight of _____ is used along with rotating action to force the bit downwards, cutting through the sediment or rock.
A. Direct Mud rotary drilling rig(s)
B. Bit
C. Large drill rig(s)
D. Drill string
E. Loss of mud drilling fluids
F. None of the Above

95. The drilling fluid that is pumped by which term and/or air compressor is jetted out of ports in the bit?
A. The flighting
B. The rig's mud pump
C. The bucket
D. A telescoping kelly
E. The cutting head
F. None of the Above

96. The drilling fluid carries cuttings up the annular space between the drill pipe and formation and into mud pits or containment recirculating systems on the surface.
A. True B. False

97. Which of the following terms pressurizes the borehole and helps to keep the hole open while removing cuttings?
A. Rotary drilling
B. Typical drilling fluid(s)
C. Advanced methods
D. A highly trained and skilled driller
E. The drilling fluid
F. None of the Above

98. Large drill rigs may utilize _____ that separate the cuttings from the drilling fluid before a pickup pump recirculates the drilling fluid back down the borehole, where the process is then repeated.
A. The reverse method
B. Zone(s)
C. The mud drilling fluid
D. The cutting's containment systems
E. Direct Mud rotary drilling rig(s)
F. None of the Above

99. Mud pits may be dug into the ground adjacent to the rig in order to contain and settle out cuttings from _____ before recirculating.
A. The flighting
B. The plug
C. The bucket
D. The drilling fluid
E. The cutting head
F. None of the Above

Direct Mud Rotary Method

100. Mud is circulated down the drill string and through the bit at the bottom of the borehole and the mud then carries the cuttings generated by the bit up to the surface and into the mud recirculating system.

A. True B. False

101. The process of building up a film of mud on the borehole walls is not important to mud rotary drilling and is called mud balling.

A. True B. False

102. Which of the following terms use various types of mud or drilling fluid to drill into the ground?

A. The reverse method
B. Zone(s)
C. The mud drilling fluid
D. The mud
E. Direct Mud rotary drilling rig(s)
F. None of the Above

103. Which of the following terms or set of screens called a shaker may be used in part of the recirculating system on larger rigs; it separates out cuttings from drilling fluid and provides an ideal sampling location?

A. Direct Mud rotary drilling rig(s)
B. A vibrating screen
C. Large drill rig(s)
D. A drilling string with drilling fluid
E. The loss of mud drilling fluids
F. None of the Above

104. Which of the following terms not only removes cuttings but also adheres to and pushes against the borehole walls, minimizes fluid loss, and cools the bit?

A. The reverse method
B. Zone(s)
C. The mud drilling fluid
D. The mud
E. Direct Mud rotary drilling rig(s)
F. None of the Above

105. Sometimes specially trained personnel are needed to manage the physical properties of the mud to ensure that a proper mud cake thickness is maintained and that a proper density or _____ is used to efficiently drill the well.

A. The reverse method
B. Weight of mud
C. The mud drilling fluid
D. The mud
E. Direct Mud rotary drilling rig(s)
F. None of the Above

106. The mud engineer will often use bentonite clay and water to make the mud drilling fluid. Sometimes chemical additives such as this term may be used.

A. The reverse method
B. Drilling polymers or gels
C. The mud drilling fluid
D. The mud
E. Direct Mud rotary drilling rig(s)
F. None of the Above

107. The loss of which term to cavities in the earth cannot be stopped with a mud cake alone?

A. The reverse method
B. Weight of mud
C. Mud drilling fluids
D. The mud
E. Direct Mud rotary drilling rig(s)
F. None of the Above

Air Rotary Method

108. Air rotary methods utilize compressed air and derived drill cuttings and groundwater as the drilling fluid.

A. True B. False

109. Which of the following terms is forced through the drill string and out the bit where it then mixes with and lifts cuttings and any derived groundwater to the surface?

A. The air rotary method
B. Soil or formation sample(s)
C. Air
D. Biodegradable foam or surfactant (soap)
E. Mud
F. None of the Above

110. The cuttings and groundwater are typically contained in subsurface pits, much like?

A. Roller bit(s)
B. Drilling
C. The borehole
D. The mud rotary method
E. The reverse method
F. None of the Above

111. Soil or formation samples may be collected in a bucket or shovel placed beneath the table of the rig as drilling proceeds, resulting in?

A. The air rotary method
B. Soil or formation sample(s)
C. Representative samples
D. Biodegradable foam or surfactant (soap)
E. The total target depth
F. None of the Above

112. Which of the following terms is kept in a pressured condition while drilling, in order to maintain the circulation of drilling fluid to the surface?

A. The flighting
B. The plug
C. The bucket
D. The borehole
E. The cutting head
F. None of the Above

113. Which of the following terms is often added while drilling with air in order to maintain sufficient hole pressurization so that cuttings may be lifted to the surface efficiently while maintaining hole stability.

A. The air rotary method
B. Soil or formation sample(s)
C. Air
D. Biodegradable foam or surfactant (soap)
E. Mud
F. None of the Above

114. According to the text, the air rotary method is particularly suitable to soft dirt drilling with a down hole air hammer.

A. True B. False

115. The air hammer utilizes compressed air to drive a piston up and down which makes this term move up and down while the drill string rotates.

A. The air rotary method
B. Soil or formation sample(s)
C. Air
D. The hammer bit
E. The total target depth
F. None of the Above

116. According to the text, conventional air rotary drilling methods utilize roller bits in the same way as those used for mud rotary drilling

A. True B. False

117. Which of the following terms action generates great rock breaking force and is very valuable for drilling through solid rock or consolidated formations?

A. Roller bit(s)
B. Drilling
C. The borehole
D. The mud rotary method
E. The combined rotating and hammering
F. None of the Above

118. Which of the following terms in hard rock or consolidated formations, may be used when drilling pressures are too high or borehole sizes are too large for the efficient operation of an air hammer?
A. The flighting
B. A roller button bit
C. The bucket
D. A telescoping kelly
E. The cutting head
F. None of the Above

Drill through Casing Driver Method

119. The drill through casing driver method drives casing into the borehole as the telescoping kelly advances.
A. True B. False

120. Which of the following terms is a pneumatic device designed to push or pull casing that is typically attached to a top head drive air rotary rig?
A. A hammer or roller bit
B. The drill string
C. The bucket auger method
D. The rig
E. A casing driver
F. None of the Above

121. Which of the following terms is a specially designed hardened steel ring that is installed on the casing end?
A. Auger boring method(s)
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The cutting shoe
F. None of the Above

122. Which of the following terms may employ a hammer or roller bit?
A. The flighting
B. The plug
C. The bucket
D. The drill string
E. The cutting head
F. None of the Above

