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

Groundwater Production and Treatment System - Contaminated Wells

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

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

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 Groundwater is withdrawn from wells to provide water when water is pumped from the ground, which of the following terms change in response to this withdrawal?

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

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

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

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

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

5. A well in an aquifer is called an artesian well.

A. True
B. False

6. Which of the following terms is the level to which the water in an artesian aquifer will rise?

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

Cone of Depression

7. When pumping begins, water begins to flow towards the well in contrast to the natural direction of groundwater movement.

A. True B. False

8. The water level in the well falls below the water table in the?

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

Where Is Ground Water Stored?

9. 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

10. 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

11. 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

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

A. True B. False

13. 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

Does Ground Water Move?

14. Ground water can move sideways as well as up or down. This movement is in response to gravity, differences in elevation, and?

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

Abandoned Wells

15. 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?

16. 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

17. 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

18. According to the text, treat the _____ 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

19. 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

Water Use or Demand

20. Water system demand comes from a number of sources including residential, commercial, industrial and public consumers as well as waste and some?

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

21. The combination of storage reservoirs and distribution lines must be capable of meeting consumers' needs for pressure at all times.

A. True B. False

22. The quantity of water used in any community varies from 100 to 200 gallons per person per day.

A. True B. False

23. Which of the following terms is desired, that could also represent a rather significant demand upon the system?

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

24. A common design assumption is to use from 100 to 150 gallons per person per day for average domestic use.

A. True B. False

25. The maximum daily use is approximately 3 to 5 times the average daily use.

A. True B. False

Water Pressure

26. 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

27. For ordinary domestic use, water pressure should be between 25 and 45 psi.

A. True B. False

28. 20 psi is considered the minimum required at any point in the water system, so that this _____ is prevented.

A. Distribution system
B. Water pressure
C. Backflow and infiltration
D. Hydropneumatic tanks and surge tanks
E. Cavitation
F. None of the Above

29. 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

30. According to the text, there are different types of storage that are used 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

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

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

32. According to the text, some storage for _____ should be provided.

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

33. 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

34. 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 Well Reports and Hydrogeology - Hydrogeologic Data

35. 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

36. 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

37. 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

38. 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

39. 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)

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

A. True B. False

41. 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)

42. 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)

43. 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

44. 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?

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

A. True B. False

46. 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

47. 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?

48. 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

49. 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

50. 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

51. Identifying where one aquifer ends and another begins is key to identifying the source of the yield for individual wells.
A. True B. False

52. 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

53. Which of the following terms is a better indicator that a different aquifer has been encountered than the lithologic description?
A. Drill hole D. Recharge and discharge zone(s)
B. SWL E. Hydrogeologic investigation(s)
C. The yield F. None of the Above

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

Water-Bearing Zones
55. 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.
A. True B. False

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

Lithologic Log
57. The well log portion of the well report describes what the driller encountered in the subsurface.
A. True B. False

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

Contributions of Well Constructors to Hydrogeology
59. This document stresses the importance of data that is recorded on well reports and how that data influences hydrogeologic investigations.
A. True B. False

60. 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

61. 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

62. Drilling fluids are often used during drilling in order to keep the borehole open while drilling is done.
A. True B. False

63. 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

64. Typical drilling fluids may be water, mud, air, chemical or natural additives, or combinations of each.
A. True B. False

65. Air rotary with _____ 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

66. Rotary drilling utilizes two methods that include: direct and reverse mud rotary, direct air rotary, and?
A. Rotary drilling
B. Typical drilling fluid(s)
C. Advanced methods
D. Drill through casing driver methods
E. Today's more common well drilling methods
F. None of the Above

The Rotary Drill String

67. 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

68. 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

69. 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

70. Some rotary rigs use a top drive to turn which 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

71. 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

72. 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

73. 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

74. 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

75. 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

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

77. Drag bits come in many shapes and sizes and cut with a shearing action aided by the jetting of drilling fluids from?
A. The drill collar
B. Drag bit(s)
C. Nozzles or jets in the bit
D. Shock absorber (floating sub)
E. The kelly
F. None of the Above

