

**Registration form**

**Valves and Fittings CEU Training Course \$200.00  
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*

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

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Email \_\_\_\_\_ Fax ( \_\_\_\_\_ ) \_\_\_\_\_

Phone:  
Home ( \_\_\_\_\_ ) \_\_\_\_\_ Work ( \_\_\_\_\_ ) \_\_\_\_\_

Operator ID# \_\_\_\_\_ Exp Date \_\_\_\_\_

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

Water Treatment \_\_\_\_\_ Distribution \_\_\_\_\_ Collection \_\_\_\_\_

Wastewater 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)**

**If you've paid on the Internet, please write your Customer# \_\_\_\_\_**

**Please invoice me, my PO# \_\_\_\_\_**

**Please pay with your credit card on our website under Bookstore or Buy Now. Or call us and provide your credit card information.**

***We will stop mailing the certificate of completion so we need either your fax number or e-mail address. We will e-mail the certificate to you, if no e-mail address; we will fax it to you.***

## **DISCLAIMER NOTICE**

I understand that it is my responsibility to ensure that this CEU course is either approved or accepted in my State for CEU credit. I understand State laws and rules change on a frequent basis and I believe this course is currently accepted in my State for CEU or contact hour credit, if it is not, I will not hold Technical Learning College responsible.

I fully understand that this type of study program deals with dangerous, changing conditions and various laws and that I will not hold Technical Learning College, Technical Learning Consultants, Inc. (TLC) liable in any fashion for any errors, omissions, advice, suggestions or neglect contained in this CEU education training course or for any violation or injury, death, neglect, damage or loss of your license or certification caused in any fashion by this CEU education training or course material suggestion or error or my lack of submitting paperwork.

It is my responsibility to call or contact TLC if I need help or assistance and double-check to ensure my registration page and assignment has been received and graded. It is my responsibility to ensure all information is correct and to abide with all rules and regulations.

**State Approval Listing Link**, check to see if your State accepts or has pre-approved this course. Not all States are listed. Not all courses are listed. If the course is not accepted for CEU credit, we will give you the course free if you ask your State to accept it for credit.

**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.abctlc.com/downloads/PDF/CEU%20State%20Approvals.pdf>

*You can obtain a printed version of the course from TLC for an additional \$129.95 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.

**All downloads are electronically tracked and monitored for security purposes.**

# Valves and Fittings CEU Course Answer Key

Name \_\_\_\_\_

Telephone # \_\_\_\_\_

You are solely responsible to ensure this course is acceptable for credit by your State. No refunds. Did you check with your State agency 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 approval number if Applicable? \_\_\_\_\_

*Please write down any questions that cannot be found or has problems*

*Please circle, underline, bold or X only one correct answer*

**A felt tipped pen works best.**

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

- |             |              |              |              |
|-------------|--------------|--------------|--------------|
| 65. A B     | 97. A B C D  | 129. A B C D | 161. A B C D |
| 66. A B     | 98. A B C D  | 130. A B C D | 162. A B C D |
| 67. A B C D | 99. A B      | 131. A B C D | 163. A B C D |
| 68. A B     | 100. A B     | 132. A B C D | 164. A B C D |
| 69. A B     | 101. A B     | 133. A B     | 165. A B C D |
| 70. A B C D | 102. A B     | 134. A B C D | 166. A B C D |
| 71. A B C D | 103. A B     | 135. A B C D | 167. A B C D |
| 72. A B C D | 104. A B C D | 136. A B C D | 168. A B C D |
| 73. A B C D | 105. A B C D | 137. A B C D | 169. A B C D |
| 74. A B C D | 106. A B C D | 138. A B C D | 170. A B C D |
| 75. A B C D | 107. A B     | 139. A B C D | 171. A B C D |
| 76. A B C D | 108. A B     | 140. A B C D | 172. A B C D |
| 77. A B C D | 109. A B     | 141. A B C D | 173. A B C D |
| 78. A B C D | 110. A B C D | 142. A B C D | 174. A B C D |
| 79. A B     | 111. A B C D | 143. A B C D | 175. A B C D |
| 80. A B     | 112. A B C D | 144. A B C D | 176. A B C D |
| 81. A B     | 113. A B C D | 145. A B C D | 177. A B     |
| 82. A B     | 114. A B C D | 146. A B     | 178. A B C D |
| 83. A B C D | 115. A B C D | 147. A B C D | 179. A B C D |
| 84. A B C D | 116. A B C D | 148. A B C D | 180. A B C D |
| 85. A B C D | 117. A B     | 149. A B C D | 181. A B C D |
| 86. A B C D | 118. A B     | 150. A B C D | 182. A B C D |
| 87. A B     | 119. A B C D | 151. A B C D | 183. A B C D |
| 88. A B     | 120. A B C D | 152. A B C D | 184. A B C D |
| 89. A B     | 121. A B C D | 153. A B C D | 185. A B C D |
| 90. A B     | 122. A B C D | 154. A B C D | 186. A B C D |
| 91. A B C D | 123. A B C D | 155. A B C D | 187. A B C D |
| 92. A B C D | 124. A B C D | 156. A B C D | 188. A B C D |
| 93. A B     | 125. A B C D | 157. A B C D | 189. A B C D |
| 94. A B     | 126. A B C D | 158. A B C D | 190. A B C D |
| 95. A B     | 127. A B C D | 159. A B C D | 191. A B C D |
| 96. A B     | 128. A B C D | 160. A B C D | 192. A B     |

193. A B	220. A B C D	247. A B	274. A B C D
194. A B	221. A B C D	248. A B	275. A B C D
195. A B	222. A B C D	249. A B	276. A B C D
196. A B	223. A B C D	250. A B	277. A B C D
197. A B C D	224. A B C D	251. A B C D	278. A B
198. A B C D	225. A B C D	252. A B C D	279. A B
199. A B C D	226. A B C D	253. A B C D	280. A B C D
200. A B C D	227. A B C D	254. A B C D	281. A B C D
201. A B C D	228. A B C D	255. A B C D	282. A B C D
202. A B C D	229. A B C D	256. A B C D	283. A B C D
203. A B C D	230. A B C D	257. A B C D	284. A B C D
204. A B C D	231. A B C D	258. A B C D	285. A B C D
205. A B	232. A B C D	259. A B	286. A B C D
206. A B	233. A B C D	260. A B	287. A B C D
207. A B	234. A B C D	261. A B	288. A B C D
208. A B	235. A B C D	262. A B C D	289. A B C D
209. A B	236. A B C D	263. A B C D	290. A B C D
210. A B	237. A B	264. A B C D	291. A B C D
211. A B C D	238. A B	265. A B C D	292. A B C D
212. A B C D	239. A B C D	266. A B C D	293. A B C D
213. A B C D	240. A B C D	267. A B C D	294. A B C D
214. A B C D	241. A B C D	268. A B C D	295. A B C D
215. A B C D	242. A B C D	269. A B	296. A B C D
216. A B	243. A B C D	270. A B C D	297. A B C D
217. A B	244. A B C D	271. A B C D	298. A B C D
218. A B C D	245. A B C D	272. A B C D	299. A B C D
219. A B C D	246. A B	273. A B C D	300. A B C D

*I understand that I am 100 percent responsible to ensure that TLC receives the Assignment and Registration Key. I understand that TLC has a zero tolerance towards not following their rules, cheating or hostility towards staff or instructors. I need to complete the entire assignment for credit. There is no credit for partial assignment completion. My exam was proctored.*

*I will contact TLC if I do not hear back from them within 2 days of assignment submission. I will forfeit my purchase costs and will not receive credit or a refund if I do not abide with TLC's rules.*

**Please Sign that you understand and will abide with TLC's Rules.**

---

**Signature**

***Please write down any questions that cannot be found or has problems***

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

**Always call to confirm that we've received the paperwork.**

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

**VALVES AND FITTINGS CEU TRAINING 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?

---

---

How about the price of the course? Poor \_\_\_ Fair \_\_\_ Average \_\_\_ Good \_\_\_ Great \_\_\_

How was your customer service? Poor \_\_\_ Fair \_\_\_ Average \_\_\_ Good \_\_\_ Great \_\_\_

Any other concerns or comments.