123. According to the text, cuttings rise to the surface with _____ through the casing and exit through the casing driver.
A. The injected air
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

124. According to the text, as the borehole is drilled, the cuttings are then collected near?
A. A hammer or roller bit
B. The drill string
C. A casing driver
D. The rig
E. The addition of casing and drill string
F. None of the Above

125. Which of the following terms can continue until competent formation is encountered?
A. A hammer or roller bit
B. The drill string
C. A casing driver
D. The rig
E. The addition of casing and drill string
F. None of the Above

126. Which of the following terms is often used to install temporary casing in order to permit the installation of a well in unstable aquifers?
A. Auger boring method(s)
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

127. Which of the following terms may be used as a puller to remove the temporary casing following well construction?

A. The flighting
B. The plug
C. The bucket
D. The casing driver
E. The cutting head
F. None of the Above

Auger Boring Methods

128. Auger boring methods make use of _____, which may be attached to a pilot bit and cutter head.

A. Auger boring method(s)
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. A rotating blade or spiral flange
E. The bucket auger method
F. None of the Above

129. Which of the following terms along with the rotating action of the blade and cutting action of the pilot and/or cutter bits facilitates the boring process?

A. The flighting
B. The plug
C. The bucket
D. A telescoping kelly
E. Down-force applied by the rig
F. None of the Above

130. Soil samples may be collected as cuttings rise or are brought to the surface, or they may be collected with?

A. Auger boring method(s)
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

131. Which of the following terms are capable of boring large diameter holes in excess of four feet in diameter?

A. Auger boring method(s)
B. Augers
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

132. According to the text, there are three primary types of _____: solid stem, bucket, and hollow stem.

A. Auger boring method(s)
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

Solid Stem Auger Method

133. Which of the following terms method uses a spiral flanged drill pipe driven by either a kelly or rotary drive head, like those used on rotary rigs?

A. Auger boring method(s)
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

134. The drill pipe may be continuously flanged or just the initial section is flanged.

A. True B. False

135. Which of the following terms typically employ a single flight and can be used in stable formations to depths of approximately 60 feet?

A. The flighting
B. The plug
C. The bucket
D. Larger diameter augers
E. The cutting head
F. None of the Above

136. Which of the following terms is removed from the borehole so that cuttings, which accumulate at the bottom of the borehole, may be removed and/or sampled?

A. The flighting
B. The lower flight
C. The bucket
D. A telescoping kelly
E. The cutting head
F. None of the Above

137. Samples may be collected from these cuttings or the flighting may be brought to the surface and samples collected from?

A. The flighting
B. The plug
C. The bucket
D. A telescoping kelly
E. The cutting head
F. None of the Above

Bucket Auger Method

138. The bucket auger method employs a single, typically large in diameter, bucket auger to drill or bore into the ground.

A. True B. False

139. Which of the following terms is rotated via a kelly and table drive much like those of rotary rigs?

A. Auger boring method(s)
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger
F. None of the Above

140. Which of the following terms consists of two or more sections of square piping that telescope into each other?

A. The flighting
B. The plug
C. The bucket
D. A telescoping kelly
E. The cutting head
F. None of the Above

141. Which of the following terms is filled with cuttings it is closed and brought to the surface where it is swung out to the side of the rig by a specially designed swing arm?

A. The flighting
B. The plug
C. The bucket
D. A telescoping kelly
E. The cutting head
F. None of the Above

142. Which of the following terms cannot be used in material containing cobbles and boulders, but is used most often in more stable semi consolidated silty or clay rich deposits?

A. Bucket auger methods
B. The plug
C. The bucket
D. A telescoping kelly
E. The cutting head
F. None of the Above

Hollow Stem Auger Method

143. Which of the following terms has been used in the geotechnical field for many years for its usefulness in obtaining soil samples?

A. The hollow stem auger
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

144. Which of the following terms contains a plug that is connected to drill pipe that passes through the center of the flights and is ultimately connected to a top drive?

A. The lowermost flight
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

145. When the plug is removed, accurate soil samples may be obtained while the flighting remains to keep _____ open.

A. The flighting
B. The plug
C. The bucket
D. The borehole
E. The cutting head
F. None of the Above

146. Samples are typically collected with this term driven into the soil a few feet ahead of the flighting.

A. The flighting
B. The plug
C. The bucket
D. A telescoping kelly
E. A split spoon sampler or core barrel sampler
F. None of the Above

147. Which of the following terms can also permit the installation of well screen and filter media in otherwise relatively unstable formations by its acting as temporary casing?

A. The flighting
B. The plug
C. The bucket
D. The use of larger diameter continuous flights
E. The cutting head
F. None of the Above

What is a Significant Deficiency?

148. Significant deficiencies cause, or have the potential to cause, the introduction of contamination into water delivered to customers include defects in design, operation, or maintenance of?

A. Well screen
B. The aquifer
C. A pumping test
D. The amount of water production
E. The source, treatment or distribution systems
F. None of the Above

149. The rule requires each state to define and describe at least one type of specific significant deficiency for each of?

A. The eight sanitary survey elements
B. The aquifer
C. A pumping test
D. The amount of water production
E. The optimum pumping rate
F. None of the Above

150. EPA will develop guidance to help states carry out sanitary surveys and identify significant deficiencies that could affect the quality of drinking water.

A. True B. False

Selecting an Appropriate Well Site

151. Before a well can be drilled a permit is normally required. The permit helps to ensure that an appropriate location of the well is selected which reduces the possibility of contamination.

A. True B. False

152. The ideal well location has good drainage and is higher than?

A. The quality of drinking water
B. The possibility of contamination
C. Surface drainage(s)
D. The surrounding ground surface
E. Preliminary aquifer parameters
F. None of the Above

153. Which of the following terms should be at a lower elevation than the well, and the distances to those contamination sources must be in accordance with the State or Local Water Well Construction Codes?

A. The quality of drinking water
B. The possibility of contamination
C. Surface drainage(s)
D. All possible sources of contamination
E. Preliminary aquifer parameters
F. None of the Above

Common Well Construction Specifications

154. Which of the following terms should always be located and constructed in such a manner that they yield safe water at all times and under all conditions?

A. Water wells
B. The aquifer
C. A pumping test
D. The amount of water production
E. The optimum pumping rate
F. None of the Above

155. Tests have shown that bacterial contamination is usually eliminated after filtering through 1000 feet of normal soil.

A. True B. False

156. Construction of _____ must ensure that the top and uppermost 20 feet of the well bore are sealed and watertight.

A. The well
B. The inflatable packer
C. The louver(s)
D. The casing and screen specifications
E. Well screen(s)
F. None of the Above

157. Which of the following terms is installed in the upper portions of the well bore between the annulus and surface casing and will normally extend to the ground surface around the well?

