

**Registration form**

**DISTRIBUTION BASICS \$150.00**  
**48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL \$50.00**

**Start and Finish Dates:** \_\_\_\_\_

*You will have 90 days from this date in order to complete this course*

List number of hours worked on assignment must match State Requirement. \_\_\_\_\_

**Name** \_\_\_\_\_ **Signature** \_\_\_\_\_

*I have read and understood the disclaimer notice on page 2. Digitally sign XXX*

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**Phone:**

**Home ( \_\_\_\_\_ )** \_\_\_\_\_ **Work ( \_\_\_\_\_ )** \_\_\_\_\_

**Operator ID #** \_\_\_\_\_ **Exp. Date** \_\_\_\_\_

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

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

Water Distribution  Water Treatment  Other \_\_\_\_\_

**Technical Learning College TLC PO Box 3060, Chino Valley, AZ 86323**  
**Toll Free (866) 557-1746 Fax (928) 272-0747 [info@tlch2o.com](mailto:info@tlch2o.com)**

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**Professional Engineers**; Most states will accept our courses for credit but we do not officially list the States or Agencies. Please check your State for approval.

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

<http://www.tlch2o.com/PDF/CEU%20State%20Approvals.pdf>

*You can obtain a printed version of the course manual from TLC for an additional \$89.95 plus shipping charges.*

## **AFFIDAVIT OF EXAM COMPLETION**

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

## **Grading Information**

In order to maintain the integrity of our courses we do not distribute test scores, percentages or questions missed. Our exams are based upon pass/fail criteria with the benchmark for successful completion set at 70%. Once you pass the exam, your record will reflect a successful completion and a certificate will be issued to you.

## **Rush Grading Service**

If you need this assignment graded and the results mailed to you within a 48-hour period, prepare to pay an additional rush service handling fee of \$50.00. This fee may not cover postage costs. If you need this service, simply write RUSH on the top of your Registration Form. We will place you in the front of the grading and processing line.

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

# Texas Students Only

## Acknowledgement of Notice of Potential Ineligibility for License

*You are required to sign and return to TLC or your credit will not be reported.*

Name: \_\_\_\_\_

Date of Birth: \_\_\_\_\_

Email Address: \_\_\_\_\_

By signing this form, I acknowledge that Technical Learning College notified me of the following:

- the potential ineligibility of an individual who has been convicted of an offense to be issued an occupational license by the Texas Commission on Environmental Quality (TCEQ) upon completion of the educational program;
- the current TCEQ Criminal Conviction Guidelines for Occupational Licensing, which describes the process by which the TCEQ's Executive Director determines whether a criminal conviction:
  - renders a prospective applicant an unsuitable candidate for an occupational license;
  - warrants the denial of a renewal application for an existing license; or
  - warrants revocation or suspension of a license previously granted.
- the right to request a criminal history evaluation from the TCEQ under Texas Occupations Code Section 53.102; and
- that the TCEQ may consider an individual to have been convicted of an offense for the purpose of denying, suspending or revoking a license under circumstances described in Title 30 Texas Administrative Code Section 30.33.

Enrollee Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name of Training Provider/Organization: Technical Learning College

Contact Person: Melissa Durbin Role/Title: Dean

## Distribution Basics Answer Key

Name \_\_\_\_\_

Phone \_\_\_\_\_

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

You are responsible to ensure this course is accepted for credit.  
Method of Course acceptance confirmation. Please fill this section

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

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

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

***You can electronically complete this assignment in Adobe Acrobat DC.***

Please Circle, Bold, Underline or X, one answer per question. A **felt tipped pen** works best.

- |             |             |             |             |
|-------------|-------------|-------------|-------------|
| 1. A B      | 20. A B C D | 39. A B C D | 58. A B     |
| 2. A B C D  | 21. A B C D | 40. A B C D | 59. A B C D |
| 3. A B C D  | 22. A B C D | 41. A B C D | 60. A B C D |
| 4. A B C D  | 23. A B C D | 42. A B     | 61. A B C D |
| 5. A B      | 24. A B C D | 43. A B C D | 62. A B     |
| 6. A B      | 25. A B     | 44. A B C D | 63. A B C D |
| 7. A B      | 26. A B     | 45. A B C D | 64. A B C D |
| 8. A B      | 27. A B C D | 46. A B C D | 65. A B     |
| 9. A B      | 28. A B C D | 47. A B C D | 66. A B C D |
| 10. A B C D | 29. A B     | 48. A B C D | 67. A B C D |
| 11. A B C D | 30. A B C D | 49. A B C D | 68. A B C D |
| 12. A B C D | 31. A B     | 50. A B C D | 69. A B C D |
| 13. A B     | 32. A B C D | 51. A B C D | 70. A B C D |
| 14. A B     | 33. A B C D | 52. A B C D | 71. A B C D |
| 15. A B C D | 34. A B C D | 53. A B C D | 72. A B     |
| 16. A B     | 35. A B C D | 54. A B     | 73. A B C D |
| 17. A B     | 36. A B C D | 55. A B     | 74. A B     |
| 18. A B C D | 37. A B C D | 56. A B C D | 75. A B C D |
| 19. A B C D | 38. A B C D | 57. A B C D | 76. A B C D |