78. Roller bits, such as _____, 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

Direct Rotary Method
79. Direct rotary drilling methods utilize a rotating bit at the end of a drilling string with drilling fluid that is circulated from the rig through the drill pipe and jets in the bit.
A. True B. False

80. Down-force exerted by the drilling rig and/or the weight of this missing term 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

81. The drilling fluid that is pumped by _____ 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

82. 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

83. 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

84. 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

85. Mud pits may be dug into the ground adjacent to the rig in order to contain and settle out cuttings from this missing term 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
86. 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

87. 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

88. 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

89. 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

90. 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

91. 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 this missing term 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

92. The mud engineer will often use bentonite clay and water to make the mud drilling fluid. Sometimes chemical additives such as _____ 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

93. Sometimes 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

Reverse Mud Rotary Method

94. Reverse rotary methods pump the drilling fluid down the borehole to the bit where the cuttings are forced up the rotary bit and into the mud pit.
A. True B. False

95. Reverse mud rotary drilling rigs utilize the same process as which term with the exception that the mud drilling fluid injection process is reversed?
A. Direct mud rotary
B. The bit
C. Large drill rig(s)
D. A drilling string with drilling fluid
E. The loss of mud drilling fluids
F. None of the Above

96. Which of the following terms is utilized in situations where borehole stability problems are particularly difficult and would otherwise prevent conventional drilling?
A. Roller bit(s)
B. Drilling
C. The borehole
D. The mud rotary method
E. The reverse method
F. None of the Above

97. Reverse mud rotary drilling is particularly applicable to hard rock aquifers in zones where highly fractured or weathered rock may prevent the efficient flow of drilling fluids up the borehole walls to the surface.
A. True
B. False

Air Rotary Method

98. Air rotary methods utilize compressed air and derived drill cuttings and groundwater as the drilling fluid.
A. True
B. False

99. 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

100. 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

101. 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

102. 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

103. 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

104. 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

105. The air hammer utilizes compressed air to drive a piston up and down which makes which 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

106. 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

107. 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

108. 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
109. The drill through casing driver method drives casing into the borehole as the telescoping kelly advances.
A. True B. False

110. 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

111. 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

112. Which of the following terms is inserted into the casing and the casing is attached to the casing driver?
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

113. Which of the following terms penetrates into the overburden or formation, the casing driver hammers the casing down, following the drill string?
A. The drill string
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

114. 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

115. 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

116. 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

117. 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

118. 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

119. 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

120. Auger boring methods make use of this missing term, 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

121. 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

122. 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

123. 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

124. 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

125. 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

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

A. True B. False

127. Flanged sections of drill pipe are referred to as?

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

128. 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

129. 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

130. 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

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

A. True B. False

132. Which of the following terms essentially combines the rotary and auger techniques?

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

133. 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

134. 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

135. 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

136. 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

137. 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

138. 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

139. When the plug is removed, accurate soil samples may be obtained while the flighting remains to keep this open.
A. The flighting
B. The plug
C. The bucket
D. The borehole
E. The cutting head
F. None of the Above

140. Samples are typically collected with _____ 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

141. 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?
142. 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

143. 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

144. 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
145. 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

146. 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

147. 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

148. 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

149. Surface water may enter the well through an opening in the top or by seeping through?

A. The quality of drinking water
B. The possibility of contamination
C. Surface drainage(s)
D. Contamination of a water
E. The shallow borehole walls
F. None of the Above

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

A. True B. False

151. Construction of this missing term 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

152. All wells must be constructed with a surface seal to prevent the infiltration of surface water and/or surface contaminants into?

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

153. The seal is constructed by pouring or pumping neat cement grout and/or bentonite between the Annulus and surface casing.