A. This seal
B. The inflatable packer
C. The louver(s)
D. The casing and screen specifications
E. Well screen(s)
F. None of the Above

158. The installation of the cement or grout between the annulus and surface casing effectively seals off the upper borehole from?

A. The anticipated flow rate
B. The well
C. Annulus and surface casing
D. The surface
E. The upper borehole from the surface
F. None of the Above

159. Which of the following terms uses is a solid piece of permanently installed casing, usually steel, that should be of sufficient size to allow the completion of the well within it?

A. The surface casing
B. The inflatable packer
C. The louver(s)
D. The casing and screen specifications
E. Well screen(s)
F. None of the Above

160. Which of the following terms in addition to the surface seal is always installed with the pumping equipment to ensure no surface water or debris enters the well?
A. A well seal or cap
B. The well
C. Annulus and surface casing
D. Unstable or non-productive areas
E. The upper borehole from the surface
F. None of the Above

161. Specialized borehole geophysical logging equipment may be used to isolate the areas of optimum production capability and aid in determining the ultimate well design.
A. True B. False

162. Preliminary pumping tests are normally conducted to ensure the well is as productive as originally estimated and to obtain?
A. The quality of drinking water
B. The possibility of contamination
C. Surface drainage(s)
D. Contamination of a water
E. Preliminary aquifer parameters
F. None of the Above

163. Which of the following terms following the installation, the well is then reamed to accept additional blank casing, well screen, and filter or gravel pack?
A. The quality of drinking water
B. The possibility of contamination
C. Surface drainage(s)
D. The well's surface seal
E. Preliminary aquifer parameters
F. None of the Above

164. According to the text, once the well has been reamed large enough in diameter for the anticipated flow rate, the appropriate casing can be installed.
A. True B. False

165. Which of the following terms may extend to the total depth of the well or may be used intermittently to total depth with blank casing used through unstable or non-productive areas?
A. The anticipated flow rate
B. The well
C. Well screen
D. Unstable or non-productive areas
E. The upper borehole from the surface
F. None of the Above

Choice of Casing
166. According to the text, stainless steel casing and screen may be required for one situation, while PVC or low carbon steel may be acceptable in another.
A. True B. False

167. According to the text, as with casing, the choice of well screen is as important as its placement, the size of the openings in the casing are dependent on the grain size of the filter or?
A. The anticipated flow rate
B. The well
C. Gravel pack
D. Unstable or non-productive areas
E. The upper borehole from the surface
F. None of the Above

168. A few of the more common types of well screen are: wire wrapped, continuous screen, slotted, louvered, and?
A. The centralizer(s)
B. The inflatable packer
C. The louver(s)
D. Perforated screens
E. Well screen(s)
F. None of the Above

169. According to the text, louvered screen is used in low yield production wells but particularly in rock packed wells and may help where cascading water is a problem.
A. True B. False

170. Which of the following terms are stronger and less expensive than wire wrapped screens and are best suited to deep applications, where borehole stability is a concern?
A. The anticipated flow rate
B. Slotted and perforated screens
C. Annulus and surface casing
D. Unstable or non-productive areas
E. The upper borehole from the surface
F. None of the Above

Selecting an Optimum Pumping Rate
171. Specific capacities for each of the pumping steps are compared. The highest Sc observed is normally associated with?
A. The anticipated flow rate
B. The well
C. The optimum pumping rate
D. Unstable or non-productive areas
E. The upper borehole from the surface
F. None of the Above

Pump Selection Section
Three Basic Types of Wells
172. Which of the following terms are usually bored into an unconfined water source, generally found at depths of 100 feet or less?
A. Unconsolidated or sand well(s)
B. Bored or shallow well(s)
C. The proper selection
D. Total dynamic or discharge head
E. The most important components
F. None of the Above

173. Which of the following terms are drilled into a formation consisting entirely of a natural rock formation that contains no soil and does not collapse?
A. Consolidated or rock wells
B. Screen filter(s)
C. Power requirement(s)
D. Total equivalent feet of lift
E. The total friction head
F. None of the Above

174. Which of the following terms are drilled into a formation consisting of soil, sand, gravel, or clay material that collapses upon itself?
A. Unconsolidated or sand well(s)
B. Bored or shallow well(s)
C. The proper selection
D. Total dynamic or discharge head
E. The most important components
F. None of the Above

Selection of Pumping Equipment
175. The proper selection of pumping equipment for a well is of great importance.
A. True B. False

Pumping Lift and Total Dynamic or Discharge Head
176. The most important components in selecting the correct pump for your application are: total pumping lift and?
A. Cavitation
B. Suction head
C. Velocity head
D. Total dynamic or discharge head
E. Pressure head
F. None of the Above

177. Which of the following terms refers to the total equivalent feet of lift that the pump must overcome in order to deliver water to its destination, including frictional losses in the delivery system?
A. Total dynamic head
B. Screen filter(s)
C. Power requirement(s)
D. Total equivalent feet of lift
E. The total friction head
F. None of the Above

Basic Pump Operating Characteristics
178. Pressure and head are interchangeable concepts in irrigation, because a column of water .433 feet high is equivalent to 2.31 pound per square inch of pressure.
A. True
B. False

179. Which of the following terms of a pump is composed of several types of head that help define the pump's operating characteristics?
A. Cavitation
B. Suction head
C. Velocity head
D. Total head
E. Pressure head
F. None of the Above

Total Dynamic Head
180. The total dynamic head of a pump is the sum of _____, the pressure head, the friction head, and the velocity head.
A. The total static head
B. Screen filter(s)
C. Power requirement(s)
D. Total equivalent feet of lift
E. The total friction head
F. None of the Above

181. The Total Dynamic Head is the sum of the total static head, _____ and the pressure head.
A. Cavitation
B. Suction head
C. Velocity head
D. Loss of head
E. Total friction head
F. None of the Above

Total Static Head
182. The total static head is the total vertical distance the pump must lift the water.
A. True
B. False

183. When pumping from a well, it would be the distance from the pumping water level in the well to the ground surface plus _____ the water is lifted from the ground surface to the discharge point.
A. Friction head
B. Total static head
C. Vertical distance
D. Total dynamic or discharge head
E. Loss of head
F. None of the Above

Pressure Head
184. 20 PSI is equal to 20 times 2.31 or 46.2 feet of head.
A. True
B. False

Friction Head
185. The velocity of the water has a significant effect on?
A. Friction head
B. Friction loss
C. Pressure head
D. Total dynamic or discharge head
E. Loss of head
F. None of the Above

186. Values for these losses can be calculated or obtained from friction loss tables. The friction head for a piping system is the sum of all the?
A. Friction head
B. Friction losses
C. Pressure head
D. Total dynamic or discharge head
E. Loss of head
F. None of the Above