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|--------------|--------------|--------------|--------------|
| 77. A B C D  | 108. A B C D | 139. A B C D | 170. A B     |
| 78. A B C D  | 109. A B C D | 140. A B C D | 171. A B     |
| 79. A B C D  | 110. A B C D | 141. A B C D | 172. A B C D |
| 80. A B C D  | 111. A B C D | 142. A B C D | 173. A B C D |
| 81. A B C D  | 112. A B C D | 143. A B C D | 174. A B C D |
| 82. A B C D  | 113. A B C D | 144. A B C D | 175. A B C D |
| 83. A B      | 114. A B C D | 145. A B C D | 176. A B C D |
| 84. A B C D  | 115. A B C D | 146. A B C D | 177. A B C D |
| 85. A B C D  | 116. A B C D | 147. A B C D | 178. A B C D |
| 86. A B C D  | 117. A B C D | 148. A B C D | 179. A B C D |
| 87. A B C D  | 118. A B     | 149. A B C D | 180. A B C D |
| 88. A B C D  | 119. A B C D | 150. A B C D | 181. A B C D |
| 89. A B C D  | 120. A B C D | 151. A B C D | 182. A B C D |
| 90. A B C D  | 121. A B C D | 152. A B C D | 183. A B C D |
| 91. A B C D  | 122. A B C D | 153. A B C D | 184. A B C D |
| 92. A B C D  | 123. A B C D | 154. A B C D | 185. A B C D |
| 93. A B C D  | 124. A B C D | 155. A B C D | 186. A B C D |
| 94. A B C D  | 125. A B     | 156. A B C D | 187. A B     |
| 95. A B C D  | 126. A B C D | 157. A B     | 188. A B     |
| 96. A B C D  | 127. A B C D | 158. A B C D | 189. A B C D |
| 97. A B C D  | 128. A B     | 159. A B C D | 190. A B     |
| 98. A B      | 129. A B C D | 160. A B C D | 191. A B C D |
| 99. A B      | 130. A B C D | 161. A B C D | 192. A B C D |
| 100. A B     | 131. A B C D | 162. A B C D | 193. A B C D |
| 101. A B     | 132. A B C D | 163. A B C D | 194. A B C D |
| 102. A B     | 133. A B     | 164. A B C D | 195. A B     |
| 103. A B     | 134. A B C D | 165. A B C D | 196. A B C D |
| 104. A B     | 135. A B C D | 166. A B C D | 197. A B C D |
| 105. A B     | 136. A B     | 167. A B C D | 198. A B C D |
| 106. A B     | 137. A B     | 168. A B C D | 199. A B C D |
| 107. A B C D | 138. A B C D | 169. A B C D | 200. A B C D |

***Please write down any questions you were not able to find the answers or that have errors.***

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

Always call us after faxing the paperwork to ensure that we've received it.

**Rush Grading Service**

If you need this assignment graded and the results mailed to you within a 48-hour period, prepare to pay an additional rush service handling fee of \$50.00.

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

*Please e-mail or fax this survey along with your final exam*

**DISTRIBUTION BASICS CEU COURSE  
CUSTOMER SERVICE RESPONSE CARD**

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

E-MAIL \_\_\_\_\_ PHONE \_\_\_\_\_

**PLEASE COMPLETE THIS FORM BY CIRCLING THE NUMBER OF THE APPROPRIATE ANSWER IN THE AREA BELOW.**

Please rate the difficulty of your course.

Very Easy    0    1    2    3    4    5    Very Difficult

Please rate the difficulty of the testing process.

Very Easy    0    1    2    3    4    5    Very Difficult

Please rate the subject matter on the exam to your actual field or work.

Very Similar    0    1    2    3    4    5    Very Different

How did you hear about this Course? \_\_\_\_\_

What would you do to improve the Course?

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Any other concerns or comments.

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## Distribution Basics 1 CEU Training Course Assignment

The Distribution Basics CEU course assignment is available in Word on the Internet for your convenience, please visit [www.abctlc.com](http://www.abctlc.com) and download the assignment and e-mail it back to TLC.

You will have 90 days from receipt of this manual to complete it in order to receive your Professional Development Hours (PDHs) or Continuing Education Unit (CEU). A score of 70 % or better is necessary to pass this course. If you should need any assistance, please email or fax all concerns and the completed ANSWER KEY to [info@tlch2o.com](mailto:info@tlch2o.com).

Select one answer per question. Please utilize the answer key. (s) on the answer will indicate either plural and singular tenses.

### Hyperlink to the Glossary and Appendix

<http://www.abctlc.com/downloads/PDF/WTGlossary.pdf>

## Water Distribution Section

### System Elements

1. Globe valves should only be the only valve used in an Arterial system for main line isolation.  
A. True            B. False

### Butterfly Valve

2. Butterfly valves are rotary type of valves usually found on large transmission lines, and may also have an additional valve beside it known as a \_\_\_\_\_ to prevent water hammer.  
A. Regulator                            C. PRV  
B. Bypass                                D. None of the above

### Water Distribution Valves

3. According to the text, at intersections of distribution mains, the number of valves required is normally one less than the number of?  
A. Ties                                    C. Depends on customers  
B. Radiating mains    D. None of the above

### Gate Valves

4. If the valve is wide open, the gate inside the valve is \_\_\_\_\_ into the valve bonnet.  
A. Fully drawn up                      C. Fully closed  
B. Fully down                            D. None of the above

### Ball Valves

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

### Valve Exercising

6. Valve exercising should be done once per year to locate inoperable valves due to freezing or build-up of rust or corrosion and to detect minimum flow restriction and to prevent valves from becoming frozen or damaged.  
A. True                                    B. False

### Common Rotary Valves

7. Globe valve is a rotary valve and is rare to find in most distribution systems, but is found at water treatment plants.