A. True B. False

154. 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

155. 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

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

157. 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 D. Unstable or non-productive areas
B. The well E. The upper borehole from the surface
C. Annulus and surface casing F. None of the Above

158. 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

159. 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 D. Contamination of a water
B. The possibility of contamination E. Preliminary aquifer parameters
C. Surface drainage(s) F. None of the Above

160. 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 D. The well's surface seal
B. The possibility of contamination E. Preliminary aquifer parameters
C. Surface drainage(s) F. None of the Above

161. 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

162. According to the text, blank casing is normally installed to the depth of?
A. The quality of drinking water D. The main producing zone
B. The possibility of contamination E. Preliminary aquifer parameters
C. Surface drainage(s) F. None of the Above

163. 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 D. Unstable or non-productive areas
B. The well E. The upper borehole from the surface
C. Well screen F. None of the Above

Choice of Casing
164. Which of the following terms needed is related to the type of aquifer, well depth, water quality, well use, and regulatory requirements?
A. The type of well casing D. The casing and screen specifications
B. The inflatable packer E. Well screen(s)
C. The louver(s) F. None of the Above

165. 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

166. 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

167. 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

168. 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

169. 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

170. 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

171. 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

172. 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

173. 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

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

175. 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 D. Total equivalent feet of lift
B. Screen filter(s) E. The total friction head
C. Power requirement(s) F. None of the Above

Basic Pump Operating Characteristics

176. Which of the following terms refers to the height of a vertical column of water?
A. Head D. Loss of head
B. Suction head E. Pressure head
C. Velocity head F. None of the Above

177. 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 D. Total head
B. Suction head E. Pressure head
C. Velocity head F. None of the Above

Total Dynamic Head

178. 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 D. Total equivalent feet of lift
B. Screen filter(s) E. The total friction head
C. Power requirement(s) F. None of the Above

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

Total Static Head

180. The total static head is the total vertical distance the pump must lift the water.
A. True B. False

Pressure Head

181. Which of the following terms at any point where a pressure gauge is located can be converted from pounds per square inch to feet of head by multiplying by 2.31?

A. Cavitation D. Loss of head
B. Suction head E. Pressure head
C. Velocity head F. None of the Above

182. 20 PSI is equal to 20 times 2.31 or 46.2 feet of head.

A. True B. False

Friction Head

183. Which of the following terms occurs when water flows through straight pipe sections, fittings, valves, around corners, and where pipes increase or decrease in size?

A. Cavitation D. Loss of head
B. Suction head E. Loss of head due to friction
C. Velocity head F. None of the Above

184. 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 D. Total dynamic or discharge head
B. Friction losses E. Loss of head
C. Pressure head F. None of the Above

Velocity Head

185. Velocity head is the energy of the water due to?

A. Cavitation D. Loss of head
B. Suction head E. Its velocity
C. Velocity head F. None of the Above

Suction Head

186. According to the text, a pump operating above a water surface is working with?

A. Friction head D. Total dynamic or discharge head
B. A suction head E. Loss of head
C. Pressure head F. None of the Above

187. There is an allowable limit to _____ on a pump and the net positive suction head of a pump sets that limit.

A. Cavitation D. Loss of head
B. Suction head E. Pressure head
C. Velocity head F. None of the Above

188. The theoretical maximum height that water can be lifted using suction is 21 feet.

A. True B. False

189. 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 D. Loss of head
B. Suction head E. Pressure head
C. Velocity head F. None of the Above

190. 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

191. 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

192. 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

Storage Reservoirs
193. 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
194. Steel reservoirs or tanks generally have higher construction and installation costs than concrete, and require less maintenance.
A. True B. False

195. Steel tanks should be inspected once a year and repainted every 5-7 years.
A. True B. False

196. The maintenance program for reservoir tanks should call for annual draining for a complete inspection of the interior.
A. True B. False

197. Many storage facilities have hydraulic considerations that has resulted in many storage facilities operating today with _____than is needed for non-emergency usage.
A. Storage reservoirs
B. Larger water storage capacity
C. Steel reservoirs
D. Adequate pressure
E. Repairing and replacing these facilities
F. None of the Above

Pump, Motor and Hydraulic Section
198. Hydraulics can be divided into two areas, which term and hydrokinetics?
A. Fluids
B. Hydrostatics
C. Hydrokinetics
D. Mechanical properties of water
E. Flow
F. None of the Above

199. Which of the following terms includes the behavior of all liquids, although it is primarily concerned with the motion of liquids.
A. Fluids D. Hydraulics
B. Hydrostatics E. Flow
C. Hydrokinetics F. None of the Above