Velocity Head
187. Velocity head is the energy of the water due to?
A. Cavitation
B. Suction head
C. Velocity head
D. Loss of head
E. Its velocity
F. None of the Above

Suction Head
188. According to the text, the suction head includes not only the vertical suction lift, but also the friction losses through the pipe, elbows, foot valves, and other fittings on the suction side of the pump.
A. True B. False

189. There is an allowable limit to _____ on a pump and the net positive suction head of a pump sets that limit.
A. Cavitation
B. Suction head
C. Velocity head
D. Loss of head
E. Pressure head
F. None of the Above

190. The theoretical maximum height that water can be lifted using suction is 21 feet.
A. True B. False

191. The NPSH curve will increase with increasing flow rate through the pump.
A. True B. False

192. At a certain flow rate, the NPSH is subtracted from 23 feet to determine the maximum suction head at which that pump will operate.
A. True B. False

193. Operating a pump with which missing term than it was designed for, or under conditions with excessive vacuum at some point in the impeller, may cause cavitation?
A. Suction lift greater
B. Suction head
C. Velocity head
D. Loss of head
E. Pressure head
F. None of the Above

194. Which of the following terms is the implosion of bubbles of air and water vapor and makes a very distinct noise like gravel in the pump?
A. Friction head
B. Total static head
C. Pressure head
D. Cavitation
E. Loss of head
F. None of the Above

195. Which of the following terms must also protect water quality between the source and the customer's tap?
A. Distribution system
B. Water pressure
C. Fire protection
D. Hydropneumatic tanks and surge tanks
E. Cavitation
F. None of the Above

196. Care must be taken that no foreign material is introduced into the system during pipe laying operations. Pipe ends should be covered at the end of the workday or during interruptions of construction.
A. True B. False

Water Use or Demand
197. Water system demand comes from a number of sources including residential, commercial, industrial and public consumers as well as waste and some?
A. Pressure D. Unavoidable loss and waste
B. System integrity E. Maximum daily use
C. Unavoidable loss F. None of the Above

198. The combination of storage reservoirs and distribution lines must be capable of meeting consumers' needs for pressure at all times.
A. True B. False

199. The quantity of water used in any community varies from 100 to 200 gallons per person per day.
A. True B. False

200. Which of the following terms is desired, that could also represent a rather significant demand upon the system?
A. Distribution system D. Hydropneumatic tanks and surge tanks
B. Water pressure E. Cavitation
C. Fire protection F. None of the Above

201. A common design assumption is to use from 100 to 150 gallons per person per day for average domestic use.
A. True B. False

202. The maximum daily use is approximately 3 to 5 times the average daily use.
A. True B. False

203. Which of the following terms is usually encountered during the summer months and can vary widely depending on irrigation practices?
A. Pressure D. Unavoidable loss and waste
B. System integrity E. Maximum daily use
C. Maximum daily use F. None of the Above

Water Pressure
204. 2.31 feet of water is equal to 1 psi, or 1 foot of water is equal to about a half a pound (.433 pounds to be exact).
A. True B. False

205. For ordinary domestic use, water pressure should be between 25 and 45 psi.
A. True B. False

206. 20 psi is considered the minimum required at any point in the water system, so that this missing term is prevented.
A. Distribution system D. Hydropneumatic tanks and surge tanks
B. Water pressure E. Cavitation
C. Backflow and infiltration F. None of the Above

207. Which of the following terms is provided by the direct force of the water, or by the height of the water?

A. Pressure
B. System integrity
C. Gravity
D. Unavoidable loss and waste
E. Maximum daily use
F. None of the Above

Storage and Distribution
Water Storage Facilities

208. According to the text, there are different types that are used for storage in the water distribution systems, such as stand pipes, elevated tanks and reservoirs, hydropneumatic tanks and?

A. Distribution system
B. Water pressure
C. Fire protection
D. Surge tanks
E. Cavitation
F. None of the Above

Storage Reservoirs

209. According to the text, it is recommended that storage reservoirs be located at a high enough elevation to allow the water to flow by this term to the distribution system.

A. Pressure
B. System integrity
C. Gravity
D. Cross-connection
E. Maximum daily use
F. None of the Above

210. According to the text, some storage for which term should be provided?

A. Fire protection
B. Reservoir(s)
C. Steel tank(s)
D. Cross-connection
E. Stored water
F. None of the Above

211. Which of the following terms are also used as detention basins to provide the required chlorine contact time necessary to ensure the adequacy of disinfection?

A. Baffle(s)
B. Reservoir(s)
C. Steel tank(s)
D. Cross-connection
E. Stored water
F. None of the Above

212. Which of the following terms inside the reservoir increase the contact time by preventing the water from leaving the reservoir too quickly?

A. Baffle(s)
B. Reservoir(s)
C. Steel tank(s)
D. Cross-connection
E. Stored water
F. None of the Above

Water Storage Introduction

213. According to the text, treated or pumped water is placed in _____in order for disinfection to take place.

A. Storage reservoirs
B. Water distribution systems
C. Steel reservoirs
D. A closed tank or reservoir
E. Repairing and replacing these facilities
F. None of the Above

Storage and Distribution

214. The cost of supplying water to the users of any water system includes are on-going maintenance costs associated with cleaning, repairing and replacing these?

A. Storage reservoirs
B. Facilities
C. Steel reservoirs
D. Adequate pressure
E. Clearwells
F. None of the Above

215. Water storage facilities and tanks vary in different types that are used in the water distribution systems, such as stand pipes, elevated tanks and reservoirs, hydropneumatic tanks and?

A. Storage reservoirs
B. Water distribution systems
C. Steel reservoirs
D. Adequate pressure
E. Surge tanks
F. None of the Above

Storage Reservoirs

216. It is recommended that _____ be located at a high enough elevation to allow the water to flow by gravity to the distribution system.

A. Storage reservoirs
B. Levelers
C. Tree systems
D. Adequate pressure
E. Pumps
F. None of the Above

Steel Reservoirs

217. Steel reservoirs or tanks generally have higher construction and installation costs than concrete, and require less maintenance.

A. True B. False

Categories of Finished Water Storage Facilities

218. According to the text, which of the following terms does not include facilities such as clearwells that are part of treatment or contact time requirements per the Surface Water Treatment Rules?

A. Long detention times
B. Clear wells
C. Storage
D. Finished water storage
E. Ground storage reservoirs
F. None of the Above

Municipal Water Supply Systems

219. Water supplies that are used to feed water to a filtration and _____ for purification for domestic purposes including drinking water is classified as raw water.

A. Storage volume of a standpipe
B. Storage
C. Distribution system
D. Water quality problems in storage facilities
E. Treatment plant
F. None of the Above

Distribution Storage Functions

220. Storage within a _____enables the system to process water at times when treatment facilities otherwise would be idle.