- A. True                      B. False

### Water Pressure

8. 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

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

- A. True                      B. False

10. 20 psi is the minimum pressure required at any point in the water system, so that \_\_\_\_\_ is prevented.

- A. Cavitation                      C. Backflow and infiltration  
B. Back pressure                      D. None of the above

11. Which of the following is provided from the direct force of the water, or by the height of the water?

- A. Pressure                      C. Maximum daily use  
B. System integrity                      D. None of the above

### Water Use or Demand

12. Water system demand comes from many sources including residential, commercial, industrial and public consumers as well as waste and some?

- A. Pressure                      C. Unavoidable loss  
B. System integrity                      D. None of the above

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

- A. True                      B. False

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

- A. True                      B. False

15. Which of the following is highly desired and represents a rather significant demand upon the system?

- A. Fire protection                      C. Surge protection  
B. Cavitation protection                      D. None of the above

16. A common design usage assumption is to plan for the usage of 100 to 150 gallons per person per day for average domestic use.

- A. True                      B. False

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

- A. True                      B. False

18. Which of the following is usually encountered during the summer months and can vary widely depending on irrigation practices?

- A. Maximum daily use                      C. Unavoidable loss and waste  
B. Minimum daily use                      D. None of the above

(S) Means the answer can be plural or singular in nature

## Groundwater Treatment/Production System Section

### Groundwater and Wells

19. When toxic substances are spilled or dumped near a well, these can leach into \_\_\_\_\_ and contaminate the groundwater drawn from that well.
- A. Karst
  - B. Aquifer
  - C. Soil moisture
  - D. None of the above
20. The area above the water table lies the?
- A. Unsaturated zone
  - B. Karst
  - C. Saturated zone
  - D. None of the above
21. The water in the saturated zone is called?
- A. Unconfined aquifer(s)
  - B. Groundwater
  - C. Water table
  - D. None of the above
22. Which of the following terms are cracks, joints, or fractures in solid rock, through which groundwater moves?
- A. Fractured aquifer(s)
  - B. Karst
  - C. Soil moisture
  - D. None of the above
23. Limestone is often located in which of the following?
- A. Unconfined aquifer(s)
  - B. Soil moisture
  - C. Fractured aquifer(s)
  - D. None of the above
24. Which of the following may move in different directions below the ground than the water flowing on the surface?
- A. Water table
  - B. Groundwater
  - C. Soil moisture
  - D. None of the above
25. Unconfined aquifers are those that are bounded by the water table. Some aquifers lie beneath layers of impermeable materials.
- A. True
  - B. False
26. A well inside an aquifer is an artesian well.
- A. True
  - B. False
27. Which of the following is the level to which the water in an artesian aquifer will rise?
- A. Aquifer
  - B. Piezometric surface
  - C. Water table
  - D. None of the above
28. Sandstone may become so highly cemented or recrystallized that all of the original space is filled, in this case, the rock is no longer a porous medium and is known as?
- A. Unconfined aquifer(s)
  - B. Porous media
  - C. Fractured aquifer(s)
  - D. None of the above
29. Clay has many spaces between its grains, but the spaces are not large enough to permit free movement of water.
- A. True
  - B. False
30. Which of the following usually flows downhill along the slope of the water table?
- A. Groundwater
  - B. Water table
  - C. Soil moisture
  - D. None of the above

### **Cone of Depression**

31. When well pumping begins, water begins to flow towards the well in contrast to the natural direction of groundwater movement.  
A. True                      B. False
32. During pumping, the water level in the well falls below the water table in the?  
A. Water table                      C. Unconfined aquifer  
B. Surrounding aquifer              D. None of the above
33. The movement of water from \_\_\_\_\_ into a well results in the formation of a cone of depression.  
A. Confined aquifer                      C. Water table  
B. An aquifer                      D. None of the above
34. Which of the following describes a three-dimensional inverted cone surrounding the well that represents the volume of water removed as a result of pumping?  
A. Water table                      C. Cone of depression  
B. Groundwater                      D. None of the above
35. Which of the following is the vertical drop in the height between the water level in the well prior to pumping and the water level in the well during pumping?  
A. Drawdown                      C. Cone of depression  
B. Groundwater                      D. None of the above
36. When a water well is installed in \_\_\_\_\_, water moves from the aquifer into the well through small holes or slits in the well casing or, in some types of wells, through the open bottom of the well?  
A. Confined aquifer                      C. Water table  
B. An unconfined aquifer              D. None of the above

### **Where Is Ground Water Stored?**

37. Areas where ground water exists in sufficient quantities to supply wells or springs are called aquifers, this term that literally means?  
A. Water table                      C. Cone of depression  
B. Water bearer                      D. None of the above

### **Does Groundwater Move?**

38. Groundwater can move sideways as well as up or down. This movement is in response to gravity, differences in elevation, and?  
A. Permeable zones                      C. Saturated zone  
B. Differences in pressure              D. None of the above

### **Groundwater Quality**

39. It is known that some contaminants can pass through all of these filtering layers into \_\_\_\_\_ to contaminate ground water.  
A. Permeable zones                      C. Saturated zone  
B. Unsaturated zone                      D. None of the above

### **How Does Groundwater Become Contaminated?**

40. If the contaminant is introduced straight into the area below \_\_\_\_\_, the primary process that can affect the impact of the contaminant is dilution by the surrounding ground water.  
A. Water table                      C. Unsaturated zone  
B. Saturated zone                      D. None of the above

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

41. Substances that can pollute \_\_\_\_\_ can be divided into two basic categories: substances that occur naturally and substances produced or introduced by man's activities.