---

---





## Valves and Fittings CEU Course Assignment

The Valves and Fittings CEU 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 the start of this course to complete in order to receive your Professional Development Hours (PDHs) or Continuing Education Unit (CEU). A score of 70 % is necessary to pass this course. If you should need any assistance, please email all concerns and the completed manual to [info@tlch2o.com](mailto:info@tlch2o.com).

We would prefer that you utilize the enclosed answer sheet in the front, but if you are unable to do so, type out your own answer key. Please include your name and address on your manual and make copy for yourself.

***Please write down any questions that cannot be found or has problems***

### **New EPA Rules for Distribution Reduction of Lead in Drinking Water Act**

1. The most common problem is with brass or chrome-plated brass faucets and fixtures which can leach significant amounts of lead into the water, especially cold water.  
A. True      B. False
2. Homes built before 1999 are more likely to have lead pipes, fixtures and solder.  
A. True      B. False
3. New homes are also at risk: even legally "lead-free" plumbing may contain up to 8 percent lead.  
A. True      B. False
4. Reduction of Lead in Drinking Water Act is to amend the Safe Drinking Water Act regarding the use and introduction into commerce of lead pipes, plumbing fittings or fixtures, solder and flux.  
A. True      B. False
5. This lead reduction law was established an effective date of January 4, 2014, which provided a three-year timeframe for affected parties to transition to the new requirements.  
A. True      B. False
6. The Reduction of Lead in Drinking Water Act means municipalities, water districts and developers who work with and pay for water infrastructure need to be preparing.  
A. True      B. False
7. Lead, a metal found in natural deposits, is commonly used in household plumbing materials and water service lines.  
A. True      B. False

8. Lead in drinking water can also cause a variety of adverse health effects. In babies and children, exposure in drinking water above the action level can result in delays in physical and mental development, along with slight deficits in attention span and learning abilities. In adults, it can cause increases in blood pressure.

- A. True      B. False

### **Pervasive Environmental Contaminant**

9. Lead can be ingested from various sources, including lead paint and house dust contaminated by lead paint, as well as soil, drinking water, and food.

- A. True      B. False

10. Because lead accumulates in the body, all sources of lead should be controlled or eliminated to prevent childhood lead poisoning.

- A. True      B. False

11. Beginning in the 1970s, lead concentrations in air, tap water, food, dust, and soil began to be substantially reduced, resulting in significantly reduced blood lead levels in children throughout the United States.

- A. True      B. False

12. Homes built before the 1978 homes might contain lead paint hazards, as well as drinking water service lines made from lead, or plumbing materials that contain lead.

- A. True      B. False

13. Which of the following control reduces the leaching of lead plumbing components or solder into drinking water?

- A. Adequate corrosion      C. Safe Drinking Water Inspector  
B. Lead enforcement      D. None of the above

### **Composite Meters**

14. Composite meters are one example of a \_\_\_\_\_ alternative that is not susceptible to no-lead regulations.

- A. Low Lead      C. Zero lead  
B. New low-lead brass      D. None of the above

15. Composite meters do not depend on metal pricing fluctuations and have zero lead as opposed to low lead or even \_\_\_\_\_ meters.

- A. Bronze      C. "Friction feeling"  
B. "Lead-free"      D. None of the above

16. Which of the following does this type of meter boast longevity and resistance to corrosion from aggressive water?

- A. Bronze      C. Composite  
B. Zero lead      D. None of the above

17. Composite meters are constructed using a blend of plastic and?

- A. Bronze      C. "Lead-free"  
B. Fiberglass      D. None of the above

18. Which of the following have been found to eliminate the “friction feeling” typically experienced with metal threads and metal couplings, facilitating easier installation?
- A. Bronze                      C. Composite threads  
B. Zero lead                  D. None of the above
19. With comprehensive testing, composite meters have demonstrated a burst pressure that is significantly greater than?
- A. Bronze                      C. Composite  
B. Zero lead                  D. None of the above
20. Which of the following term or zero lead products on the market and it is critical that utilities consider all of their options when selecting a new fleet of meters?
- A. Bronze                      C. Lead-free  
B. Plastic and fiberglass    D. None of the above
21. According to the text, it is essential that manufacturers deliver products that meet the highest standards for safety, quality, reliability and accuracy to ensure availability to, and conservation of?
- A. Their personal health                      C. This most precious resource  
B. Water system customers                  D. None of the above
22. To ensure that drinking water supplied by all public water supply systems as defined by the EPA meet Federal and State requirements, water system operators are required to collect samples regularly and?
- A. Frequency of sampling                      C. An adequate chlorine residual  
B. Have the water tested                      D. None of the above
23. The regulations specify maximum sampling frequencies, sampling locations, testing procedures, methods of keeping records, and frequency of reporting to the State.
- A. True                  B. False
24. Everyone deserves access to safe, clean water.
- A. True                  B. False
25. Composite technology today allows for better, more environmentally friendly composite products that will last up to 10 years in residential applications.
- A. True                  B. False
26. According to the text, about half the distribution systems must provide periodic monitoring for microbiological contaminants and some chemical contaminants.
- A. True                  B. False
27. The regulations also mandate special reporting procedures to be followed if a contaminant exceeds?
- A. An MCL                      C. Continuous chlorine residual  
B. Turbidity                      D. None of the above
28. The frequency of sampling and the chemicals that must be tested for depend on the physical size of the water system, \_\_\_\_\_, and the history of analyses.
- A. The water source                      C. Byproduct chemicals  
B. Water system customers                  D. None of the above

### General Disinfection Requirements

29. As the water enters the distribution system, it must carry a \_\_\_\_\_ that will be retained throughout the distribution system.
- A. Disinfectant like UV      C. Continuous chlorine residual  
B. Chemical analyses      D. None of the above
30. Water samples from points on the distribution system must be analyzed periodically to make sure \_\_\_\_\_ is being maintained.
- A. Frequency of sampling      C. An adequate chlorine residual  
B. Water system customers      D. None of the above
31. According to the text, disinfection is absolutely required for all water systems using surface water sources.
- A. True      B. False
32. The use of chlorine has almost completely eliminated occurrences of waterborne diseases in the United States.
- A. True      B. False
33. The disinfection byproducts are formed when chlorine reacts with naturally occurring substances in raw water such as decaying vegetation containing?
- A. An MCL      C. Humic and fulvic acids  
B. Turbidity      D. None of the above
34. Which of the following was identified as trihalomethane a group of organic chemicals that are known carcinogens to some animals, so they are assumed also to be carcinogenic to humans?
- A. MCLs      C. Chlorine residual  
B. Chlorine byproduct chemicals      D. None of the above
35. Which of the following have been identified that may be harmful, and may cause some adverse health reactions?
- A. Other byproducts of disinfection      C. Continuous chlorine residual  
B. Turbidity      D. None of the above

### Consumer Confidence Reports

36. One of the very significant provisions of the 1996 SDWA amendments is Continuous chlorine residual requirement.
- A. True      B. False
37. According to the text, some States are preparing much of the information for their water systems, but the system operator still must add local information.
- A. True      B. False
38. Some States are preparing much of the information for their water systems, but the system operator still must add local information.
- A. True      B. False
39. The consumer confidence report (CCR) is a requirement.
- A. True      B. False

40. The purpose of the CCR is to provide all water customers with basic facts regarding their drinking water so that individuals can make decisions about decisions based on their personal health.