A. System demand
B. Variations in demand
C. Holding tank
D. Most useful form of storage
E. Distribution system
F. None of the Above

Advantages.

221. The principal advantages of _____ include the fact that storage equalizes demands on supply sources, production works, and transmission and distribution mains.

A. Pumping equipment
B. Dedicated fire storage
C. System demands
D. Water supply distribution system
E. Distribution storage
F. None of the Above

Elevated and Ground-Level Storage

222. Distribution system storage normally is provided in one of two ways, elevated storage or ground storage with?

A. System demand
B. Variations in demand
C. Holding tank
D. High-service pumping
E. Capacity of the system's high-service pumps
F. None of the Above

Elevated Storage

223. Properly sized elevated water tanks provide dedicated fire storage and are used to maintain constant pressure on the?

A. Pumping equipment
B. Dedicated fire storage
C. System demands
D. Water supply distribution system
E. Distribution storage
F. None of the Above

Ground Storage

224. Since water kept in ground storage is not under any significant pressure, it must be delivered to the point of use by?

A. Pumping equipment
B. Dedicated fire storage
C. System demands
D. Water supply distribution system height
E. Distribution storage in stand pipes
F. None of the Above

Backflow/Cross-Connection Section - What is backflow? Reverse flow condition

225. 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
B. Backpressure
C. Backsiphonage
D. Cross-connection
E. Indirect connection
F. None of the Above

226. 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
B. Backpressure
C. Backsiphonage
D. Cross-connection
E. Indirect connection
F. None of the Above

227. Which of the following terms is there two forms-backpressure and backsiphonage?

A. Backflow
B. Backpressure
C. Backsiphonage
D. Cross-connection
E. Indirect connection
F. None of the Above

228. The basic mechanism for preventing backflow is a mechanical _____, which provides a physical barrier to backflow.

A. High hazard installations
B. Air gap
C. Backflow preventer
D. Backflow
E. Device or method
F. None of the Above

229. The principal types of mechanical backflow preventers are the reduced-pressure principle assembly, the _____, and the double check valve assembly.

A. High hazard installations
B. Air gap
C. Vacuum breaker
D. Backflow
E. Device or method
F. None of the Above

230. 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

231. Which of the following terms is a type 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

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

Water Distribution Section
System Elements
233. Distribution mains function is to carry water from the water source or treatment works to users, these are the pipelines that make up the?
A. Increase water pressure D. Distribution system
B. Distribution tree E. Arterial system
C. Complete gridiron system F. None of the Above

234. Arterial mains are interconnected with smaller distribution mains to form a complete gridiron system and are for?
A. Increasing water pressure D. Distribution mains of large size
B. Tree system E. Fire protection
C. Complete gridiron system F. None of the Above

235. Storage reservoirs are structures used to store water and _____ the supply or pressure in the distribution system.
A. Increase water pressure D. Main line isolation
B. Equalize E. Provide a reserve pressure
C. Complete gridiron system F. None of the Above

236. Booster stations are used to _____ from storage tanks for low-pressure mains.
A. Increase water pressure D. Boost flow
B. Equalize E. Provide a reserve pressure
C. Complete gridiron system F. None of the Above

237. Valves control the flow of water in the distribution system by isolating areas for repair or by?
A. Increase water pressure D. Main line isolation
B. Bypasses E. Regulating system flow or pressure.
C. Complete gridiron system F. None of the Above

238. According to the text, Gate valves should be used in the _____for main line isolation.
A. Increase water pressure D. Distribution system
B. Distribution tree E. Arterial system
C. Complete gridiron system F. None of the Above

Butterfly Valve
239. Butterfly valves are rotary type of valves usually found on large transmission lines, and may also have an additional valve beside it known as a_____ to prevent water hammer.
A. Regulator D. Main line isolation
B. Bypass E. PRV
C. Complete gridiron system F. None of the Above

Water Distribution Valves
240. 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 D. Curtail the service
B. Adjust the pressure E. Taken out of service for repairs
C. Open or close the valve F. None of the Above

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

Gate Valves
242. In the distribution system, gate valves are used when a straight-line flow of fluid and?
A. Principally D. Minimum flow restriction
B. Dependability E. Stops or allows
C. Repair or replacement F. None of the Above

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

Ball Valves
244. Most ball valves require only a 180-degree turn to either completely open or close the valve.
A. True B. False

Valve Exercising
245. 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 D. Minimum flow restriction
B. Dependability E. Stops or allows
C. Repair or replacement F. None of the Above

If Excessive Torque is Needed to Work the Valve

246. 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

247. 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

248. 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

Tree System

249. Newer water systems are frequently expanded with planning and developed into a tree-like system.

A. True B. False

250. 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

251. 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

252. 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

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

253. 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

254. 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

255. 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

256. 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

Cast Iron (CIP)

257. CIP can be found in diameters from 3" to 48".

A. True B. False

258. 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

Ductile Iron Pipe (DIP)

259. 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

260. 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

Steel Pipe

261. 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

262. Steel pipe's advantage is that it is able withstand corrosion by both soil and water.

A. True B. False

263. 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

264. 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

Asbestos Cement Pipe (ACP)

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

266. 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

Stage 2 DBP Rule Federal Register Notices

267. Which of the following rules is part of the Microbial and Disinfection Byproducts Rules, which are a set of interrelated regulations that address risks from microbial pathogens and disinfectants/disinfection byproducts?
A. Groundwater Rule (GWR) D. Long Term 2 Enhanced Surface Water Treatment Rule (LT2)
B. Compliance E. Interim Enhanced Surface Water Treatment Rule
C. The Stage 2 DBP rule F. None of the Above

268. Which of the following rules focuses on public health protection by limiting exposure to DBPs, specifically total trihalomethanes and five haloacetic acids, which can form in water through disinfectants used to control microbial pathogens?
A. Stage 2 DBPR D. Long Term 2 Enhanced Surface Water Treatment Rule
B. DBP exposure E. Traditional disinfection practices
C. The Stage 2 DBP rule F. None of the Above

269. This rule will apply to all community water systems and nontransient non-community water systems that add a primary or residual disinfectant other than _____or deliver water that has been disinfected by a primary or residual disinfectant other than UV.
A. Ultraviolet (UV) light D. UV source
B. The open-channel system E. UV radiation
C. UV rather than ozone F. None of the Above

270. Which of the following rules has been highly effective in protecting public health and has also evolved to respond to new and emerging threats to safe drinking water?
A. Stage 2 DBPR D. Long Term 2 Enhanced Surface Water Treatment Rule
B. DBP exposure E. Safe Drinking Water Act (SDWA)
C. The Stage 2 DBP rule F. None of the Above

271. Which of the following terms is one of the major public health advances in the 20th century?
A. Major public health advances D. Amendments to the SDWA in 1996
B. The Stage 2 DBPR E. Primary or residual disinfectant
C. Disinfection of drinking water F. None of the Above

272. There are specific microbial pathogens, such as_____, which can cause illness, and are highly resistant to traditional disinfection practices.
A. Enteric virus(es) D. C. perfringens
B. Oocyst(s) E. E. coli host culture
C. Cryptosporidium F. None of the Above

273. The Stage 1 Disinfectants and Disinfection Byproducts Rule and_____, promulgated in December 1998.

A. Major public health advances
B. The Stage 2 DBPR
C. This final rule
D. Amendments to the SDWA in 1996
E. Interim Enhanced Surface Water Treatment Rule
F. None of the Above

274. The Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) builds upon the _____to address higher risk public water systems for protection measures beyond those required for existing regulations.