- A. Synthetic organic chemical(s)
- B. Groundwater
- C. Permeable zones
- D. None of the above

### Water Well Reports and Hydrogeology

#### Hydrogeologic Data

42. 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

#### Nature of the Aquifer

43. An unconfined aquifer has the \_\_\_\_\_ 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. Permeability area
- D. None of the above

44. 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. Hydraulic head
- B. Water table
- C. Permeability zone
- D. None of the above

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

- A. Hydraulic head
- B. Water table
- C. A confined aquifer
- D. None of the above

### Pump and Motor Section

#### Common Hydraulic Terms

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

- A. Hydraulics
- B. Hydrology
- C. Hydrokinetics
- D. None of the above

47. Which of the following definitions is pressure above zero absolute, i.e. the sum of atmospheric and gauge pressure?

- A. Pressure, Atmospheric
- B. Pressure, Static
- C. Pressure, Gauge
- D. None of the above

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

- A. Pressure, Absolute
- B. Pressure
- C. Pressure, Gauge
- D. None of the above

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

- A. Pressure, Absolute
- B. Pressure
- C. Pressure, Gauge
- D. None of the above

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

- A. Head, Friction
- B. Head, Static
- C. Head
- D. None of the above



63. 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. Center of the impeller
  - D. None of the above

**Venturi (Bernoulli's law):**

64. Which of the following 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. None of the above

**Types of Water Pumps**

65. The water production well industry almost exclusively uses Turbine pumps, which are a type of centrifugal pump.
- A. True
  - B. False

66. The most common type of water pumps used for municipal and domestic water supplies are?
- A. Axial flow
  - B. Variable displacement pumps
  - C. Rotary pumps
  - D. None of the above

67. Which of the following will produce at different rates relative to the amount of pressure or lift the pump is working against?
- A. Pump's lifting capacity
  - B. Atmospheric pressure
  - C. Variable displacement pump
  - D. None of the above

68. Impellers are rotated by the pump motor, which provides the \_\_\_\_\_ needed to overcome the pumping head.
- A. Pump's lifting capacity
  - B. Atmospheric pressure
  - C. Horsepower
  - D. None of the above

69. The size and number of stages, horsepower of the motor and \_\_\_\_\_ are the key components relating to the pump's lifting capacity.
- A. Pumping head
  - B. Atmospheric pressure
  - C. Horsepower
  - D. None of the above

70. Which of the following terms are variable displacement pumps that are by far used the most?
- A. Axial flow
  - B. Centrifugal pumps
  - C. Turbine pumps
  - D. None of the above

71. According to the text, the turbine pump utilizes impellers enclosed in single or multiple bowls or stages to?
- A. Pump head
  - B. Lift water
  - C. Horsepower
  - D. None of the above

72. 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

73. The shaft turns the impellers within the pump housing while the?
- A. Desired pumping rate is obtained
  - B. Horsepower turns the shaft
  - C. Water moves up the column
  - D. None of the above

74. 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

75. The size of the \_\_\_\_\_ are selected based on the desired pumping rate and lift requirements.

- A. Impeller(s)
- B. Lantern ring
- C. Column, impeller, and bowls
- D. None of the above

**There are three main types of diaphragm pumps:**

76. 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
- B. Chamber pressure
- C. Diaphragm is sealed
- D. None of the above

77. Which of the following moving up once again draws fluid into the Chamber, completing the cycle?

- A. Spring
- B. Diaphragm
- C. Time delay or ratchet assembly
- D. None of the above

**Water Quality Section**

**Three Types of Public Water Systems**

78. Provides water where people do not remain for long periods of time for example: gas stations, campgrounds.

- A. TNCWS
- B. CWSs
- C. NTNCWSs
- D. None of the above

79. Approximately 52,000 systems serving the majority of the U.S. population

- A. TNCWS
- B. CWSs
- C. NTNCWSs
- D. None of the above

80. Provides water to the same people at least six months a year, but not all year (for example: schools, factories, churches, office buildings that have their own water system)

- A. TNCWS
- B. CWSs
- C. NTNCWSs
- D. None of the above

81. Approximately 18,000 water systems

- A. TNCWS
- B. CWSs
- C. NTNCWSs
- D. None of the above

**Managing Water Quality at the Source**

82. Contingent upon the region, source water may have several restrictions of use as part of a Water Shed Management Plan. In some areas, it may be restricted from recreational use, discharge or runoff from agriculture, or \_\_\_\_\_.

- A. Excess nutrients
- B. Biological actions
- C. Industrial and wastewater discharge
- D. None of the above

83. Another characteristic of quality control is aquatic plants. The ecological equilibrium in lakes and reservoirs plays a natural part in purifying and sustaining the life of the lake. Certain vegetation removes the excess nutrients that would promote the growth of algae. Too much algae will imbalance the lake and kill fish.

- A. True
- B. False

(S) Means the answer can be plural or singular in nature



### Physical Characteristics of Water

84. Physical characteristics are the elements found that are considered alkali, metals, and non-metals such as carbonates, fluoride, \_\_\_\_\_. The consumer relates it to scaling of faucets or staining.