200. Which of the following terms includes the manner in which liquids act in tanks and pipes, deals with their properties, and explores ways to take advantage of these properties?
A. Pressure D. Hydraulics
B. Hydrostatics E. Flow
C. Hydrokinetics F. None of the Above

201. Which of the following terms includes the consideration of liquids at rest, involves problems of buoyancy and flotation?
A. Pressure D. Hydraulics
B. Hydrostatics E. Flow
C. Hydrokinetics F. None of the Above

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

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

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

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

206. According to the text, hydraulics may be the physical property that varies over the largest numerical range, competing with electrical resistivity.
A. True B. False

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

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

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

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

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

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

213. According to the text, absolute pressure and gauge pressure?
A. Are the same D. That effectively protects
B. Referred to using pressure E. Permanent forces tangential
C. Are related F. None of the Above

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

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

216. Gauge pressure is simply the pressure read on the gauge. If there is no pressure on the gauge other than atmospheric, the gauge will read zero.
A. True B. False

Pump Definitions
217. Which of the following definitions is the end of the pump closest to the motor?
A. Packing D. Bowl
B. Impeller E. Outboard
C. Inboard F. None of the Above

218. Which of the following definitions is the energy associated with motion?
A. Soft start D. Flow
B. Phase E. Kinetic energy
C. Energy F. None of the Above

219. Which of the following definitions is a rectangular piece of metal that prevents the impeller from rotating on the shaft?
A. Gasket D. Bearing
B. Key E. Seal
C. Energy F. None of the Above

220. Which of the following definitions is the area on the shaft that accepts the key?
A. Gasket D. Inter-stage diaphragm
B. Keyway E. Kinetic energy
C. Energy F. None of the Above

221. Which of the following definitions is any substance that can be pumped such as oil, water, refrigerant, or even air?
A. Fluid D. Substance
B. Mixed flow pump E. Flow
C. Energy F. None of the Above

222. Which of the following definitions is a mechanical device that seals the pump stuffing box?
A. Packing D. Mechanical seal
B. Bearing E. Lantern ring
C. Seal F. None of the Above

223. Which of the following definitions is a pump that uses both axial-flow and radial-flow components in one impeller?
A. Bellows D. Dynamic
B. Mixed flow pump E. Diaphragm pump
C. Kinetic energy F. None of the Above

224. Which of the following definitions is bushing at the bottom of the stuffing box that prevents packing from being pushed out of the stuffing box into the suction eye of the impeller?
A. Strainer D. Stuffing box
B. Suction E. Throat bushing
C. Suction eye F. None of the Above

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

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

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

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

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

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

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

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

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

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

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

236. 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

237. According to the text, pumps may be classified on the basis of the application they serve.
A. True
B. False

238. 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

239. In a centrifugal pump, as water drifts outward between the _____ of the pump, it must move faster and faster because its circular path is getting larger and larger.
A. Centrifugal pump(s)
B. Impeller blade(s)
C. Bernoulli's equation
D. Diaphragm pump(s)
E. Cylindrical pump housing
F. None of the Above

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

241. 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

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

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

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

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

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

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

247. 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):

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

A. True
B. False

249. 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

250. 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

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

A. True
B. False

252. 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

253. 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

254. Impellers are rotated by the pump motor, which provides the _____ needed to overcome the pumping head.
A. Spider bearing(s) D. Turbine pump(s)
B. Horsepower E. Desired pumping rate
C. Impeller(s) F. None of the Above

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

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

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

258. Vertical turbine pumps are commonly used in groundwater wells. These pumps are driven by a shaft rotated by a motor on the surface.
A. True B. False

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

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

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

262. According to the text, column pipe sections can be threaded or coupled together while the drive shaft is coupled and suspended within the column by?
A. Oil tube D. Single or multiple bowls
B. Spider bearings E. Pump's lifting capacity
C. Column pipe F. None of the Above

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

264. Which of the following terms, provide both a seal at the column pipe joints and keep the shaft aligned within the column?
A. Spider bearing(s)
B. Keyway
C. Impeller(s)
D. Roller bearings
E. Lantern rings
F. None of the Above

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

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

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

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

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

270. According to the text, water and oil lubricated turbine pump units can be driven by?
A. Gears
B. Drive shaft
C. Column pipe
D. Electric or fuel powered motors
E. Pump's lifting capacity
F. None of the Above