A. Stage 2 DBPR
B. DBP exposure
C. Stage 1 DBPR
D. Long Term 2 Enhanced Surface Water Treatment Rule
E. Traditional disinfection practices
F. None of the Above

275. Which of the following rules and the Long Term 2 Enhanced Surface Water Treatment Rule are the second phase of rules required by Congress?

A. Major public health advances
B. The Stage 2 DBPR
C. This final rule
D. Amendments to the SDWA in 1996
E. Primary or residual disinfectant
F. None of the Above

276. Which of the following rules will reduce potential cancer and reproductive and developmental health risks from disinfection byproducts?

A. Stage 3 DBPR
B. DBP exposure
C. Stage 2 Disinfection Byproducts
D. Long Term 2 Enhanced Surface Water
E. Traditional disinfection practices
F. None of the Above

277. Which Rule strengthens public health protection for customers by tightening compliance monitoring requirements for two groups of DBPs, trihalomethanes (TTHM) and haloacetic acids (HAA5)?

A. Major public health advances
B. The Stage 3 DBPR
C. Stage 2 Disinfection Byproducts
D. Amendments to the SDWA in 1996
E. Primary or residual disinfectant
F. None of the Above

278. Which of the following rules targets systems with the greatest risk and builds incrementally on existing rules?

A. Stage 2 DBPR
B. The rule
C. The Stage 1 DBP rule
D. Long Term 2 Enhanced Surface Water Treatment Rule
E. Traditional disinfection practices
F. None of the Above

279. Which of the following rules is being promulgated simultaneously with the Long Term 2 Enhanced Surface Water Treatment Rule to address concerns about risk tradeoffs between pathogens and DBPs?

A. Major public health advances
B. The Stage 2 DBPR
C. This final rule
D. Amendments to the SDWA in 1996
E. Primary or residual disinfectant
F. None of the Above

What does the rule require?

280. Under this rule, systems will conduct an evaluation of their distribution systems, known as an Initial Distribution System Evaluation.

A. Stage 2 DBPR
B. DBP exposure
C. The Stage 1 DBP rule
D. Long Term 2 Enhanced Surface Water Treatment Rule
E. Traditional disinfection practices
F. None of the Above

281. Compliance with the maximum contaminant levels for two groups of disinfection byproducts (TTHM and HAA5) will be calculated for each monitoring location in the distribution system. This approach is referred to as the?

A. TTHM and HAA5
B. DBP MCLs
C. Locational running annual average (LRAA))
D. Disinfection byproducts (DBPs)
E. Trihalomethanes and haloacetic acids
F. None of the Above

282. Which of the following rules also requires each system to determine if they have exceeded an operational evaluation level, which is identified using their compliance monitoring results?

A. Stage 2 DBPR
B. DBP exposure
C. The Stage 1 DBP rule
D. Long Term 2 Enhanced Surface Water Treatment Rule
E. Traditional disinfection practices
F. None of the Above

Microbial Regulations

283. Which rule was established to maintain control of pathogens while systems lower disinfection byproduct levels to comply with the Stage 1 Disinfectants/Disinfection Byproducts Rule and to control Cryptosporidium?

A. Long Term 1 Enhanced Surface Water Treatment Rule
B. Maximum Contaminant Level Goal (MCLG)
C. Stage 1 Disinfectants/Disinfection Byproducts Rule
D. Surface Water Treatment Rule
E. Interim Enhanced Surface Water Treatment Rule
F. None of the Above

284. The EPA established a MCL of 0.0010 for all public water systems and a 99% removal requirement for Cryptosporidium in filtered public water systems that serve at least 100,000 people. The new rule will tighten turbidity standards by December 2001.

A. True B. False

285. Color is an indicator of the physical removal of particulates, including pathogens.

A. True B. False

Waterborne Pathogens and Disease Section

286. Bacteria, viruses and protozoan that causes disease are known as pathogens.

A. True B. False

287. 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
B. Are mild in nature
C. Cause intestinal illness
D. Will cause fatalities
E. Limit the travel of pathogens
F. None of the Above

How Diseases are Transmitted.

288. Waterborne pathogens are primarily spread by ?

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

289. 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

290. For another person to become infected, he or she must take the pathogen in through the mouth.
A. True B. False

291. This term 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

Safe Drinking Water Act (SDWA) Review
292. The states are expected to administer and enforce these regulations for public water systems (systems that either have 25 or more service connections or regularly serve an average of 50 or more people daily for at least 60 days each year).
A. True B. False

293. Public water systems must provide water treatment, ensure proper drinking water quality through monitoring, and provide public notification of contamination problems.
A. True B. False

Relating to prevention of waterborne disease, the SDWA required EPA to:
294. Set numerical standards, referred to as Maximum Contaminant Levels (MCLs — the highest allowable contaminant concentrations in drinking water) or treatment technique requirements for contaminants in public water supplies;
A. True B. False

295. Issue regulations requiring monitoring of all regulated and certain unregulated contaminants, depending on the number of people served by the system, the source of the water supply, and the contaminants likely to be found;
A. True B. False

296. Set criteria under which systems are obligated to filter water from surface water sources; it must also develop procedures for states to determine which systems have to filter.
A. True B. False

Microbes
297. Coliform bacteria are common in the environment and are harmful.
A. True B. False

298. The presence of these bacteria in drinking water indicates that water may be contaminated with germs that can cause disease.
A. True B. False

299. 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

300. 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

301. 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

302. According to the text, whenever a Routine sample is total coliform or fecal coliform present, a set of repeat samples must be collected within _____ hours after being notified by the laboratory.

A. 12
B. 24
C. 48
D. 10
E. 2
F. None of the Above

303. 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

304. 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

Maximum Contaminant Levels (MCLs)

305. State and federal laws establish standards for drinking water quality. Under normal circumstances when these guidelines are being met, the water is somewhat safe to drink with little threat to human health.