- A. True      B. False

41. Information on the source water and \_\_\_\_\_ must be furnished to the satellite system by the system selling the water (parent company).

- A. Chemical analyses      C. No concern for byproducts  
B. Turbidity      D. None of the above

42. According to the text, water system operators should keep in mind that CCRs provide an opportunity to educate consumers about the?

- A. Chemical analyses      C. Sources and quality of their drinking water  
B. Concern for byproducts      D. None of the above

### **Distribution System Water Quality Problems**

#### **Turbidity**

43. Turbidity in water is significant from a public health standpoint because \_\_\_\_\_ could shelter microorganisms from the disinfectant and allow them to still be viable when they reach the customer.

- A. Hardness      C. Suspended particles  
B. Chlorine      D. None of the above

44. Turbidity is caused by particles suspended in water; these particles scatter or reflect light rays, making the water appear cloudy.

- A. True      B. False

45. EPA regulations direct that, for most water systems, the turbidity of water entering the distribution system must be equal or less than 0.5 ntu in at least 95 percent of the measurements taken each month; at no time may the turbidity exceed 5 ntu.

- A. True      B. False

46. Increases in turbidity may be caused by changes in velocity or inadequate flushing following main replacement.

- A. True      B. False

#### **Hardness**

47. Water hardness usually comes from water contacting rock formations, such as water from wells in?

- A. Turbidity      C. Concentration of calcium and magnesium  
B. Limestone formations      D. None of the above

48. Most surface water is of?

- A. Hard hardness      C. Hard and soft water  
B. Medium hardness      D. None of the above

49. Water with 300 mg/L of hardness usually is considered soft.

- A. True      B. False

50. Hard water usually is quite corrosive, and may have to be treated to reduce the corrosivity.

- A. True      B. False

## Iron

51. Ferrous iron ( $\text{Fe}^{2+}$ ) is in a \_\_\_\_\_, and water containing ferrous iron is colorless.  
A. Corrosivity                      C. Turbidity  
B. Dissolved state                  D. None of the above
52. Ferric iron ( $\text{Fe}^{3+}$ ) has been oxidized, and water containing it is?  
A. Hardness                          C. Rust-colored  
B. Medium hardness                D. None of the above
53. Gallionella can cause \_\_\_\_\_, tastes and odors, clogged pipes, and pump failure.  
A. System failure                  C. Red water  
B. Bacteria                            D. None of the above
54. Water samples show increased iron concentrations between the point where water enters the distribution system and the consumer's tap, either corrosion, Iron bacteria, or both are probably taking place.  
A. True                      B. False
55. If the problem is caused by system pressure, flushing mains, shock chlorination, and carrying increased residual chlorine are alternatives to consider.  
A. True                      B. False

## Manganese

56. The NSDWR recommend a concentration not to exceed 0.05 mg/L to avoid?  
A. Corrosion                          C. Harmful effects on humans  
B. Customer complaints            D. None of the above

## Water Quality Safeguards

57. Which of the following are recommended above is absolutely necessary to prevent backsiphonage and the entry of contaminants?  
A. Static pressure                  C. Continuous positive pressure  
B. Chlorine                          D. None of the above
58. Which of the following also may be reduced during a main break because of the large amount of escaping water?  
A. Bacteriological safety            C. Cross connection  
B. System pressure                  D. None of the above
59. Either water use must be restricted or the water system must be upgraded to be capable of supplying more water, if water demands are so great during peak demand periods that pressure declines in parts of the systems.  
A. True                      B. False

## Water Hammer

60. Water hammer is a pressure surge or wave caused by the static energy of a fluid in motion when it is forced to stop or change direction suddenly.  
A. True                      B. False

61. Moving water in a pipe has kinetic energy proportional to the mass of the water in a given volume times the square of the velocity of the water.

- A. True      B. False

### **System Layouts**

#### **Tree System**

62. The Tree system consists of a single main that \_\_\_\_\_ as it leaves the source and progresses through the area originally served.

- A. Be isolated      C. Limits the expansion  
B. Decreases in size      D. None of the above

63. Smaller pipelines \_\_\_\_\_ the main and divide again, much like the trunk and branches of a tree.

- A. Branch off      C. Limit the expansion  
B. Decrease      D. None of the above

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

- A. True      B. False

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

- A. True      B. False

#### **Friction Loss**

66. 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

67. During periods of peak fire flow demand, there will be less impact from \_\_\_\_\_ in water mains as the velocity within any given section of main.

- A. Carrying capacity      C. Static pressure  
B. Friction loss      D. None of the above

### **Types of Pipes Used in the Distribution Field**

#### **Plastic Pipe (PVC)**

68. Plastic pipe has seen extensive use available in different lengths and sizes, it is lighter than steel or copper and requires no special tools to install.

- A. True      B. False

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

- A. True      B. False

70. Plastic pipe has complete resistance to corrosion; and, in addition, it can be installed aboveground or below ground. has several advantages over metal pipe: it is flexible; it has superior resistance to?

- A. Ease of installation      C. Rupture from freezing  
B. Chemical resistance      D. None of the above

71. PVC pipes are made of tough, strong thermoplastic material that has \_\_\_\_\_ of physical and chemical properties.

- A. An excellent combination
- B. Chemical resistance
- C. Complete resistance to corrosion
- D. None of the above

72. PVC's chemical resistance and \_\_\_\_\_ make it an excellent material for application in various mechanical systems.

- A. Ease of installation
- B. Chemical resistance
- C. Design strength
- D. None of the above

73. According to the text, often polyvinyl chloride is further chlorinated to obtain a stiffer design, a higher level of impact resistance, and a \_\_\_\_\_ to extremes of temperature.

- A. Ease of installation
- B. Greater resistance
- C. Design strength
- D. None of the above

74. Which of the following and economy makes plastic pipe popular for use in either water distribution and supply systems or sewer drainage systems?

- A. Ease of installation
- B. Chemical resistance
- C. Stamped on the outside
- D. None of the above

75. You will want to date and collect coupons or tap cut-outs to determine the condition of the pipe or?

- A. Measure the corrosion
- B. Chemical resistance
- C. Determine the C Factor
- D. None of the above

### **Plastic Pipe (PVC)**

76. A main advantage of PVC piping is its light weight, allowing for?

- A. Easy installation
- B. Measure the corrosion
- C. Measure the shock load
- D. None of the above

77. The National Sanitation Foundation currently lists most brands of PVC pipe as being acceptable for potable water use, this information should be stamped on the outside of the pipe, along with \_\_\_\_\_ and temperature, diameter and pipe manufacturer.

- A. Ease of installation
- B. Working pressure
- C. Date and time
- D. None of the above

78. PVC pipe will have the highest C Factor of all the above pipes, the higher the C factor the?

- A. Long life
- B. Rougher the interior
- C. Smoother the pipe
- D. None of the above

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

- A. True
- B. False

### **Cast Iron (CIP)**

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

- A. True
- B. False

81. Advantages of CIP are its long life, ability to withstand shock loads and to withstand working pressures up to 120 psi.

- A. True
- B. False



### Ductile Iron Pipe (DIP)

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

- A. True      B. False

83. DIP was developed to \_\_\_\_\_ associated with cast iron pipe.

- A. Overcome the breakage problems      C. Provide a High C Factor  
B. Withstand shock loads      D. None of the above

84. DIP's main advantage is that it is \_\_\_\_\_ by internal or external pressures.

- A. Withstand shock loads      C. Nearly indestructible  
B. Extend the life      D. None of the above

85. 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      C. Provide a High C Factor  
B. Extend the life      D. None of the above

### Steel Pipe

86. Steel pipe is usually galvanized or dipped in coal-tar enamel and wrapped with coal-tar impregnated felt to reduce?

- A. Corrosion problems      C. Good yielding  
B. Costs      D. None of the above

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

- A. True      B. False

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

- A. True      B. False

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

- A. True      B. False

### Asbestos Cement Pipe (ACP)

90. ACP is available in diameters from 3" to 36" and in 13' lengths.

- A. True      B. False

91. ACP main advantages are its ability to \_\_\_\_\_ and its excellent hydraulic flow characteristics due to its smoothness.