- A. pH and alkalinity
- B. Sulfides or acids
- C. Powdered activated carbon and chlorine
- D. None of the above

85. Total Dissolved Solids (TDS) is not a primary pollutant; it is a gauge of appealing water characteristics such as hardness and an indication of an assortment of chemical contaminants that might be present, such as?

- A. Turbidity
- B. Colloids
- C. Arsenic
- D. None of the above

86. pH is the negative logarithm of the hydrogen ion concentration,  $[H^+]$ , a measure of the degree to which a solution is \_\_\_\_\_.

- A. Alkalinity
- B. Acidic or alkaline
- C. Hydrogen ion ( $H^+$ )
- D. None of the above

87. \_\_\_\_\_ is a substance that can give up a hydrogen ion ( $H^+$ ); a base is a substance that can accept  $H^+$ .

- A. Acid
- B. Base
- C. Acidic or alkaline
- D. None of the above

88. The more acidic a solution the greater the hydrogen ion concentration and the lower the pH; a pH of 7.0 indicates neutrality, a pH of less than 7 indicates acidity, and a pH of more than 7 indicates \_\_\_\_\_.

- A. Acid
- B. Base
- C. Alkalinity
- D. None of the above

### Bacteriological Monitoring Section Organisms Descriptors and Meanings

89. Litho means...

- A. Rock
- B. Organic
- C. Light
- D. None of the above

90. Organo means...

- A. Rock
- B. Organic
- C. Light
- D. None of the above

91. Auto means...

- A. Without air
- B. With air
- C. Self (Inorganic carbon)
- D. None of the above

92. Chemo means...

- A. Rock
- B. Organic
- C. Chemical
- D. None of the above

93. Hetero means...

- A. Feed or nourish
- B. Other (Organic carbon)
- C. Light
- D. None of the above

94. Anaerobic means...

- A. Without air
- B. With air
- C. Self (Inorganic carbon)
- D. None of the above

**Contaminants that may be present in sources of drinking water include:**

95. Which of the following may come from a variety of sources such as agriculture, urban stormwater run-off, and residential uses?

- A. Radioactive contaminants
- B. Pesticides and herbicides
- C. Inorganic contaminants
- D. Microbial contaminants

96. Which of the following, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife?

- A. Microbial contaminants
- B. Pesticides and herbicides
- C. Inorganic contaminants
- D. Microbial contaminants

97. Which of the following like salts and metals, which can be naturally occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming?

- A. Radioactive contaminants
- B. Pesticides and herbicides
- C. Inorganic contaminants
- D. Microbial contaminants

**TCR**

98. The TCR recommends most of the Public Water Systems (PWS) to monitor their distribution system for bacteria according to the written sample sitting plan for that system.

- A. True
- B. False

99. The sample sitting plan identifies sampling frequency and locations throughout the distribution system that are selected to be representative of conditions in the entire system.

- A. True
- B. False

100. Coliform contamination may occur anywhere in the system, possibly due to problems such as; high pressure conditions, line fluctuations, or wells, and therefore routine monitoring is required.

- A. True
- B. False

**Routine Sampling Requirements**

101. Total coliform samples must be collected by PWSs at sites which are representative of water quality throughout the distribution system according to a written sample siting plan subject to state review and revision.

- A. True
- B. False

102. For PWSs collecting more than one sample per month, collect total coliform samples at regular intervals throughout the month, except that ground water systems serving 4,900 or fewer people may collect all required samples on a single day if the samples are taken from different sites.

- A. True
- B. False

103. Each total coliform-positive (TC+) routine sample must be tested for the presence of heterotrophic bacteria.

- A. True
- B. False

104. If any TC+ sample is also E. coli-positive (EC+), then the EC+ sample result must be reported to the state by the end of the month that the PWS is notified.

- A. True
- B. False

(S) Means the answer can be plural or singular in nature

105. If any routine sample is TC+, repeat samples are required. – PWSs on quarterly or annual monitoring must take a minimum of one additional routine samples (known as additional routine monitoring) the quarter following a TC+ routine or repeat sample.

- A. True      B. False

106. Reduced monitoring is general available for PWSs using only surface water and serving 1,000 or fewer persons that meet certain additional PWS criteria.

- A. True      B. False

### **Dangerous Waterborne Microbes**

107. Which of the following is a parasite that enters lakes and rivers through sewage and animal waste. It causes cryptosporidiosis, a mild gastrointestinal disease. The disease can be severe or fatal for people with severely weakened immune systems.

- A. Coliform Bacteria    C. Giardia lamblia  
B. Cryptosporidium    D. None of the above

108. Which of the following are not necessarily agents of disease, fecal coliform bacteria may indicate the presence of disease-carrying organisms, which live in the same environment as the fecal coliform bacteria.

- A. Fecal coliform bacteria    C. Shigella dysenteriae  
B. Cryptosporidium          D. None of the above

### **Bacteriological Monitoring Introduction**

109. Which of the following are usually harmless, occur in high densities in their natural environment and are easily cultured in relatively simple bacteriological media?

- A. Indicator bacteria    C. Viruses  
B. Amoebas              D. None of the above

110. Indicators in common use today for routine monitoring of drinking water include total coliforms, fecal coliforms, and?