A. True
B. False

306. EPA had developed standards that are known as maximum contaminant levels (MCL). When a particular contaminant exceeds this term a potential health threat may occur.
A. Coliform bacteria count D. HPC
B. MCL E. CFU
C. Standards F. None of the Above

Heterotrophic Plate Count HPC
307. 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

308. Colonies may arise from pairs, chains, clusters, or single cells, all of which are included in the term "_____" (CFU).
A. Coliform bacteria units D. HPC units
B. MCLs units E. Colony-forming units
C. Standards F. None of the Above

Total Coliforms
309. 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

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

Chlorine Gas Section
311. When chlorine is added into the water stream, chlorine hydrolyzes into?
A. HCL D. Chlorine Acid
B. Sodium hypochlorite E. Hypochlorous acid (HOCl), and hydrochloric acid (HCl)
C. Bromoform F. None of the Above

312. When chlorine hydrolyzation occurs, it provides an active toxicant, _____, which is pH-dependent. In alkaline cooling systems, it readily dissociates to form the hypochlorite ion (OCl-).
A. HCl D. pH of 7.0 than at pH 8.5
B. HOCl E. the hypochlorite ion (OCl-)
C. High chlorine concentrations F. None of the Above

Pathophysiology
313. 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 D. Water solubility
B. Vapor from Chlorine gas E. The odor threshold for chlorine
C. Effects of Hydrochloric acid F. None of the Above

314. 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 D. The chemical species produced
B. Chlorine gas E. Plasma exudation
C. The gas F. None of the Above

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

Mechanism of Activity
316. 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 D. A caustic effect
B. Chlorine acid E. Hypochlorous and hydrochloric acid
C. Hydrochloric acid F. None of the Above

Pathological Findings
317. Chlorine gas is sold as a compressed liquid, which is amber in color. Chlorine, as a solid, is heavier (less dense) than water. If the chlorine liquid is released from its container it will quickly return back to its liquid state.
A. True B. False

318. Chlorine gas is the most expensive form of chlorine to use. The typical amount of chlorine gas required for water treatment is 1-16 mg/L of water. 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

Types of Residual
319. Either a total or a _____can be read when a chlorine residual test is taken,
A. Chlorine residual D. Break-point chlorination
B. Chlorine demand E. Total chlorine residual
C. Free chlorine residual F. None of the Above

320. Which of the following terms is a much stronger disinfecting agent, therefore, most water regulating agencies will require that your daily chlorine residual readings be of free chlorine residual?
A. Free chlorine D. "CT" disinfection concept
B. Total residual E. T10 of the process unit
C. Free chlorine residual F. None of the Above

321. Which of the following terms is where the chlorine demand has been satisfied, and any additional chlorine will be considered free chlorine?
A. Chlorine residual D. Break-point chlorination
B. Chlorine demand E. Total chlorine residual
C. Free chlorine F. None of the Above

Disinfection Byproduct Regulations Summary

322. Regulators and the public have focused greater attention on potential health risks from chemical contaminants in drinking water. One such concern relates to disinfection byproducts (DBPs), chemical compounds formed unintentionally when chlorine and other disinfectants react with certain inorganic matter in water.

A. True B. False

323. Water system managers may also consider switching from chlorine to alternative disinfectants to reduce formation of THMs and HAAs.

A. True B. False

Hydraulics

324. 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

325. 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

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

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

Barometric Loop

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

A. True B. False

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

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

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

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

Pump Definitions

330. Which of the following definitions is the end of the pump closest to the motor?

A. Packing
B. Impeller
C. Inboard
D. Bowl
E. Outboard
F. None of the Above

331. Which of the following definitions are bearings that prevent shaft movement in any direction outward from the centerline of the pump?
A. Volute
B. Rotor
C. Spider
D. Radial bearings
E. Retaining bearings
F. None of the Above

332. Which of the following definitions is flow at 90° to the centerline of the shaft?
A. Radial flow
B. Reverse
C. Score
D. Vertical
E. Horizontal
F. None of the Above

Pumps

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

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

Pump Categories

335. The key to understanding a pumps operation is that a pump is to move water and generate the _____ we call pressure.
A. Centrifugal pump(s)
B. Impeller blade(s)
C. Delivery force
D. Diaphragm pump(s)
E. Cylindrical pump housing
F. None of the Above

336. 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
B. Head
C. Viscous drag pump
D. Center of the impeller
E. Incompressible fluid
F. None of the Above

337. According to the text, pumps may be classified based on the application they serve.
A. True
B. False

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

Basic Water Pump

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

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

341. 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

342. 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

343. 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

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

345. 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

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

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

348. 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

349. 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

350. 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

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

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

Venturi (Bernoulli's law):

352. A venturi is a pipe that has a gradual restriction that opens up into a gradual enlargement.

A. True
B. False

353. The area of the restriction in a venture will have a _____than the enlarged area ahead of it.

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

354. Which of the following terms best describes a pump whose impeller has no vanes but relies on fluid contact with a flat rotating plate turning at high speed to move the liquid?

A. Submersible
B. Blower
C. Viscous drag pump
D. Rotary pump
E. Bicycle pump
F. None of the Above

Types of Water Pumps

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

A. True
B. False

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

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

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

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

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

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

359. The size and number of stages, horsepower of the motor and _____are the key components relating to the pump’s lifting capacity.

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

360. Which of the following terms are variable displacement pumps that are by far used the most?
A. Axial flow
B. Submersible
C. Rotary pump
D. Turbine pump(s)
E. Centrifugal pumps
F. None of the Above

361. According to the text, the turbine pump utilizes impellers enclosed in single or multiple bowls or stages to?
A. Lift water
B. Drive shaft
C. Column pipe
D. Single or multiple bowls
E. Pump's lifting capacity
F. None of the Above

Common Hydraulic Terms

362. Which of the following definitions is the engineering science pertaining to liquid pressure and flow?
A. Pressure, Absolute
B. Pressure
C. Hydraulics
D. Hydrokinetics
E. Pascal's Law
F. None of the Above

363. Which of the following definitions is the engineering science pertaining to the energy of liquid flow and pressure?
A. Pressure, Absolute
B. Pressure
C. Hydraulics
D. Hydrokinetics
E. Pascal's Law
F. None of the Above

364. Which of the following definitions is the pressure applied to a confined fluid at rest is transmitted with equal intensity throughout the fluid?
A. Pressure, Absolute
B. Pressure
C. Hydraulics
D. Hydrokinetics
E. Pascal's Law
F. None of the Above

365. Which of the following definitions is the application of continuous force by one body upon another that it is touching; compression?
A. Pressure, Absolute
B. Pressure
C. Hydraulics
D. Hydrokinetics
E. Pascal's Law
F. None of the Above

