

Registration form

**CROSS-CONNECTION ID CEU TRAINING COURSE**  
**48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL \$50.00**

**Start Date:** \_\_\_\_\_ **Finish Date:** \_\_\_\_\_  
*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/PDH's.  
Water Treatment \_\_\_\_\_ Distribution \_\_\_\_\_ Collection \_\_\_\_\_ BPAT \_\_\_\_\_

Well Drillers \_\_\_\_\_ Pump Installer \_\_\_\_\_ CSI \_\_\_\_\_ WTS \_\_\_\_\_

Other \_\_\_\_\_

Technical Learning College PO Box 3060, Chino Valley, AZ 86323  
Toll Free (866) 557-1746 Fax (928) 272-0747 e-mail - 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 we need your e-mail address. We will e-mail the certificate to you, if no e-mail address; we will mail 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/downloadsPDF/CEU%20State%20Approvals.pdf>

*You can obtain a printed version of the course manual from TLC for an additional \$169.95 plus shipping charges.*

### **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.

### **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.

### **Texas TCEQ STUDENTS ONLY**

All TCEQ Students will need to sign this and date this form as well. TCEQ students will also be given special assistance if you fail the examination. You will also have access to failed or wrong questions and/or the area or topic of the assignment to complete your learning experience.

### **Attention Texas TCEQ Operators, Irrigators, CSI and Backflow Testers...**

**NOTE:** Any course cannot be taken for same credit in the same renewal period. Please call TCEQ and make sure that these courses are still accepted for credit before starting. Do not retake this course for credit in the same renewal period.

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

## For TCEQ Licensed Wastewater Operators

### Rule Changes and Updates for Domestic Wastewater Systems

On Nov. 4, 2014, TCEQ commissioners adopted revisions to 30 Texas Administrative Code (TAC), Chapter 217, Design Criteria for Domestic Wastewater Systems, and “re-adopted” previously repealed rules in 30 TAC, Chapter 317, Design Criteria Prior to 2008.

#### ***Some of the changes to Chapter 217 include:***

- Adding new definitions and clarifying existing definitions;
- Adding design criteria and approval requirements for rehabilitation of existing infrastructure;
- Adding design criteria for new technologies, including cloth filters and air lift pumps;
- Making changes to reflect modern practices, standards and trends;
- Modifying rule language to improve readability and enforceability; and
- Modifying the design organic loadings and flows for a new wastewater treatment facility.

### **SUBCHAPTER A: ADMINISTRATIVE REQUIREMENTS §§217.1 - 217.18**

Effective December 4, 2015 §217.1. Applicability. (a) Applicability. (1) This chapter applies to the design, operation, and maintenance of: (A) domestic wastewater treatment facilities that are constructed with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter; (B) treatment units that are altered, constructed, or re-rated with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter; (C) collection systems that are constructed with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter; (D) collection system units that are altered, constructed, or re-rated with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter; (E) existing domestic wastewater treatment facilities that do not have a current Texas Pollutant Discharge Elimination System permit or a Texas Land Application Permit and are required to have an active wastewater permit; (F) existing wastewater treatment facilities and collection systems that never received approval for plans and specifications from the executive director; and (G) collection system rehabilitation projects covered in §217.56(c) and §217.69 of this title (relating to Trenchless Pipe Installation; and Maintenance, Inspection, and Rehabilitation of the Collection System). (2) Domestic wastewater treatment facilities, treatment units, collection systems, and collection system units with plans and specifications approved by the executive director that were received on or after August 28, 2008 and before the effective date of this chapter must comply with the rules in this chapter, as they existed immediately before the effective date of the amendments to this chapter.

The rules in Texas Commission on Environmental Quality Page 2 Chapter 217 - Design Criteria for Domestic Wastewater Systems effect immediately before the effective date of the amendments to this chapter are continued in effect for that purpose. (3) This chapter does not apply to: (A) the design, installation, operation, or maintenance of domestic wastewater treatment facilities, treatment units, collection systems, or collection system units with plans and specifications that were approved by the executive director on or before August 27, 2008, which are governed by Chapter 317 of this title (relating to Design Criteria Prior to 2008) or

design criteria that preceded Chapter 317 of this title; and (B) systems regulated by Chapter 285 of this title (relating to On-Site Sewage Facilities); or collection systems or wastewater treatment facilities that collect, transport, treat, or dispose of wastewater that does not have the characteristics of domestic wastewater, although the wastewater may contain domestic wastewater.