- A. Cryptosporidium    C. Escherichia coli (E. coli)  
B. Protozoa            D. None of the above

111. According to the text, the routine microbiological analysis of your water is for?

- A. Contamination    C. Coliform bacteria  
B. Colloids            D. None of the above

### **The three (3) primary types of samples are:**

112. Samples collected following a coliform present routine sample. The number of repeat samples to be collected is based on the number of \_\_\_\_\_ samples you normally collect.

- A. Repeat    C. Routine  
B. Special    D. None of the above

113. A PWS fails to take every required repeat sample after any single TC+ sample

- A. Trigger: Level 1 Assessment    C. All of the above  
B. Trigger: Level 2 Assessment    D. None of the above

114. A PWS incurs an E. coli MCL violation.

- A. Trigger: Level 1 Assessment    C. All of the above  
B. Trigger: Level 2 Assessment    D. None of the above

115. A PWS collecting at least 40 samples per month has greater than 5.0 percent of the routine/repeat samples in the same month that are TC+.

- A. Trigger: Level 1 Assessment    C. All of the above  
B. Trigger: Level 2 Assessment    D. None of the above

116. A PWS has a second Level 1 Assessment within a rolling 12-month period.

- A. Trigger: Level 1 Assessment
- B. Trigger: Level 2 Assessment
- C. All of the above
- D. None of the above

### Positive or Coliform Present Results

117. If you are notified of a positive coliform test result you need to contact either the Drinking Water Program or your local county health department within 72 hours, or by the next business day after the MCL compliance violation

- A. True
- B. False

### Revised Total Coliform Rule (RTCR) Summary

118. EPA published the Revised Total Coliform Rule (RTCR) in the Federal Register (FR) on February 13, 2013 (78 FR 10269). It is the revision to the 1989 Total Coliform Rule (TCR).

- A. True
- B. False

119. Community water systems (CWSs) must use specific language in their CCRs when they must conduct an assessment or if they incur\_\_\_\_\_.

- A. CCR(s)
- B. PN
- C. An E. coli MCL violation
- D. TC+ routine or repeat sample

### Disinfection Key

120. The RTCR requires 99.99% or 4 log inactivation of \_\_\_\_\_ .

- A. Enteric viruses
- B. Crypto
- C. Giardia lamblia cysts
- D. None of the above

### Disinfection Section

#### Chlorine's Appearance and Odor

121. Chlorine is a greenish-yellow gas it will condense to an amber liquid at approximately \_\_\_\_\_F or at high pressures.

- A. -29.2 degrees
- B. - 100 degrees
- C. 29 degrees
- D. None of the above

#### Chlorine Gas

##### Pathophysiology

122. 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. Effects of Hydrochloric acid
- B. Vapor from Chlorine gas
- C. Water solubility
- D. None of the above

123. The odor threshold for chlorine gas is approximately?

- A. 0.3-0.5 parts per million (ppm)
- B. 3 parts per million (ppm)
- C. 3-5 parts per million (ppm)
- D. None of the above

124. The effectiveness of chlorination depends on the \_\_\_\_\_ of the water, the concentration of the chlorine solution added, the time that chlorine is in contact with the organism, and water quality.

- A. Chlorine residual
- B. Chlorine demand
- C. Oxygen
- D. None of the above

#### Chlorination Chemistry

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

- A. True
- B. False

### Types of Residual

126. Which of the following is all chlorine that is available for disinfection?  
A. Chlorine residual    C. Total chlorine  
B. Chlorine demand    D. None of the above

### Chlorine Exposure Limits

127. What is OSHA's PEL?  
A. 10 PPM                      C. 1,000 PPM  
B. 1 PPM                        D. None of the above
128. Chlorine's Physical and chemical properties: A yellowish green, nonflammable and liquefied gas with an unpleasant and irritating smell.  
A. True                        B. False
129. Liquid chlorine is about \_\_\_\_\_ times heavier than water  
A. 1.5                      C. 2.5  
B. 10                        D. None of the above
130. Gaseous chlorine is about \_\_\_\_\_ times heavier than air.  
A. 1.5                      C. 2.5  
B. 10                        D. None of the above

### Alternate Disinfectants - Chloramine

131. It is recommended that Chloramine be used in conjunction with a stronger disinfectant. It is best utilized as a?  
A. Chloramine                      C. Stable distribution system disinfectant  
B. T10 value disinfectant        D. None of the above

### Chlorine Dioxide

132. Which term provides good Giardia and virus protection but its use is limited by the restriction on the maximum residual of 0.5 mg/L ClO<sub>2</sub>/chlorite/chlorate allowed in finished water?  
A. Chlorinated byproducts    C. Ammonia residual(s)  
B. Chlorine dioxide            D. None of the above

### Ozone

133. Ozone is a very effective disinfectant for both Giardia and viruses  
A. True                      B. False
134. When determining Ozone CT (contact time) values must be determined for the ozone basin alone; an accurate \_\_\_\_\_ must be obtained for the contact chamber, and residual levels.  
A. Residual    C. Contact time  
B. T10 value    D. None of the above
135. Ozone does not provide a system residual and should be used as a primary disinfectant only in conjunction with?  
A. Dry sodium chlorite            C. Free and/or combined chlorine  
B. Chlorine dioxide                D. None of the above

136. Ozone does not produce chlorinated byproducts (such as trihalomethanes) but it may cause an increase in such byproduct formation if it is fed ahead of free chlorine; ozone may also produce its own oxygenated byproducts such as  $\text{Cl}_2 + \text{NH}_4$ .

- A. True      B. False

## Safety Section

### Confined Space Entry Program -Purpose

137. The Confined Space Entry Program is provided to protect authorized employees that will enter confined spaces from safety or health hazards associated with confined spaces.