- A. Withstand corrosion      C. Transfer less friction  
B. Lower C factor      D. None of the above

92. ACP main disadvantage is that it is \_\_\_\_\_ during construction or by shock loading.

- A. Very light weight      C. Transfer less friction  
B. Brittle and is easily broken      D. None of the above

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

- A. True      B. False

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

### **Galvanized Pipe**

95. Galvanized pipe is manufactured in 21-ft lengths and is coated with zinc the outside only.

A. True      B. False

96. Pipe sizes are based on nominal inside diameters, these diameters vary with the thickness of the pipe.

A. True      B. False

97. Galvanized pipe is commonly used for the water distributing pipes inside a building to supply hot and cold water to?

A. The fixtures                      C. To copper fittings  
B. Inside and outside              D. None of the above

98. According to the text, outside pipe diameters remain constant so that pipe can be?

A. Flanged                              C. Threaded for standard fittings  
B. Connected to Sharkbites      D. None of the above

### **Copper**

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

A. True      B. False

100. K pipe has the thickest walls.

A. True      B. False

101. Copper pipe M has the thinnest walls.

A. True      B. False

102. Soldering allows all the tubing and fittings to be set in place before the joints are finished.

A. True      B. False

103. Hard temper tubing is available in 40- or 60-ft coils, while soft tubing comes in 12- and 20-ft straight lengths.

A. True      B. False

104. Type K copper tubing is available in either rigid or flexible and is primarily used for \_\_\_\_\_ in the water distribution systems.

A. Exposed lines                      C. Straight lengths  
B. Underground service              D. None of the above

105. Type L copper tubing is also available in either hard or soft temper and either in coils or?

A. In boxes                              C. Straight lengths  
B. Short pieces                          D. None of the above

106. According to the text, soft temper tubing is often used as replacement plumbing because of the tube's flexibility, which allows?

- A. Exposed lines
- B. Easier installation
- C. Straight lengths
- D. None of the above

107. Type M copper tubing is widely used in water distribution systems.

- A. True
- B. False

108. Type M copper tubing is made in hard temper only and is available in straight lengths of 12 and 20 ft. It has a thin wall and is used for branch supplies.

- A. True
- B. False

109. Type M copper tubing is used for chilled water systems, for exposed lines in hot-water heating systems, and for drainage piping.

- A. True
- B. False

### **Water Service Pipe Installation**

110. Underground Water Service.

Water service pipe shall be installed outside the?

- A. Water service pipe
- B. Foundation wall
- C. Center of the sanitary sewer
- D. None of the above

111. Water service and building drain or building sewer may be installed in which of the following with a minimum of 10 feet horizontal separation?

- A. Same trench
- B. Separate trenches
- C. An underground potable water pipe
- D. None of the above

112. According to the text, the water service and the building drain or building sewer may be installed in the same trench provided that the water service is placed on which of the following a minimum of 18 inches above the building drain or building sewer?

- A. A solid shelf
- B. Same trench
- C. Beneath a sanitary sewer or drain
- D. None of the above

113. The minimum depth for any water service pipe shall be at least 36 inches or the maximum frost penetration of the \_\_\_\_\_, whichever is of greater depth?

- A. Local area
- B. Water service pipe
- C. Maximum frost penetration
- D. None of the above

114. No water service pipe shall be installed or permitted outside of a building or in which of the following unless provisions are made to protect such pipe from freezing?

- A. An exterior wall
- B. Same trench
- C. Beneath a sanitary sewer or drain
- D. None of the above

115. Potable Water Piping and Sanitary Sewer Crossing Installation Requirements.

Where it is necessary for the potable water piping to pass above or below a sanitary sewer, such piping shall be installed with which of the following for a distance of 10 feet on either side from the center of the sanitary sewer?

- A. Water service pipe
- B. Foundation wall
- C. Minimum vertical separation of 18 inches
- D. None of the above

116. Where it is necessary for the potable water piping to pass beneath a which of the following terms, the sanitary sewer or drain shall be constructed of materials as specified in Approved Building Drainage/Vent Pipe for building drains, and shall extend on each side of the crossing to a distance of at least 10 feet as measured at right angles to the water line.

- A. An exterior wall
- B. Soil or waste lines
- C. Sanitary sewer or drain
- D. None of the above

#### **Wet/Dry Bore**

117. The casing pipe shall be sealed with a casing seal and extend 10 feet on either side of the center of the sanitary sewer pipe?

- A. True
- B. False

#### **Stop-And-Waste Valve**

118. Frost free hydrants and fire hydrants shall not be considered?

- A. Stop-and-waste valves
- B. Air gaps
- C. Supply outlets
- D. None of the above

#### **Potable Water Pumping and Storage Equipment**

119. Potable water pumps, tanks, filters, and all other appliances and devices shall be protected against?

- A. Relief valve
- B. Contamination
- C. Maximum allowable working pressure
- D. None of the above

#### **Water Supply Tanks.**

120. Which of the following shall be properly covered to prevent contamination of the water supply?

- A. Potability of the water
- B. Potable water supply tanks
- C. Supply outlet
- D. None of the above

#### **Cleaning, Painting, Repairing Water Tanks.**

121. A potable water supply tank used for which of the following shall not be lined, painted or repaired with any material which affects either the taste or the potability of the water?

- A. Domestic purposes
- B. Potability of the water
- C. The supply outlet
- D. None of the above

122. Tanks shall be disconnected from the system during such operations to prevent any which of the following from entering the system?

- A. Foreign substance
- B. No restrictions
- C. Auxiliary pressure systems
- D. None of the above

#### **Potable Water Supply Tanks and Auxiliary Pressure Tanks**

123. When the water pressure from the \_\_\_\_\_ is insufficient during periods of peak flow or due to the building height to supply all fixtures, the rate of supply shall be supplemented by a gravity tank or auxiliary pressure system?

- A. Public water supply main
- B. Auxiliary system
- C. Supply outlet
- D. None of the above

124. Which of the following shall not substitute for adequate sizing of water distribution piping within the building?

- A. Vacuum relief valve
- B. No restrictions
- C. Auxiliary pressure systems
- D. None of the above

**Tank Supply Inlet and Outlet.**

125. Which of the following to the tank shall have a minimum air gap of at least six (6) inches?

- A. Water supply inlet
- B. Gravity tank(s)
- C. Supply outlet
- D. None of the above

**Overflow For Water Supply Tanks.**

126. Overflow pipes for which of the following shall be indirectly connected to the drainage system with an air gap of at least six (6) inches?

- A. Water supply inlet
- B. Gravity tank(s)
- C. Supply outlet
- D. None of the above

127. Which of the following shall be full sized, unrestricted and screened with 24-mesh per inch stainless steel or bronze screen?

- A. Overflow pipes
- B. An air gap
- C. The supply outlet
- D. None of the above

**Size of Overflow.**

128. Overflow drains for gravity water supply tanks shall have an area of at least twice the size of which of the following terms?

- A. Restriction
- B. Air gap
- C. Supply pipe
- D. None of the above

**Drains.**

129. Water supply tanks shall be provided with which of the following located at their lowest point and discharge through an indirect waste with an air gap of twice the diameter of the drain line?