(b) The executive director may grant variances from new requirements added by the amendments of this chapter to a person who proposes to construct, alter, or re-rate a collection system or wastewater treatment facility if the plans and specifications for the project are submitted within 180 days after the date the amendments to this chapter are effective, provided the plans and specifications comply with the rules in effect immediately prior to the amendment. Adopted November 4, 2015 Effective December 4, 2015

**The link to the rules is available on the TCEQ website at <https://www.tceq.texas.gov/rules/indxpdf.html>**

*For Texas Wastewater Students Only....*

Please sign and date this notice

Printed Name

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Signature

Date

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**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



## CERTIFICATION OF COURSE PROCTOR

Technical Learning College requires that our students who takes a correspondence or home study program course must pass a proctored course reading, quiz and final examination. The proctor must complete and provide to the school a certification form approved by the commission for each examination administered by the proctor.

**Instructions.** When a student completes the course work, fill out the blanks in this section and provide the form to the proctor with the examination.

Name of Course: \_\_\_\_\_

Name of Licensee: \_\_\_\_\_

**Instructions to Proctor.** After an examination is administered, complete and return this certification and examination to the school in a sealed exam packet or in pdf format.

I certify that:

1. I am a disinterested third party in the administration of this examination. I am not related by blood, marriage or any other relationship to the licensee which would influence me from properly administering the examination.
2. The licensee showed me positive photo identification prior to completing the examination.
3. The enclosed examination was administered under my supervision on \_\_\_\_\_. The licensee received no assistance and had no access to books, notes or reference material.
4. I have not permitted the examination to be compromised, copied, or recorded in any way or by any method.
5. Provide an estimate of the amount of time the student took to complete the assignment.

Time to complete the entire course and final exam. \_\_\_\_\_

Notation of any problem or concerns:

Name and Telephone of Proctor (please print):

\_\_\_\_\_

\_\_\_\_\_

Signature of Proctor



# Cross-Connection CEU Course Answer Key

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

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

**No refunds**

**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 are responsible to ensure that TLC receives the Assignment and Registration Key. Please call us to ensure that we received it.**

**Please select one answer. You can Bold, Circle, Underline or X your answer. You can use Adobe Acrobat DC to electronically fill out this sheet. A felt Tipped pen works best.**

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

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

- |             |              |              |              |
|-------------|--------------|--------------|--------------|
| 69. A B C D | 90. A B      | 111. A B C D | 132. A B     |
| 70. A B C D | 91. A B      | 112. A B C D | 133. A B     |
| 71. A B C D | 92. A B      | 113. A B     | 134. A B C D |
| 72. A B C D | 93. A B      | 114. A B     | 135. A B     |
| 73. A B C D | 94. A B      | 115. A B     | 136. A B C D |
| 74. A B C D | 95. A B C D  | 116. A B C D | 137. A B     |
| 75. A B C D | 96. A B C D  | 117. A B C D | 138. A B     |
| 76. A B C D | 97. A B C D  | 118. A B C D | 139. A B     |
| 77. A B C D | 98. A B C D  | 119. A B C D | 140. A B     |
| 78. A B C D | 99. A B C D  | 120. A B     | 141. A B     |
| 79. A B C D | 100. A B C D | 121. A B     | 142. A B C D |
| 80. A B C D | 101. A B C D | 122. A B C D | 143. A B C D |
| 81. A B C D | 102. A B     | 123. A B C D | 144. A B     |
| 82. A B C D | 103. A B     | 124. A B C D | 145. A B     |
| 83. A B C D | 104. A B     | 125. A B C D | 146. A B     |
| 84. A B C D | 105. A B     | 126. A B C D | 147. A B     |
| 85. A B C D | 106. A B     | 127. A B C D | 148. A B     |
| 86. A B C D | 107. A B C D | 128. A B C D | 149. A B     |
| 87. A B C D | 108. A B C D | 129. A B     | 150. A B     |
| 88. A B C D | 109. A B C D | 130. A B     |              |
| 89. A B     | 110. A B C D | 131. A B     |              |

*I understand that I am 100 percent responsible to ensure that TLC receives the Assignment and Registration Key and that it is accepted for credit by my State or Providence. 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. I will not hold TLC liable for any errors, injury, death or non-compliance with rules. I will abide with all federal and state rules and rules found on page 2.*

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

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**Signature**

**Cross-Connection Identification 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.**

1. Please rate the difficulty of your course.

Very Easy    0        1        2        3        4        5    Very Difficult

2. Please rate the difficulty of the testing process.

Very Easy    0        1        2        3        4        5    Very Difficult

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

Very Similar   0        1        2        3        4        5    Very Different

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

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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.