- A. True      B. False

### Scope

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

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

### Definitions

#### Confined space:

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

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

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

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

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

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

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

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

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

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

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

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

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

- A. Engulfing an entrant      C. Health hazard  
B. Hazardous atmospheres      D. None of the above

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

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

### Permitted Confined Space Entry Program

147 Subpart P (of OSHA's Construction Regulations – refer to page 60) applies to all \_\_\_\_\_ in the earth's surface.

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

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

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

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

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

### Permit Required Confined Space Entry General Rules

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

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

### Irritant (Corrosive) Atmospheres

151. According to the text, irritant or corrosive atmospheres can be \_\_\_\_\_.

- A. Primary irritants
- B. Combustible gases
- C. Divided into primary and secondary groups
- D. None of the above

### Oxygen Deprivation

152. Oxygen deprivation is a form of \_\_\_\_\_.

- A. Oxygen deprivation
- B. Asphyxiation
- C. Combustion
- D. None of the above

153. The first sign of hypoxia (oxygen deprivation) is deterioration to night vision, which occurs when the \_\_\_\_\_ level falls to 17%.

- A. Argon
- B. Oxygen
- C. Irritant gases
- D. None of the above

### Excavation and Trenching Section

154. According to the text, the \_\_\_\_\_ was revised because excavating is the most dangerous of all construction operations.

- A. Competent rule
- B. OSHA excavation standard
- C. Emergency rule
- D. None of the above

155. The performance criteria in the new standard provides employers with options when classifying soil and when selecting methods to protect the \_\_\_\_\_ from cave-ins.

- A. Competent person
- B. Employee
- C. Construction equipment
- D. None of the above

156. Although employers have options when meeting some of the requirements, \_\_\_\_\_ must realize that the employee must be protected at all times.

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

157. Professional engineers will be required in some situations to plan or design the excavation and/or method of protecting the worker.

- A. True
- B. False

### Competent Person

158. Competent person means one who is capable of identifying existing hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees. The \_\_\_\_\_ has authorization to take prompt corrective measures to eliminate identified hazards.

- A. Competent person
- B. Contractor
- C. Watchman
- D. None of the above

159. A \_\_\_\_\_ must have specific training in and be knowledgeable about soils analysis, the use of protective systems and the requirements of 29 CFR Part 1926.650-652 Subpart P.

- A. Competent person
- B. Contractor
- C. Watchman
- D. None of the above

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

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

### Competent Person Duties

161. The competent person performs daily inspections of the protective equipment, \_\_\_\_\_, safety equipment, and adjacent areas.

- A. Work progress
- B. Construction Crew
- C. Trench conditions
- D. None of the above

162. The competent person shall make \_\_\_\_\_ prior to the start of work and as needed throughout the shift.

- A. Personnel assignments
- B. Training available
- C. Inspections
- D. None of the above

163. The competent person shall make \_\_\_\_\_ after every rainstorm or other hazard occurrence.

- A. Inspections
- B. Training available
- C. Protective equipment available
- D. None of the above

164. The competent person must have knowledge of \_\_\_\_\_, telephone or radio dispatch.

- A. Personnel assignments
- B. Work schedules
- C. Emergency contact methods
- D. None of the above

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

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



166. The competent person makes sure that all \_\_\_\_\_ have proper protective equipment, hard-hats, reflective vests, steel-toed boots, harnesses, eye protection, hearing protection and drinking water.
- A. Competent persons
  - B. Contractors
  - C. Employees
  - D. None of the above

### Scope of Work

167. According to the text, during excavation work a competent person shall be on the job site at all times when personnel are working within or around the \_\_\_\_\_.
- A. Competent person
  - B. Contractors
  - C. Excavation
  - D. None of the above

168. Prior to opening an excavation, the estimated locations of \_\_\_\_\_ that reasonably may be expected to be encountered during excavation work shall be determined.
- A. Unauthorized persons
  - B. Employees
  - C. Underground utility installations
  - D. None of the above

169. \_\_\_\_\_ shall be taken to protect employees against the hazards posed by water accumulation in the excavation.
- A. Additional care
  - B. Adequate precautions
  - C. Ladders
  - D. None of the above

170. According to the text, employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations.
- A. True
  - B. False

171. The Ladder(s), stairway(s), or ramp shall be spaced so that no employee in the trench excavation is more than fifty (50') feet from a means of egress.
- A. True
  - B. False

172. When the atmosphere contains less than 19.5 percent oxygen, the area must be continuously ventilated until the \_\_\_\_\_.
- A. Excavation is closed
  - B. Employees enter the space
  - C. Oxygen levels are above 19.5 percent
  - D. None of the above

173. Where a \_\_\_\_\_, the area shall be ventilated until the flammable gas concentration is below 20 percent of the LFL (lower flammable limit).
- A. Competent person requires monitoring
  - B. Gaseous condition exists
  - C. Worker encounters fumes
  - D. None of the above

### Personnel Protective Systems

174. Requirements for sloping, benching or protective systems are found in \_\_\_\_\_.
- A. Safety Manuals
  - B. Tabulated data
  - C. CFR 1926.652 (OSHA Construction Standards)
  - D. None of the above

175. Whenever support systems, \_\_\_\_\_, or other protective systems are being used, a written copy of the manufacturer's specifications, recommendations, and limitations sheet shall be available at the job site.
- A. Shield systems
  - B. Tabulated data
  - C. Ramps
  - D. None of the above

### Excavation Protection Systems

176. There are three basic protective systems for excavations and trenches. They are sloping and benching systems, \_\_\_\_\_, and shields.