271. Often an electric motor that is connected to the _____by a keyway and nut.
A. Drive shaft
B. Rotor
C. Inboard
D. Sprocket
E. Time delay or ratchet assembly
F. None of the Above

272. Where electricity is not readily available, fuel powered engines may be connected to the drive shaft by a?
A. Gear
B. Lantern ring
C. Drive shaft
D. Volumetric positive displacement
E. Right angle drive gear
F. None of the Above

273. Oil and water lubricated systems will have a strainer attached to the _____to prevent sediment from entering the pump.
A. Intake D. Lantern ring
B. Diaphragm E. Sump
C. Inboard F. None of the Above

274. Which of the following terms: water flowing back down the column, turning the impellers in a reverse direction?
A. Vapor bubbles are created D. Volumetric positive displacement is turned off
B. Chamber pressure E. Line shaft turbine is turned off
C. Drive shaft is off F. None of the Above

275. Time delays or ratchet assemblies are often installed on these motors to either prevent the motor from turning on before _____stops or simply not allow it to reverse at all.
A. Reverse rotation D. Keyway and nut
B. Diaphragm E. Time delay or ratchet assembly
C. Inertial cavitation F. None of the Above

There are three main types of diaphragm pumps:
276. In the first type, the _____with one side in the fluid to be pumped, and the other in air or hydraulic fluid.
A. Vapor bubbles D. Volumetric positive displacement
B. Chamber pressure E. Diaphragm is sealed
C. Drive shaft F. None of the Above

277. The diaphragm is flexed, causing the volume of the pump chamber to increase and decrease.
A. True B. False

278. A pair of _____prevents reverse flow of the fluid.
A. Strainers D. Non-return check valves
B. Diaphragms E. Check valves
C. Springs F. None of the Above

279. The second type of diaphragm pump works with volumetric positive displacement, but differs in that the prime mover of the diaphragm is neither oil nor air; but is?
A. Vapor bubbles D. Volumetric positive displacement
B. Chamber pressure E. Reverse direction
C. Electro-mechanical F. None of the Above

280. The third type of diaphragm pump has one or more springs with the fluid to be pumped on both sides.
A. True B. False

281. According to the text, when the volume of a chamber of either type of pump is increased (the diaphragm moving up), the pressure decreases, and fluid is drawn into the?
A. Chamber D. Keyway and nut
B. Diaphragm E. Time delay or ratchet assembly
C. Inertial cavitation F. None of the Above

282. Which of the following terms - pressure later increases from decreased volume (the diaphragm moving down), the fluid previously drawn in is forced out?
A. Vapor bubbles
B. Chamber
C. Drive shaft
D. Volumetric positive displacement
E. Diaphragm
F. None of the Above

283. Which of the following terms - moving up once again draws fluid into the chamber, completing the cycle?
A. Spring
B. Diaphragm
C. Inertial cavitation
D. Keyway and nut
E. Time delay or ratchet assembly
F. None of the Above

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

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

286. 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
B. Suction lift
C. Center of the pump
D. Pressure differential
E. Negative suction head
F. None of the Above

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

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

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

290. 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
B. Mixed flow
C. Dynamic
D. Discharge tube
E. Roots blower
F. None of the Above

291. 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
B. Chamber
C. Radial flow
D. Cavity
E. Positive Displacement Pump(s)
F. None of the Above

Key Pump Words

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

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

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

295. 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
B. Specific Speed
C. Viscosity
D. S.G.: Specific gravity
E. Vapor Pressure
F. None of the Above

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

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

298. 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
B. Specific Speed
C. Viscosity
D. S.G.: Specific gravity
E. Vapor Pressure
F. None of the Above

Submersible Pumps

299. Submersible pumps are in essence very similar to?

A. Cased wells
B. Turbine pumps
C. Pump's intake
D. Pump bowl assembly
E. VHS or VSS motors
F. None of the Above

300. The pump shaft has a keyway in which the splined motor end shaft inserts, the motor is often bolted to the?

A. Motor
B. Pump shrouds
C. Canned configurations
D. Pump housing
E. Number of stages
F. None of the Above

301. 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
B. Shroud
C. Pump's intake
D. Pump bowl assembly
E. VHS or VSS motors
F. None of the Above