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## Special Notice to all TCEQ Students

### § 344.51. SPECIFIC CONDITIONS AND CROSS-CONNECTION CONTROL.

(d) If an irrigation system is designed or installed on a property that is served by an on-site sewage facility, as defined in Chapter 285 of this title (relating to On-Site Sewage Facilities), then:

(1) all irrigation piping and valves must meet the separation distances from the On-Site Sewage Facilities system as required for a private water line in §285.91(10) of this title (relating to Minimum Required Separation Distances for On-Site Sewage Facilities);

(2) any connections using a private or public potable water source must be connected to the water source through a reduced pressure principle backflow prevention assembly as defined in §344.50 of this title (relating to Backflow Prevention Methods); and

(3) any water from the irrigation system that is applied to the surface of the area utilized by the On-Site Sewage Facility system must be controlled on a separate irrigation zone or zones so as to allow complete control of any irrigation to that area so that there will not be excess water that would prevent the On-Site Sewage Facilities system from operating effectively.

## When Finished with Your Assignment

### REQUIRED DOCUMENTS

Please scan the **Registration Page, Answer Key, Survey and Driver's License** and email it to [info@TLCH2O.com](mailto:info@TLCH2O.com).

### IPhone Scanning Instructions

If you are unable to scan, take a photo of these documents with your **iPhone** and send these photos to TLC, [info@TLCH2O.com](mailto:info@TLCH2O.com).

### FAX

If you are unable to scan and email, please fax these to TLC, if you fax, call to confirm that we received your paperwork. **(928) 468-0675**

### 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. Thank you...

In the near future, 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.

## **CROSS-CONNECTION IDENTIFICATION CEU COURSE ASSIGNMENT**

The focus of this course is a basic understanding of Backflow Prevention/Cross-Connection. This course is **NOT** designed to certify you as a General Tester or a Cross-Connection Specialist.

You will have 90 days from receipt of this course to complete in order to receive your Continuing Education Units (CEUs) or Professional Development Hours (PDHs).

A score of 80 % or better is necessary to pass this course. If you should need any assistance, please email all concerns and the final test to [info@tlch2o.com](mailto:info@tlch2o.com). You can find online assistance for this course on the in the Search function on Adobe Acrobat PDF to help find the answers.

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

### **Backflow Introduction**

1. 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
2. The SDWA assigned each state with primary enforcement responsibility for a program to assure access to safe drinking water by all citizens.  
A. True      B. False
3. The first level of the SDWA is protection of the \_\_\_\_\_ and the second is protection of persons subject to such risks involving service to a single customer.  
A. Water provider      C. Pollutant source  
B. General public      D. None of the above
4. Sources of pollution that may result in a danger to health are not always obvious and such cross-connections are?  
A. Internal or external piping      C. Certainly intentional  
B. Certainly not usually intentional      D. None of the above
5. Within the business environment, the pollutant source may involve the unintentional cross-connection of \_\_\_\_\_ with chemical processes or a heating boiler.  
A. Indirect piping      C. Internal or external piping  
B. Direct connection      D. None of the above
6. In a residential environment, the pollutant source may be an illegal cross-connection with a landscape sprinkler system or reserve tank fire protection system.  
A. True      B. False
7. 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. OSHA Enforcement responsibility      C. Local Cross-Connection Control ordinances  
B. State program regulations      D. None of the above

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

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

9. Cross-Connection Control addressed on the federal level by passage of the "Federal Safe Drinking Water Act" as developed by Occupational Safety and Health Administration and passed into law on December 16, 1974.

- A. True
- B. False

10. The following could be a cause of a cross-connection: A situation as simple as leaving a garden hose nozzle submerged in a bucket of liquid or attached to a chemical sprayer.

- A. True
- B. False

11. As far as a cross-connection, another potential hazard source within any environment may be a cross-connection of piping could be?

- A. With an air gap
- B. Air break
- C. Involving a water well located on the property.
- D. None of the above

12. The proper control of cross-connections is possible....

- A. Only through knowledge and vigilance
- B. The key is public safety and the second is protection
- C. Certainly not usually intentional
- D. None of the Above

13. Public education is not essential, for many that are educated in piping and plumbing installations are able to recognize cross-connection dangers.