- A. Shoring
- B. Ramps
- C. Attendants
- D. None of the above

177. Every employee in an excavation or trench shall be protected from \_\_\_\_\_ by an adequate protective system.

- A. Unauthorized persons
- B. Cave-ins
- C. Polluted air
- D. None of the above

### Sloping and Benching Systems

178. An option for sloping is to slope to the angle required by OSHA Construction Standards for Type C, which is the most \_\_\_\_\_.

- A. Unstable soil type
- B. Stable soil type
- C. Porous soil type
- D. None of the above

179. Another option for sloping is to first determine the soil type, then use the table provided in Appendix B of the standard to determine the \_\_\_\_\_.

- A. Maximum allowable angle
- B. Porosity
- C. Protective system to be used
- D. None of the above

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

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

### Shoring Systems

181. \_\_\_\_\_ is another protective system that utilizes a framework of vertical members, horizontal members, and cross braces to support the sides of the excavation to prevent a cave-in.

- A. Shoring
- B. Tabulated data
- C. Lateral support
- D. None of the above

### Shield Systems (Trench Boxes)

182. Shielding is the third method of providing a safe workplace in excavations. Unlike sloping and shoring, \_\_\_\_\_ does not prevent a cave-in.

- A. Shielding
- B. Tabulated data
- C. Soil testing
- D. None of the above

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

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

### Safety Precautions for Shield Systems

184. There must not be any lateral movement of \_\_\_\_\_ when installed.

- A. Sloping and benching systems
- B. Shields
- C. Ladders
- D. None of the above

185. To protect employees from cave-ins when entering and exiting the shield, a ladder within the \_\_\_\_\_ or a properly sloped ramp at the end shall be provided.

- A. Shield
- B. Jobsite
- C. Tabulated data
- D. None of the above

### Personal Protective Equipment

186. \_\_\_\_\_ requires that employees wear a hard hat, safety glasses, and work boots on the jobsite.

- A. The contractor
- B. OSHA policy
- C. Recommended practice
- D. None of the above

### Excavation & Trenching Guidelines

187. Procedures and guidelines for the protection of employees working in and around excavations and trenches must be in compliance with OSHA Standards described in Subpart P (CFR 1926.650) for the construction industry.

- A. True
- B. False

188. According to the text, the competent person(s) must be trained in accordance with the OSHA Excavation Standard, and all other programs that may apply, and must demonstrate a thorough understanding and knowledge of the programs and the hazards associated.

- A. True
- B. False

189. All other employees working in and around the excavation must be trained to recognize the hazards associated with \_\_\_\_\_.

- A. OSHA Standards
- B. Trenching and excavating
- C. Personal protective equipment
- D. None of the above

### Hazard Controls

190. Knowing the location of underground installations is a good idea because it could make the work go faster.

- A. True
- B. False

### Excavation Safety Plan

191. A written excavation safety plan is required. This plan is to be developed to the level necessary to ensure complete compliance with the \_\_\_\_\_ and state and local safety standards.

- A. Professional engineer's requirements
- B. OSHA Excavation Safety Standard
- C. Protective systems
- D. None of the above

### Soil Classification and Identification

192. The Simplified Soil Classification System defined by OSHA Standards consists of four categories: \_\_\_\_\_, Type A, Type B, and Type C.

- A. Stable rock
- B. Gravel
- C. Stiff clay
- D. None of the above

193. Type A soils are \_\_\_\_\_ with an unconfined compressive strength of 1.5 tons per square foot (TSF) or greater.

- A. The least stable
- B. Cohesive soils
- C. Field tested
- D. None of the above

### Soil Test & Identification

194. The competent person will classify the \_\_\_\_\_ according to the definitions in Appendix A of the OSHA standard based on at least one visual and one manual analysis.
- A. Shields
  - B. Soil type
  - C. Cohesion tests
  - D. None of the above

### Shielding

195. Shielding does not prevent cave-ins. Instead, it protects the workers in the event of a cave-in.

- A. True
- B. False

196. When placed in an excavation, shields have sufficient structural strength to support the \_\_\_\_\_, thereby protecting the employees in the trench.

- A. Nearby structures
- B. Construction vehicles
- C. Force of a cave-in should one occur
- D. None of the above

197. The excavation wall at the \_\_\_\_\_ should be sloped, shored or shielded off to prevent a cave-in from the end.

- A. Side of the shield
- B. End of the job
- C. Open end of the shield
- D. None of the above

198. If the excavation will be deeper than the \_\_\_\_\_, attached shields of the correct specifications may be used. As an alternate, the excavation may be sloped back to the maximum allowable angle from a point 18 inches below the top of the shield.

- A. Planned depth
- B. Shield is tall
- C. Designed depth
- D. None of the above

### Inspections

199. The excavations, adjacent areas, and protective systems shall be inspected daily by the \_\_\_\_\_.

- A. Contractor
- B. Employees
- C. Competent person
- D. None of the above

200. During inspections, the competent person shall look for evidence of a situation that could result in a cave-in, indications of \_\_\_\_\_, hazardous atmospheres or other hazardous conditions.

- A. Failure of protective systems
- B. Poor workmanship
- C. OSHA compliance
- D. None of the above