- A. Valved drain lines
- B. An air gap
- C. Auxiliary pressure (booster) system
- D. None of the above

130. Which of the following shall have no restrictions and need not exceed two (2) inches in diameter?

- A. Air breaks
- B. An air gap
- C. Drain line and valve
- D. None of the above

**Gravity and Suction Tanks.**

131. Which of the following used for potable water supply or to supply fire-fighting equipment only shall be equipped with tight, overlapping covers?

- A. Tanks
- B. Water service
- C. A common shut-off valve
- D. None of the above

**Pressure Tanks.**

132. Pressure tanks used for supplying water to the water distribution system, or to supply standpipes for fire equipment only, shall be equipped with a vacuum relief valve located on?

- A. Top of the tank
- B. An air gap
- C. Bottom of the tank
- D. None of the above

### **Water Supply Control Valves and Meter**

133. A full-port shut-off valve shall be located near the curb or property line and immediately inside the building, either on the inlet or outlet side of the water meter, when underground, this valve shall be located in a Stop box or meter vault.

- A. True      B. False

134. The meter shall have unions on \_\_\_\_\_, but is not required to have a shut-off valve on the inlet side of the meter if it is inside a building?

- A. Water service      C. The water supply system  
B. Inlet/outlet openings      D. None of the above

135. Which of the following with an open area at least that of the water service shall be provided for all meters?

- A. A shut-off valve      C. Stop box or meter vault  
B. A full-port valve      D. None of the above

### **Tank Controls.**

136. Supply lines taken from which of the following shall be valved at or near their source?

- A. Gravity tank(s)      C. A common shut-off valve  
B. Pressure or gravity tanks      D. None of the above

### **Water Heating Equipment.**

137. A shut-off valve shall be provided in the cold-water branch line within \_\_\_\_\_ feet of each water storage tank or each Water heater.

- A. 5      C. 6  
B. 10      D. None of the above

### **Separate Controls for Each Family Unit.**

138. In multiple family dwellings, the water service or water distribution pipe to each family unit shall be controlled by an arrangement of shut-off valves which permits each group of fixtures and \_\_\_\_\_ to be shut off without interference with the water supply to any other family unit or portion of the building?

- A. A common shut-off valve      C. Each individual fixture  
B. Water meter      D. None of the above

### **Buildings Other Than Dwellings.**

139. Shut-off valves shall be installed to permit the water supply to all equipment and/or fixtures in each separate room to be shut off without interfering with \_\_\_\_\_ to any other room or portion of the building?

- A. A shut-off valve      C. Stop box or meter vault  
B. Water supply      D. None of the above

140. For plumbing equipment or fixtures that are installed back-to-back in adjacent rooms, e.g., in adjacent restrooms, a common shut-off valve may be used to shut off \_\_\_\_\_ to the back-to-back fixtures in no more than 2 adjacent rooms?

- A. Water supply      C. A common shut-off valve  
B. Water service      D. None of the above

**Health Care Facilities.**

141. In the residence rooms of health care facilities \_\_\_\_\_ to each resident unit or back-to-back rooms shall be controlled by an arrangement of line valves that permits each group of fixtures.

- A. Water supply
- B. Water meter
- C. Water distribution pipe
- D. None of the above

**Flushing/Disinfection of Potable Water System**

142. If the potable water supply serving the water supply system is chlorinated, e.g., a community water system, \_\_\_\_\_ or appropriate repaired portion, shall be flushed with clean, potable water until no dirty water appears at the point of outlet.

- A. Water supply system
- B. Chlorine solution
- C. Water sample
- D. None of the above

**Non-Chlorinated Water Supply.**

143. The pipe system shall be flushed with clean, potable water until \_\_\_\_\_ appears at the point of outlet?

- A. No dirty water
- B. Potable water
- C. Water sample
- D. None of the above

144. The system shall be filled with \_\_\_\_\_ containing at least 50 parts per million of chlorine, shall be valved off and allowed to stand for 24 hours,

- A. A chlorine solution
- B. The water
- C. Potable water
- D. None of the above

145. Following the required contact time, the system shall be flushed with clean, potable water until the chlorine level in the water discharging from the system is within acceptable limits for potable water, i.e., generally until the water has?

- A. Water supply system
- B. No detectable chlorine odor
- C. Water sample
- D. None of the above

146. To ensure that the water supplied by the water system is safe for drinking, a bacteriological examination of a water sample taken from the water supply system shall be secured.

- A. True
- B. False

**Water Service Sizing**

147. If flushometers or other devices requiring a high rate of water flow are used, which of the following shall be designed and installed to provide this additional flow?

- A. Peak demand
- B. An air chamber
- C. Water service pipe
- D. None of the above

**Demand Load.**

148. The calculation of the \_\_\_\_\_ for a building shall be based on the total number and types of fixtures installed in the building?

- A. Water service demand load
- B. Any plumbing fixture
- C. Discharge side of the water meter
- D. None of the above

149. Unused sections of water service or water distribution piping ("dead ends"), where the water in the piping may become stagnant, are prohibited. A developed length of more than \_\_\_\_\_ feet shall be considered a dead end.

- A. 2
- B. 10
- C. 5
- D. None of the above

### **Design of a Building Water Distribution System**

150. Design and Installation. The design and installation of the hot and cold water building distribution systems shall provide a volume of water at the required rates and pressures to ensure the safe, efficient and satisfactory operation of fixtures, fittings, appliances and other connected devices during periods of?

- A. Water service demand load
- B. Peak use
- C. Discharge side of the water meter
- D. None of the above

151. No distribution pipe or pipes shall be installed or \_\_\_\_\_ or in an exterior wall unless provisions are made to protect such pipe from freezing.

- A. Same trench
- B. Soil or waste lines
- C. Permitted outside of a building
- D. None of the above

### **Minimum Water Pressure.**

152. The minimum constant water service pressure on the discharge side of the water meter shall be (at least) \_\_\_\_\_ p.s.i.

- A. 20
- B. 8
- C. 10
- D. None of the above

### **Auxiliary Pressure. Supplementary Tank.**

153. If the pressure in the system is below the minimum \_\_\_\_\_ p.s.i. at the highest water outlet when the flow in the system is at peak demand, an automatically controlled pressure tank or gravity tank of a capacity to supply sections of the building installation which are too high to be supplied directly from the public water main.

- A. 5
- B. 8
- C. 10
- D. None of the above

### **Low Pressure Cut-Off.**

154. When a booster pump except those used for fire protection is used on an auxiliary pressure system, there shall be installed a Low-pressure cut-off switch on the booster pump to prevent the creation of pressures less than \_\_\_\_\_ p.s.i. on the suction side of the pump.

- A. 20
- B. 5
- C. 10
- D. None of the above

155. A shut-off valve shall be installed on the suction side of the water system and within \_\_\_\_\_ feet from the pump suction inlet, and pressure gauge shall be installed between the shut-off valve and pump.

- A. 20
- B. 5
- C. 10
- D. None of the above



**Water Hammer.**

156. All building water supply systems shall be provided with which of the following or approved mechanical devices or water hammer arrestors to absorb high pressures?

- A. Air chamber(s)
- B. An auxiliary pressure system
- C. Discharge side of the water meter
- D. None of the above

**Air Chambers.**

157. Which of the following with a volume equivalent to one with the dimension listed above may also be used?

- A. Pressure relief valve(s)
- B. An air chamber
- C. Combination pressure-temperature relief valve
- D. None of the above

**Excessive Static Water Pressure.**

158. When water main pressure exceeds 80 p.s.i., a pressure reducing valve and a strainer with a by-pass relief valve shall be installed in the water service pipe near the entrance to the building to reduce the water pressure to \_\_\_\_\_ p.s.i. or lower, except where the water service pipe supplies water directly to a water pressure booster system.