- A. True
- B. False

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

14. Which of the following are there two forms-backpressure and backsiphonage?

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

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

- A. High air gap hazard installations
- B. Device or method
- C. Mechanical backflow preventer
- D. None of the above

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

- A. High hazard installations
- B. Vacuum breaker
- C. Air gapper
- D. None of the above

17. Backflow is the undesirable reversal of flow of nonpotable water or other substances through a \_\_\_\_\_ and into the piping of a public water system or consumer's potable water system.

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

18. 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. Connection                      C. Backpressure  
B. Backsiphonage                  D. None of the above
19. Which of the following is a type of backflow caused by a downstream pressure that is greater than the upstream or supply pressure in a public water system or consumer's potable water system?
- A. Backpressure                  C. Indirect connection  
B. Backsiphonage                  D. None of the above
20. 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. Indirect connection              C. Cross-connection  
B. Backpressure                      D. None of the above
21. Which of the following is a means or mechanism to prevent backflow?
- A. High hazard stop device              C. Backwater valve  
B. Backflow preventer                  D. None of the above
22. The fundamental backflow prevention method is \_\_\_\_\_, which either eliminates a cross-connection or provides a barrier to backflow.
- A. An Air gap                          C. Device or method  
B. Vacuum breaker                      D. None of the above
23. Which of the following can occur whenever the amount of water being used exceeds the amount of water being supplied, such as during water line flushing, firefighting, or breaks in water mains?
- A. Cross-connection                  C. Backsiphonage  
B. Backpressure                      D. None of the above
24. 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                  C. Backsiphonage  
B. Backpressure                      D. None of the above
25. Which of the following is a form backflow caused by a negative pressure (i.e., a vacuum or partial vacuum) in a public water system or consumer's potable water system?
- A. Cross-connection                  C. Backsiphonage  
B. Backpressure                      D. None of the above

### **Common Hydraulic Terms**

26. Which of the following definitions is the engineering science pertaining to liquid pressure and flow?
- A. Hydraulics                      C. Hydrokinetics  
B. Hydrology                      D. None of the above

27. Which of the following definitions is the pressure in a fluid at rest?  
A. Head, Friction      C. Head  
B. Pressure, Static    D. None of the above
28. Which of the following definitions is the height of a column or body of fluid above a given point?  
A. Head, Friction      C. Head  
B. Head, Static        D. None of the above
29. Which of the following definitions is the pressure exported by the atmosphere at any specific location?  
A. Pressure, Atmospheric    C. Pressure, Gauge  
B. Pressure, Static        D. None of the above
30. 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      C. Head  
B. Head, Static        D. None of the above
31. Which of the following definitions is required to overcome the friction at the interior surface of a conductor and between fluid particles in motion?  
A. Head, Friction      C. Head  
B. Head, Static        D. None of the above
32. Which of the following definitions is pressure above zero absolute, i.e. the sum of atmospheric and gauge pressure?  
A. Pressure, Atmospheric    C. Pressure, Gauge  
B. Pressure, Static        D. None of the above
33. Which of the following definitions is the force per unit area, usually expressed in pounds per square inch?  
A. Pressure, Absolute      C. Pressure, Gauge  
B. Pressure                D. None of the above
34. Which of the following definitions is the pressure differential above or below ambient atmospheric pressure?  
A. Pressure, Absolute      C. Pressure, Gauge  
B. Pressure                D. None of the above
35. Sea level pressure is approximately 2.31 pounds per square inch absolute, 1 bar = .433psi.  
A. True                  B. False

### Hydraulics

36. Hydraulics is a branch of engineering concerned mainly with moving liquids.  
A. True                  B. False
37. Which of the following includes the manner in which liquids act in tanks and pipes, deals with their properties and explores ways to take advantage of these properties?  
A. Pressure                C. Hydraulics  
B. Hydrostatics        D. None of the above

38. Which of the following includes the consideration of liquids at rest, involves problems of buoyancy and flotation?  
 A. Pressure                      C. Hydraulics  
 B. Hydrostatics                D. None of the above
39. Which of the following \_\_\_\_\_ is about the pressures exerted by a fluid at rest?  
 A. Fluids                         C. Hydrokinetics  
 B. Hydrostatics                D. None of the above
40. Hydraulics is applied commonly to the study of the \_\_\_\_\_, other liquids, and even gases when the effects of compressibility are small.  
 A. Fluids                         C. Mechanical properties of water  
 B. Flow                            D. None of the above
41. Hydraulics can be divided into two areas, \_\_\_\_\_ and hydrokinetics.  
 A. Fluids                         C. Hydrokinetics  
 B. Hydrostatics                D. None of the above
42. Which of the following \_\_\_\_\_ includes the study of liquids in motion, is concerned with such matters as friction and turbulence generated in pipes by flowing liquids?  
 A. Fluids                         C. Hydrokinetics  
 B. Hydrostatics                D. None of the above