366. Which of the following definitions is the force per unit area, usually expressed in pounds per square inch?
A. Pressure, Absolute
B. Pressure
C. Hydraulics
D. Hydrokinetics
E. Pascal's Law
F. None of the Above

367. Which of the following definitions is the pressure differential above or below ambient atmospheric pressure?
A. Pressure, Atmospheric
B. Pressure, Static
C. Hydraulics
D. Pressure, Gauge
E. Pascal's Law
F. None of the Above

368. 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

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

370. 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

371. 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

General Pumping Fundamentals
372. According to the text, the ability of the pump to lift water is the result of a partial vacuum created at the?
A. Partial vacuum D. Pressure differential
B. Suction lift E. Negative suction head
C. Center of the pump F. None of the Above

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

374. The required eccentric reducer should be turned so that the top is flat and the bottom tapered.
A. True B. False

Types of Pumps
375. The family of pumps comprises a large number of types based on application and capabilities. The two major groups of pumps are?
A. Plunger and bicycle pump D. Discharge and radical displacement
B. Mixed flow and single E. Dynamic and positive displacement
C. Dynamic and radical F. None of the Above

Centrifugal pumps are classified into three general categories:
376. Which of the following terms is a centrifugal pump in which the pressure is developed wholly by centrifugal force?
A. Cylinder D. Cavity
B. Chamber E. Positive Displacement Pump(s)
C. Radial flow F. None of the Above

377. Which of the following terms is a centrifugal pump in which the pressure is developed partly by centrifugal force and partly by the lift of the vanes of the impeller on the liquid?
A. Plunger pump D. Discharge tube
B. Mixed flow E. Roots blower
C. Dynamic F. None of the Above

378. Which of the following terms is a centrifugal pump in which the pressure is developed by the propelling or lifting action of the vanes of the impeller on the liquid?
A. Axial flow D. Cavity
B. Chamber E. Positive Displacement Pump(s)
C. Radial flow F. None of the Above

Positive Displacement Pumps
379. A Positive Displacement Pump has an expanding cavity on the _____of the pump and a decreasing cavity on the discharge side.
A. Plunger pump D. Discharge tube
B. Suction side E. Roots blower
C. Dynamic F. None of the Above

380. According to the text, liquid is allowed to flow into the pump as the cavity on the suction side expands and the liquid is forced out of the?
A. Cylinder D. Cavity
B. Chamber E. Discharge
C. Radial flow F. None of the Above

381. This principle applies to all types of Positive Displacement Pumps whether the pump is a rotary lobe, gear within a gear, piston, diaphragm, screw, and?
A. Plunger pump D. Progressing cavity
B. Mixed flow E. Roots blower
C. Dynamic F. None of the Above

382. A Positive Displacement Pump, unlike a Centrifugal Pump, will produce the same flow at a given RPM no matter what the discharge pressure is.
A. True B. False

383. Which of the following terms cannot be operated against a closed valve on the discharge side of the pump?
A. Bicycle D. Centrifugal
B. Bellows E. Positive Displacement Pump(s)
C. Radial flow F. None of the Above

384. If a Positive Displacement Pump is allowed to operate against a closed discharge valve it will continue to produce flow that will increase the pressure in the discharge line until either the line bursts or the pump is severely damaged or both.
A. True B. False

Key Pump Words
385. Which of the following key terms is a measure of a liquid's resistance to flow. i.e.: how thick it is?
A. NPSH D. S.G.: Specific gravity
B. Specific Speed E. Vapor Pressure
C. Viscosity F. None of the Above

386. Which of the following key terms is the weight of liquid in comparison to water at approx. 20 degrees C?
A. NPSH D. S.G.: Specific gravity
B. Specific Speed E. Vapor Pressure
C. Viscosity F. None of the Above

387. Which of the following key terms is a number that is the function of pump flow, head, efficiency?
A. NPSH D. S.G.: Specific gravity
B. Specific Speed E. Vapor Pressure
C. Viscosity F. None of the Above

388. Which of the following key terms determines the type of pump used, the speed it can run at, and with gear pumps, the internal clearances required?
A. NPSH D. S.G.: Specific gravity
B. Specific Speed E. Vapor Pressure
C. Viscosity F. None of the Above

389. Which of the following key terms is the amount of pressure / head required to 'force' liquid through pipe and fittings?
A. NPSH D. Friction Loss
B. Specific Speed E. Vapor Pressure
C. Viscosity F. None of the Above

390. Which of the following key terms is related to how much suction lift a pump can achieve by creating a partial vacuum?
A. NPSH D. S.G.: Specific gravity
B. Specific Speed E. Vapor Pressure
C. Viscosity F. None of the Above

391. Which of the following key terms is related to how a liquid is greater than the surrounding air pressure, the liquid will boil?
A. NPSH D. S.G.: Specific gravity
B. Specific Speed E. Vapor Pressure
C. Viscosity F. None of the Above

Submersible Pumps

392. Submersible pumps are in essence very similar to?
A. Cased wells D. Pump bowl assembly
B. Turbine pumps E. VHS or VSS motors
C. Pump's intake F. None of the Above

393. The pump shaft has a keyway in which the splined motor end shaft inserts, the motor is often bolted to the?
A. Motor D. Pump housing
B. Pump shrouds E. Number of stages
C. Canned configurations F. None of the Above

394. The pump's intake is located between the motor and the pump and is normally screened to prevent sediment from entering the pump and damaging the?
A. Impellers D. Pump bowl assembly
B. Shroud E. VHS or VSS motors
C. Pump's intake F. None of the Above

395. These types of pumps are often installed such that flow through the _____can occur upwards past the motor and into the intake.
A. Well screen D. Pump housing
B. Pump shrouds E. Number of stages
C. Volute F. None of the Above

Understanding the Operation of a Vertical Turbine Pump
396. Turbine pump efficiencies are comparable to or greater than most centrifugal pumps, these are usually more expensive than centrifugal pumps and more difficult to inspect and repair.
A. True B. False

397. According to the text, the intake for the turbine pump is continuously under water, priming is not a concern.
A. True B. False

398. Which of the following terms are available in deep well, shallow well, or canned configurations?
A. Cased wells D. Pump bowl assembly
B. Shroud E. Vertical turbine pumps
C. Pump's intake F. None of the Above

399. Which of the following terms are also available, these pumps are also suitable industrial, municipal, commercial and agricultural applications?
A. Motor D. Submersible motors
B. Pump shrouds E. Number of stages
C. Canned configurations F. None of the Above

400. Deep well turbine pumps are adapted for use in cased wells or where the water surface is below the practical limits of a?
A. Cased wells D. Pump bowl assembly
B. Shroud E. Centrifugal pump
C. Pump's intake F. None of the Above