- A. 20
- B. 5
- C. 80
- D. None of the above

159. When the water pressure exceeds \_\_\_\_\_ p.s.i. at any plumbing fixture, a pressure reducing valve, pressure gauge and a strainer with a by-pass relief valve.

- A. 20
- B. 80
- C. 10
- D. None of the above

**Variable Street Pressures.**

160. Which of the following has a wide fluctuation in pressure, the water distribution system shall be designed for minimum pressure available at the main?

- A. Water main
- B. Potable water
- C. A pressure relief valve
- D. None of the above

**Hot Water Supply and Distribution**

161. Which of the following used for heating and storage of hot water shall bear the marking of an approved testing agency?

- A. All equipment
- B. Water main
- C. Full water main pressure
- D. None of the above

162. Which of the following shall use a double-walled heat exchanger which is exposed or vented to the atmosphere between the walls?

- A. A solar-heated system
- B. Potable water
- C. Full water main pressure
- D. None of the above

163. Heat exchangers may be of single wall construction if a non-toxic transfer fluid with no conditioning chemicals in the system is used, or if \_\_\_\_\_ is installed to isolate the heat exchanger from the potable water system?

- A. Cold water line
- B. Water heater
- C. A pressure gradient monitor system
- D. None of the above

164. If pressure on the potable water side reaches a pressure less than \_\_\_\_\_ p.s.i. above the toxic transfer fluid pressure, an audible alarm shall be activated?

- A. 20
- B. 80
- C. 10
- D. None of the above

165. Heat exchangers using a \_\_\_\_\_ or having conditioning chemicals in the system shall be separated from the potable water by double wall construction?

- A. Toxic transfer fluid
- B. Standard
- C. Hydropneumatic or elevated water supply tank system
- D. None of the above

**Direct Fired Instantaneous Heaters.**

166. A properly sized temperature and pressure relief valve, based upon the energy input rating of the heater, shall be installed on the tempered line with the temperature sensing element immersed in the tempered water line as close as possible to the?

- A. Mixing valve
- B. Water main
- C. Full water main pressure
- D. None of the above

**Water Heaters Used for Space Heating.**

167. Any water heater to be used for space heating, in addition to which of the following terms, must conform to ANSI Z21.10.1a-1991?

- A. Hot water supply
- B. Water heater
- C. Water heater's cold water supply
- D. None of the above

168. The mixing valve shall be set to prevent temperatures exceeding \_\_\_\_\_ °F from reaching the plumbing fixtures.

- A. 212
- B. 180
- C. 120
- D. None of the above

169. A single check valve shall be installed in the cold water line supplying the?

- A. Hot water
- B. Water heater
- C. Water heater's cold water supply
- D. None of the above

170. A properly sized and approved expansion tank shall be located on the outlet side of the check valve in the water heater's cold water supply with \_\_\_\_\_ between the heater and expansion tank?

- A. Cold water line
- B. No shut-off valve
- C. Proper terminal heating device
- D. None of the above

171. Valves supplying hot water to the heat transfer unit for space heating shall have a minimum of a \_\_\_\_\_-inch orifice.

- A. 12
- B. 1
- C. 5
- D. None of the above

172. The water heater instructions shall have a statement specifying that piping and components connected to the water heater for the space heating application shall be suitable for use with potable water, and water heater shall not exceed a developed length of more than \_\_\_\_\_ feet from the heating coil.

- A. 25
- B. 50
- C. 100
- D. None of the above

### **Safety Devices**

173. All equipment used for heating water or storing hot water shall be achieved by installing either a pressure relief valve and which of the following or by installing a combination pressure-temperature relief valve?

- A. Energy cut-off devices
- B. Temperature relief valve
- C. Temperature sensing element
- D. None of the above

### **Backflow Section**

174. Which of the following rules are required to be at least as stringent as the federal regulations as developed and enforced by the E.P.A.?

- A. Enforcement responsibility
- B. State program regulations
- C. Cross-Connection Control
- D. None of the above

175. Which of the following definition terms is "the link or channel connecting a source of pollution with a potable water supply?"

- A. Direct piping
- B. Direct connection
- C. Cross-Connection
- D. None of the above

176. Which of the following definition terms, also referred to as Cross-Connection Control, addresses a serious health issue?

- A. Direct piping
- B. Direct connection
- C. Backflow prevention
- D. None of the above

177. Cross-Connection was addressed by passage of the "Federal Safe Drinking Water Act" as developed by the Environmental Protection Agency (E.P.A.).

- A. True
- B. False

### **What is backflow? Reverse flow condition**

178. 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. Cross-connection
- B. Backsiphonage
- C. Indirect connection
- D. None of the above

179. Which of the following can occur when there is a stoppage of water supply due to nearby firefighting, a break in a water main?

- A. Backpressure
- B. Backsiphonage
- C. Indirect connection
- D. None of the above

180. Which of the following is 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. Backpressure
- B. Backsiphonage
- C. Indirect connection
- D. None of the above

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

- A. Backpressure
- B. Backsiphonage
- C. Indirect connection
- D. None of the above

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

- A. Backflow
- B. Indirect connection
- C. Cross-connection
- D. None of the above

183. The basic mechanism for preventing backflow is a mechanical \_\_\_\_\_, which provides a physical barrier to backflow.

- A. Air break
- B. Backflow preventer
- C. Device or method
- D. None of the above

184. The principal types of mechanical backflow preventer are the reduced-pressure principle assembly, the \_\_\_\_\_, and the double check valve assembly.

- A. Air gap
- B. Vacuum breaker
- C. Device or method
- D. None of the above

185. Which of the following 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. Cross-connection
- B. Backsiphonage
- C. Indirect connection
- D. None of the above

### System Operation Section

#### System Elements

186. Storage reservoirs are structures used to store water and \_\_\_\_\_ the supply or pressure in the distribution system.

- A. Increase water pressure
- B. Equalize
- C. Main line isolation
- D. None of the above

187. Booster stations are used to \_\_\_\_\_ from storage tanks for low-pressure mains.

- A. Increase water pressure
- B. Equalize
- C. Boost flow
- D. None of the above

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

- A. Increase water pressure
- B. Regulating system flow or pressure
- C. Service line isolation
- D. None of the above

189. According to the text, Gate valves should be used in the \_\_\_\_\_ for main line isolation.

- A. Distribution system
- B. Complete gridiron system
- C. Distribution tree
- D. None of the above

### Hydraulic Principles Section

#### Hydraulics

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

- A. Hydrostatics
- B. Hydrokinetics
- C. Flow
- D. None of the above

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

- A. Hydrostatics
- B. Hydrokinetics
- C. Flow
- D. None of the above

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

- A. True
- B. False

### **Atmospheric Pressure**

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

- A. True
- B. False

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

- A. True
- B. False

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

- A. True
- B. False

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

- A. True
- B. False

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

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

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

- A. Troposphere
- B. Sea level
- C. Atmospheric pressure
- D. None of the above

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

- A. Static pressure
- B. Gauge pressure
- C. Sea level
- D. None of the above

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

- A. Pressure(s) of the air
- B. Height
- C. Sea Level
- D. None of the above

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

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

202. Which of the following could be measured with the aneroid Barometer?

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

203. The atmospheric pressure does not vary uniformly with?

- A. Barometer
- B. Weight
- C. Altitude
- D. None of the above

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

- A. Barometer
- B. Weight
- C. Altitude
- D. None of the above

### **Barometric Loop**

205. 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

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

- A. True
- B. False

207. 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

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

- A. True
- B. False

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

- A. True
- B. False

210. 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

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

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

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

- A. Referred to using pressure
- B. Are related
- C. Permanent forces tangential
- D. None of the above