Understanding the Operation of a Vertical Turbine Pump

302. 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

303. According to the text, the intake for the turbine pump is continuously under water, priming is not a concern.

A. True B. False

304. Which of the following terms are available in deep well, shallow well, or canned configurations?

A. Cased wells
B. Shroud
C. Pump's intake
D. Pump bowl assembly
E. Vertical turbine pumps
F. None of the Above

NPSH - Net Positive Suction Head

305. NPSH (a) must exceed NPSH(r) to allow pump operation without cavitation.

A. True B. False

306. The vapor pressure of water at 95 degrees C is 84.53 kPa, there was enough suction to contain the vapor, but once the atmospheric pressure dropped at the higher elevation, the vapor was able to escape.

A. True B. False

Affinity Laws

307. The Centrifugal Pump is a very capable and?

A. Centrifugal Pump
B. Transmit tension
C. Most economical
D. Atmospheric pressure
E. Flexible machine
F. None of the Above

Suction Lift

308. According to the text, atmospheric pressure at sea level is called absolute pressure (PSIA) because it is a measurement using absolute zero (a perfect vacuum) as a base.

A. True B. False

Cavitation - Two Main Causes:

309. Due to low pressure the _____and higher pressure implodes into the vapor bubbles as they pass through the pump, causing reduced performance and potentially major damage.

A. Pump suction
B. Speed
C. Suction conditions
D. Water vaporizes (boils)
E. Hydraulic efficiency
F. None of the Above

Motor, Coupling and Bearing Section

310. The purpose of the bearing house is to hold the shaft firmly in place, yet allow it to rotate.

A. True B. False

311. The pump assembly can only be a vertical set-up.

A. True B. False

312. The power source of the pump is usually an electric motor. The motor is connected by a coupling to the?

A. Static head
B. Bearings
C. Pump assembly
D. System or dynamic head
E. Pump shaft
F. None of the Above

D-C Motors

313. The important characteristic of the D-C motor is that its speed will not vary with the amount of current used.

A. True B. False

314. There are many different kinds of D-C motors, depending on how they are wound and their totally enclosed motors.

A. True B. False

A-C Motors

315. The synchronous type of A-C motor is used in smaller horsepower sizes, usually above 100 HP.

A. True B. False

316. There are a number of different types of alternating current motors, such as Synchronous, Induction, wound rotor, and?

A. Bubbler pipe
B. Manual pump controls
C. Wound rotor type
D. Totally enclosed motors
E. Squirrel cage
F. None of the Above

Motor Starters

317. All electric motors, except very large ones are equipped with starters, either full voltage or reduced voltage.

A. True B. False

318. Motors draw a much higher current when they are?
A. Heat generated
B. Synchronous type
C. Motor(s)
D. Starting and gaining speed
E. Full voltage or reduced voltage
F. None of the Above

319. The purpose of the _____is to prevent the load from coming on until the amperage is low enough.
A. Bubbler pipe
B. Manual pump controls
C. Reduced voltage starter
D. Totally enclosed motors
E. Reduced voltage starter
F. None of the Above

Motor Enclosures
320. Depending on the application, motors may need special protection.
A. True B. False

321. Some motors are referred to as open motors.
A. True B. False

322. Open motors allow air to pass through to remove heat generated when current passes through the windings.
A. True B. False

Motor Controls
323. Which of the following terms are provided with some method of control, typically a combination of manual and automatic?
A. Heat generated
B. Synchronous type
C. Pump motors
D. Speed/torque characteristics
E. Full voltage or reduced voltage
F. None of the Above

324. Which of the following terms can be located at the central control panel at the pump or at the suction or discharge points of the liquid being pumped?
A. Bubbler pipe
B. Manual pump controls
C. Wound rotor type
D. Totally enclosed motors
E. Reduced voltage starter
F. None of the Above

325. Two typical level sensors are the float sensor and the bubble regulator.
A. True B. False

Motor Maintenance
326. Motors should be kept clean, free of moisture, and lubricated properly.
A. True B. False