213. Which of the following at sea level is 14.7 psia?

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

214. Which of the following is the total pressure?

- A. Static pressure
- B. Absolute pressure
- C. Sea level
- D. None of the above

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

- A. Absolute pressure
- B. Gauge pressure
- C. Atmospheric pressure
- D. None of the above

### Pressure

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

- A. True
- B. False

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

- A. True
- B. False

218. Both air and water are considered to be?

- A. Absolute pressure
- B. Fluid(s)
- C. Volume
- D. None of the above

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

- A. Absolute pressure
- B. Fluid(s)
- C. Volume
- D. None of the above

220. According to the text, a force is proportional to the \_\_\_\_\_, and is called a pressure.

- A. Pascal's Principle
- B. Area on which it is exerted
- C. Permanent forces tangential
- D. None of the above

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

- A. Hydrostatics
- B. Acting on the body of the fluid
- C. Area on which it is exerted
- D. None of the above

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

- A. Low viscosity
- B. Shearing force
- C. Volume
- D. None of the above

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

- A. Absolute pressure
- B. Fluid(s)
- C. Volume
- D. None of the above

224. The coefficient of viscosity is the ratio of \_\_\_\_\_ to the velocity gradient.

- A. Atmospheric pressure
- B. Fluid(s)
- C. Shearing force
- D. None of the above

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

- A. Pascal's Principle
- B. Hydrostatics
- C. Permanent forces tangential
- D. None of the above

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

- A. Pascal's Principle
- B. Hydrostatics
- C. Permanent forces tangential
- D. None of the above

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

- A. Axiom
- B. Gravitational body force
- C. Displaced fluid
- D. None of the above

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

- A. Axiom
- B. Gravitation
- C. Displaced fluid
- D. None of the above

229. We call this relation the barometric equation, for when this equation is integrated, we find the variation of pressure with?

- A. Height or depth
- B. Pressure
- C. Gravitation
- D. None of the above

### Free Surface Perpendicular to Gravity

230. Archimedes' Principle says that the buoyant force is equal to the weight of the displaced fluid, and passes through the center of mass of?

- A. Axiom
- B. Pressure
- C. Displaced fluid
- D. None of the above

### Standard Atmospheric Pressure

231. Which of the following is a practice that is convenient to measure pressure differences by measuring the height of liquid columns?

- A. Total vacuum
- B. Capillarity
- C. Manometer
- D. None of the above

232. Which of the following uses a partially evacuated chamber of thin metal that expands and contracts according to the external pressure?

- A. Aneroid barometer
- B. Capillarity tube
- C. Partial vacuum
- D. None of the above

### Vacuum

233. The term vacuum indicates that the absolute pressure is less than the atmospheric pressure and that the \_\_\_\_\_ is negative.

- A. Static pressure
- B. Gauge pressure
- C. Total vacuum
- D. None of the above

234. Which of the following would mean a pressure of 0 psia or -14.7 psig?

- A. Static pressure
- B. Gauge pressure
- C. Total vacuum
- D. None of the above



235. \_\_\_\_\_ the pressure would range from slightly less than 14.7 psia to slightly greater than 0 psia?

- A. Pressure
- B. Gauge pressure
- C. Partial vacuum
- D. None of the above

236. Backsiphonage results from \_\_\_\_\_ exerted on a liquid, forcing it toward a supply system that is under a vacuum.

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

237. According to the text, it is impossible to produce a partial vacuum.

- A. True
- B. False

### Water Pressure

238. The weight of a cubic foot of water is 62.4 pounds per square foot. The base can be subdivided into 144-square inches with each subdivision being subjected to a pressure of 0.433 psig. This is one of our key foundation for backflow prevention.

- A. True
- B. False

239. Which of the following are very frequently stated in terms of the height of a fluid?

- A. Friction
- B. Pressure(s)
- C. Siphon
- D. None of the above

240. Water with a pressure head of 10 ft can provide the same \_\_\_\_\_ as an equal amount of water raised by 10 ft.

- A. Weight
- B. Pressure(s)
- C. Energy
- D. None of the above

241. Water flowing in a pipe is subject to head loss because of?

- A. Friction
- B. Weight
- C. Siphon
- D. None of the above

242. The name is Greek for the tube and is another application of pressure is the?

- A. Water bearer
- B. Siphon
- C. Hydraulic machine
- D. None of the above

243. When a siphon goes below the free water levels, it is called an?

- A. Water bearer
- B. Siphon
- C. Inverted siphon
- D. None of the above

244. Which of the following can be made by filling the tube, closing the ends, and then putting the ends under the surface on both sides?

- A. Epihydro
- B. Siphon
- C. Hydrostat
- D. None of the above

### Pressure and Force

245. Which of the following is the force that pushes water through pipes?

- A. Absolute pressure
- B. Pressure
- C. Volume
- D. None of the above

246. Water pressure determines the flow of water from the tap.  
A. True      B. False

### Development of Hydraulics

247. According to the text, valves, pumps, actuating cylinders, and motors have been developed and refined to make hydraulics one of the leading methods of transmitting power.  
A. True      B. False

248. One characteristic of a liquid is the tendency to keep its free surface level.  
A. True      B. False

249. The mercury column was held up by the pressure by horror vacui as Aristotle had supposed.  
A. True      B. False

250. Air, which is by no means incompressible. As we rise in the atmosphere and the pressure decreases, the air also expands.  
A. True      B. False

251. Which of the following to be made effective for practical applications, it was necessary to have a piston that "fit exactly?"  
A. Pascal's law                      C. Aristotle' law  
B. Archimedes' law                  D. None of the above

252. During the same period, Blaise Pascal, a French scientist, discovered the fundamental law for the science of?  
A. Experiments                      C. Physics  
B. Hydraulics                        D. None of the above

253. Which of the following states that increase in pressure on the surface of a confined fluid is transmitted undiminished throughout the confining vessel or system?  
A. Pascal's law                      C. Aristotle' law  
B. Otto von Guericke                D. None of the above

254. Which of the following scientists had a barometer carried up the 1465 m high Puy de Dôme, an extinct volcano in the Auvergne just west of his home of Clermont-Ferrand in 1648 by Périer, his brother-in-law?  
A. Aristotle                          C. Blaise Pascal  
B. Evangelista Torricelli            D. None of the above

255. Which of the following scientists making the first vacuum pump, which he used in vivid demonstrations of the pressure of the atmosphere?  
A. Aristotle                          C. Blaise Pascal  
B. Evangelista Torricelli            D. None of the above

256. Which of the following is by no means isothermal close to the ground?  
A. Tropopause                      C. Sea level  
B. Atmosphere                      D. None of the above

### **Meteorology**

257. Which of the following is of great importance in meteorology, since it determines the winds?

- A. Stratosphere
- B. Atmosphere
- C. Atmospheric pressure
- D. None of the above

258. Certain typical weather patterns are associated with relatively high and relatively low \_\_\_\_\_, and how they vary with time.

- A. Stratosphere
- B. Atmosphere
- C. Pressures
- D. None of the above

### **Pascal's Law**

259. Pascal discovered that pressure in a fluid acts equally in some directions.

- A. True
- B. False

260. According to the text, pressure acts at right angles to the containing surfaces.

- A. True
- B. False

261. If a pressure gauge, with an exposed face, is placed beneath the surface of a liquid at a specific depth and pointed in different directions, the pressure will read the same.

- A. True
- B. False

262. Pressure in a \_\_\_\_\_ of direction.

- A. Liquid at a specific depth
- B. Liquid is independent
- C. Height of a liquid
- D. None of the above

263. Pressure due to the \_\_\_\_\_, at any level, depends on the depth of the fluid from the surface.

- A. Modern hydraulics
- B. Liquid at a specific depth
- C. Weight of a liquid
- D. None of the above

264. If the exposed face of the pressure gauges are moved closer to the surface of the liquid, the indicated?

- A. Pressure will be less
- B. Column is tripled
- C. Is equal
- D. None of the above

265. The indicated pressure is doubled, when the?

- A. Depth is doubled
- B. Pressure of a liquid
- C. Column is tripled
- D. None of the above

266. The pressure at any depth in \_\_\_\_\_ of the column of liquid at that depth divided by the cross-sectional area of the column at that depth.

- A. Depth is doubled
- B. Pressure of a liquid
- C. Liquid is equal to the weight
- D. None of the above

267. Which of the following produces the pressure is referred to as the fluid head of the liquid?

- A. Depth is doubled
- B. Pressure of a liquid
- C. Volume of a liquid
- D. None of the above

268. Which of the following is due to its fluid head is also dependent on the density of the liquid?

- A. Depth is doubled
- B. Pressure of a liquid
- C. Volume of a liquid
- D. None of the above

**Static Pressure**

269. Static pressure exists in addition to Gravity that may also be present at the same time.

- A. True
- B. False

270. Pascal's law covers the situation only for fluids at rest or practically at rest. It is true only for the factors making up \_\_\_\_\_.

- A. Velocity of flow
- B. Volume of a liquid
- C. Static head
- D. None of the above

271. When velocity becomes a factor it must have a direction, the force related to the velocity must also have a direction, so that Pascal's law alone does not apply to the dynamic factors of?

- A. Pressure drop
- B. Volume of a liquid
- C. Fluid power
- D. None of the above

272. The dynamic factors of inertia and friction are related to the static factors. Velocity head and \_\_\_\_\_ are obtained at the expense of static head.

- A. Friction head
- B. Volume of a liquid
- C. Static head
- D. None of the above

273. Which of the following can be produced by pressure or head when dealing with fluids?

- A. Pressure drop
- B. Force
- C. Fluid power
- D. None of the above

**Volume and Velocity of Flow**

274. Which of the following flow terms is passing a point in a given time is known as its volume of flow or flow rate?

- A. Pressure drop
- B. Volume of a liquid
- C. Velocity of flow
- D. None of the above

275. Which of the following flow terms is usually expressed in gallons per minute (gpm) and is associated with relative pressures of the liquid, such as 5 gpm at 40 psi?

- A. Pressure drop
- B. Volume of flow
- C. Velocity of flow
- D. None of the above

276. Which of the following flow terms is defined as the average speed at which the fluid moves past a given point? It is usually expressed in feet per second (fps) or feet per minute (fpm).

- A. Pressure drop
- B. Friction head
- C. Velocity of flow
- D. None of the above

277. Which of the following flow terms is an important consideration in sizing the hydraulic lines?

- A. Pressure drop
- B. Volume of a liquid
- C. Velocity of flow
- D. None of the above

278. Volume and friction head are often considered together, that is, with volume of input unchanged—the velocity of flow increases as the cross section or size of the pipe decreases.  
A. True      B. False

### Confined Space Safety Section

279. The Confined Space Entry Program is provided to protect authorized employees that will enter confined spaces and may be Exposed to hazardous atmosphere, engulfment in materials, conditions which may trap or asphyxiate due to converging or sloping walls, or contains any other safety or health hazards.  
A. True      B. False

### Scope

280. According to the text, you are required to recognize \_\_\_\_\_ associated with confined spaces.  
A. An internal configuration      C. Dangers and hazards  
B. Permit-Required Confined Space      D. None of the above

### Definitions

#### Confined space:

281. Is large enough or so configured that an employee can?  
A. Engulfing an entrant      C. Recognized serious safety or health hazard  
B. Bodily enter and perform work      D. None of the above
282. Is not designed for?  
A. Hazardous atmospheres      C. Continuous employee occupancy  
B. An internal configuration      D. None of the above
283. Permit required confined space (permit space), is a confined space that has one or more of the following characteristics: Contains or has a potential to contain a?  
A. An internal configuration      C. Entry or exit  
B. Hazardous atmosphere      D. None of the above
284. Has limited or restricted means for entry or exit (i.e. tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have?  
A. Hazardous atmosphere      C. Atmospheric factors and physical agents  
B. Limited means of entry      D. None of the above
285. Contains a material that has the?  
A. Engulfing an entrant      C. Recognized serious safety or health hazard  
B. Potential for engulfing an entrant      D. None of the above
286. Has an internal configuration such that \_\_\_\_\_ could be trapped or asphyxiated by inwardly covering walls or by a floor that slopes downward and tapers to a smaller cross-section.  
A. An internal configuration      C. An entrant  
B. Hazardous atmosphere      D. None of the above
287. Contains any other recognized serious safety or?  
A. Engulfing an entrant      C. Health hazard  
B. An internal configuration      D. None of the above

288. Which of the following will be marked "Confined Space - Entry Permit Required"?
- A. An internal configuration
  - B. Permit-Required Confined Space
  - C. Entry or exit
  - D. None of the above

### Confined Space Hazards

289. Fatalities and injuries constantly occur among construction workers who, during the course of their jobs, are required to enter?

- A. Hazardous atmosphere
- B. Ventilation ducts
- C. Confined spaces
- D. None of the above

290. Throughout the construction jobsite, contractors and workers encounter both inherent and \_\_\_\_\_ within confined workspaces.

- A. An internal configuration
- B. Permit-Required Confined Space
- C. Induced hazards
- D. None of the above

### Inherent Hazards

291. Which of the following such as electrical, thermal, chemical, mechanical, etc., are associated with specific types of equipment and the interactions among them?

- A. Inherent hazards
- B. An internal configuration
- C. Recognized serious safety or health hazard
- D. None of the above

292. Inherent Hazards include high voltage (shock or corona discharge and the resulting burns), radiation generated by equipment, \_\_\_\_\_, omission of protective features, high or low temperatures, high noise levels, and high-pressure vessels and lines.

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

293. Inherent hazards usually cannot be eliminated without degrading the system or equipment, or without making them inoperative. An emphasis must be placed on?

- A. Hazard control methods
- B. An internal configuration
- C. Recognized serious safety or health hazard
- D. None of the above

### Induced Hazards

294. Induced Hazards are: omission of protective features, physical arrangements that may cause unintentional worker contact with electrical energy sources, oxygen-deficient atmospheres created at the bottom of pits or shafts, lack of safety factors in structural strength, and?

- A. Hazard
- B. Vaults
- C. Flammable atmospheres
- D. None of the above

295. Which of the following arise, and are induced from, a multitude of incorrect decisions and actions that occur during the actual construction process?

- A. Induced hazards
- B. Below-grade location
- C. Build-up of explosive gases
- D. None of the above

### Typical Examples of Confined Workspaces

296. An examples of confined workspaces in construction that contain?

- A. Purging agents
- B. Below-grade location
- C. Both inherent and induced hazards
- D. None of the above

### Condenser Pits

297. According to the text, a common confined space found in the construction of nuclear power plants is the condenser pit, because of their large size, they are often overlooked as?

- A. Common confined spaces
- B. Vaults
- C. Potentially hazardous confined spaces
- D. None of the above

298. Below-grade areas create large containment areas for the accumulation of toxic fumes, gases, and so forth, or for the creation of \_\_\_\_\_ when purging with argon, Freon, and other inert gases.

- A. Below-grade location
- B. Vibration
- C. Oxygen-deficient atmospheres
- D. None of the above

299. Which of the following will be created by workers above dropping equipment, tools, and materials into the pit?

- A. Hazards
- B. Heat prostration
- C. Problem with the pumps
- D. None of the above

300. Which of the following are associated with manholes?

- A. Collection place
- B. A variety of hazards
- C. Normal Oxygen
- D. None of the above