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

328. Valves control the flow of water in the distribution system by isolating areas for repair or by?

A. Increase water pressure
B. Bypasses
C. Complete gridiron system
D. Main line isolation
E. Regulating system flow or pressure.
F. None of the Above

329. According to the text, gate valves should be used in the _____for main line isolation.

A. Increase water pressure
B. Distribution tree
C. Complete gridiron system
D. Distribution system
E. Arterial system
F. None of the Above

Water Distribution Valves

330. All buried small- and medium-sized valves should be installed in the sidewalk.

A. True B. False

Gate Valves

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

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

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

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

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

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

Ball Valves

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

A. True B. False

Valve Exercising

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

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

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

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

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

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

If Excessive Torque is Needed to Work the Valve

338. 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

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

A. True B. False

System Layouts Tree System

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

A. True B. False

Friction Loss

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

A. True B. False

Ductile Iron Pipe (DIP)

342. DIP can be purchased in 4" to 45" diameters and lengths of 18' to 20'.

A. True B. False

343. DIP was developed to _____ associated with cast iron pipe.

A. Overcome the breakage problems
B. Withstand shock loads
C. Extend the life
D. Provide a High C Factor
E. Be nearly indestructible
F. None of the Above

344. 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

345. 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

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

346. Which of the following terms is any temporary or permanent connection between a public water system or consumer's potable water system and any source or system containing nonpotable water or other substances?

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

347. Which of the following terms is a form of backflow caused by a negative pressure (i.e., a vacuum or partial vacuum) 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

348. Backflow is the undesirable reversal of flow of nonpotable water or other substances through a _____and into the piping of a public water system or consumer's potable water system.

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

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

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

350. 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

351. Which of the following terms is a form of backflow caused by a downstream pressure that is greater than the upstream or supply pressure in a public water system or consumer's potable water system?

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

352. Which of the following terms can result from an increase in downstream pressure, a reduction in the potable water supply pressure, or a combination of both?

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

353. Which of the following terms can have two forms-backpressure and backsiphonage?

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

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

355. Which of the following terms is a means or mechanism to prevent backflow?
A. High hazard installations D. Backflow
B. Air gap E. Device or method
C. Backflow preventer F. None of the Above

356. According to the text, basic means of preventing backflow is an _____, which either eliminates a cross-connection or provides a barrier to backflow.
A. High hazard installations D. Backflow
B. Air gap E. Device or method
C. Backflow preventer F. None of the Above

Stage 2 DBP Rule Federal Register Notices

357. 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

358. 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

359. The Stage 1 Disinfectants and Disinfection Byproducts Rule and_____, promulgated in December 1998.
A. Major public health advances D. Amendments to the SDWA in 1996
B. The Stage 2 DBPR E. Interim Enhanced Surface Water Treatment Rule
C. This final rule F. None of the Above

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

361. Which of the following rules along with the Long Term 2 Enhanced Surface Water Treatment Rule are the second phase of rules required by Congress?
A. Major public health advances D. Amendments to the SDWA in 1996
B. The Stage 2 DBPR E. Primary or residual disinfectant
C. This final rule F. None of the Above

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

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

363. Which of the following terms strengthens public health protection for customers by tightening compliance monitoring requirements for two groups of DBPs, trihalomethanes and haloacetic acids?

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

364. 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
B. The open-channel system
C. UV rather than ozone
D. UV source
E. UV radiation
F. None of the Above

365. 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
B. DBP exposure
C. The Stage 2 DBP rule
D. Long Term 2 Enhanced Surface Water Treatment Rule
E. Safe Drinking Water Act (SDWA)
F. None of the Above

366. Which of the following terms is one of the major public health advances in the 20th century?

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

367. There are specific microbial pathogens, such as_____, which can cause illness, and are highly resistant to traditional disinfection practices.

A. Enteric virus(es)
B. Oocyst(s)
C. Cryptosporidium
D. C. perfringens
E. E. coli host culture
F. None of the Above

Microbial Regulations

368. One of the key regulations developed and implemented by the USEPA to counter pathogens in drinking water is the SWTR requires that a public water system, using surface water as its source, have sufficient treatment to reduce the source water concentration of Giardia and viruses by at least 99.9% and 99.99%, respectively.

A. True B. False

369. Which rule specifies treatment criteria to assure that these performance requirements are met; they include turbidity limits, disinfectant residual, and disinfectant contact time conditions?

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

Waterborne Pathogens Section
The reason we disinfect.
370. Bacteria, viruses and protozoan that cause disease are known as pathogens.
A. True B. False

371. 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.
372. Waterborne pathogens are primarily spread by the?
A. Fecal-oral, or feces-to-mouth, route
B. Dermal to fecal route
C. Oral to fecal route
D. Influenza route
E. Waterborne mishaps
F. None of the Above

Repeat Sampling
373. 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

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

The follow-up for repeat sampling is:
375. If only one _____ per month or quarter is required, four (4) repeat samples must be collected.
A. Routine sample
B. Surface water sample
C. Original sample
D. Sample
E. MCL sample
F. None of the Above

376. For systems collecting two (2) or more routine samples per month, three _____ must be collected.
A. Routine samples
B. Surface water samples
C. Samplers
D. Repeat samples
E. MCL compliance calculations
F. None of the Above

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

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

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

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

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

Positive or Coliform Present Results
382. 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 D. Sample violation
B. Positive violation E. MCL compliance violation
C. Repeat sampling immediately F. None of the Above

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

Total Coliforms
384. 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

385. 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

386. For systems that collect _____ or more samples per month, no more than five (5) percent may be Positive.
A. 5 D. 200
B. 10 E. 40
C. 100 F. None of the Above

Acute Risk to Health (Fecal coliforms and E. coli)
387. Which of the following terms to human health violation occurs if a routine analysis shows total coliform present, and a follow-up repeat analysis indicates fecal coliform or E. coli present, an acute risk to human health violation
A. Routine analysis D. Human health violation
B. Drinking violation E. Fecal coliform or E. coli is present
C. Acute risk F. None of the Above

Chlorine Gas Section
388. 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

289. What is the term that best describes the amount of chlorine needed to react with contamination species and it must be satisfied before active HOCl is available to provide a free chlorine residual?
A. Chlorine demand D. Total residual
B. HOCl E. The hypochlorite ion (OCl-)
C. High chlorine concentration F. None of the Above

Pathophysiology
390. 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

391. 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
392. 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_____.
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

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

394. Which of the following terms may account for the toxicity of elemental chlorine and hydrochloric acid to the human body?

A. Hydrochloric acid
B. H2SO4
C. Hypochloric acid
D. Hypochlorous acid
E. Sulfuric Acid
F. None of the Above

Early Response to Chlorine Gas

395. If you mix ammonia with chlorine gas, this compound reacts to form?

A. Hypochlorous acid
B. Chlorine gas
C. Hydrochloric acid
D. Sulfuric acid
E. Chloramine gas
F. None of the Above

Immediate Effects

396. Which of the following answers is the best choice for the immediate effects of this substance's toxicity include acute inflammation of the conjunctivae, nose, pharynx, larynx, trachea, and bronchi?

A. Hydrochloric acid
B. Chlorine gas
C. Hypochlorous gas
D. Sulfuric acid
E. HOCL
F. None of the Above

Pathological Findings

397. Chlorine gas is greenish yellow in color and very toxic. It is heavier than air and will therefore sink to the ground if released from its container. It is the toxic effect of Chlorine gas that makes it a good disinfectant, but it is toxic to more than just waterborne pathogens; it is also toxic to humans. It is a respiratory irritant and it can also irritate skin and mucus membranes.

A. True B. False

398. Chlorine gas is sold as a compressed liquid, which is amber in color. Chlorine, as a solid, is heavier than water. If the chlorine liquid is released from its container, it will quickly return back to its liquid state.

A. True B. False

Chemistry of Chlorination

399. The hypochlorite ion is a much weaker disinfecting agent than Hypochlorous acid, about 100 times less effective.

A. True B. False

Types of Residual

400. Total chlorine residual = free +_____.

A. Chlorine residual
B. Chlorine demand
C. Free chlorine
D. Combined chlorine residual
E. Total chlorine residual
F. None of the Above