**Atmospheric Pressure**

43. The atmosphere is the entire mass of air that surrounds the earth.  
 A. True                      B. False
44. 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
45. If you were to ascend up, the atmospheric pressure increases by approximately 1.0 psi for every 2,343 feet.  
 A. True                      B. False
46. At sea level and at a temperature of 0° Celsius (C), the height of the mercury column is approximately 2 inches, or 20 centimeters. This represents a pressure of approximately 2.31 psi.  
 A. True                      B. False
47. Which of the following terms at sea level is approximately 14.7 psi?  
 A. Atmospheric pressure                      C. Sea level  
 B. Pressure(s) of the air                      D. None of the above
48. \_\_\_\_\_ is the layer called that spreads upward for about 300-500 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. Atmospheric pressure                      C. Sea level  
 B. Troposphere                                  D. None of the above

49. Pressures under water differ from those under air only because the weight of the water must be added to the?  
 A. Atmospheric pressure      C. Sea level  
 B. Pressure(s) of the air      D. None of the above
50. Which of the following can be measured by several methods, one method is the mercury column barometer?  
 A. Static pressure      C. Sea level  
 B. Atmospheric pressure      D. None of the above
51. Which of the following can be measured with the aneroid barometer?  
 A. Static pressure      C. Atmospheric pressure  
 B. Pressure      D. None of the above
52. Atmospheric pressure does not vary consistently with?  
 A. Altitude      C. Weight  
 B. Pressure(s)      D. None of the above
53. Atmospheric pressure is demarcated as the force per unit area exerted against a surface by the \_\_\_\_\_ of the air above that surface.  
 A. Altitude      C. Weight  
 B. Pressure(s)      D. None of the above

### **Barometric Loop**

54. 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
55. Absolute pressure is equal to gauge pressure plus the atmospheric pressure.  
 A. True      B. False
56. 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
57. Which of the following terms could be measured an absolute scale, pounds per square inch absolute (psia), or gauge scale, (psiag).  
 A. Static pressure      C. Gauge pressure  
 B. Pressure      D. None of the above
58. According to the text, absolute pressure and gauge pressure?  
 A. Are the same      C. Permanent forces tangential  
 B. Are related      D. None of the above
59. Which of the following at sea level is 14.7 psai?  
 A. Static pressure      C. Gauge pressure  
 B. Atmospheric pressure      D. None of the above

60. Which of the following terms is the total pressure?  
A. Static pressure                      C. Gauge pressure  
B. Absolute pressure                    D. None of the above
61. Which of the following terms would be equal to 14.7 psi, which is also the atmospheric pressure?  
A. Static pressure                      C. Gauge pressure  
B. Absolute pressure                    D. None of the above

62. 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

**Pressure**

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

- A. True            B. False

64. 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

65. Both air and water are considered to be?

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

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

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

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

- A. Pascal's Principle                    C. Acting on the body of the fluid  
B. Area on which it is exerted        D. None of the above

68. 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. Pascal's Principle                    C. Acting on the body of the fluid  
B. Area on which it is exerted        D. None of the above

69. The coefficient of viscosity is the ratio of this term to the velocity gradient.

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

70. 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                                    C. Displaced fluid  
B. Gravitation                            D. None of the above

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

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

72. In relation to the barometric equation, for when this equation is integrated, we find the variation of pressure with?

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

### Free Surface Perpendicular to Gravity

73. 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. Pressure
- B. Gravitational body force
- C. Displaced fluid
- D. None of the above

### Standard Atmospheric Pressure

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

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

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

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

### Vacuum

76. 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

77. Which of the following terms 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

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

- A. Total vacuum
- B. Partial vacuum
- C. Atmospheric pressure
- D. None of the above

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

- A. Total vacuum
- B. Partial vacuum
- C. Atmospheric pressure
- D. None of the above

### Water Pressure

80. Which of the following are defined in terms of the height of a fluid.

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

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

- A. Friction
- B. Depth
- C. Energy
- D. None of the above

82. Water flowing in a pipe is subject to head loss because of?  
A. Friction                      C. Pressure(s)  
B. Weight                        D. None of the above

83. When a siphon goes below the free water levels, it is called an?  
A. Hydrostat                    C. Expressed siphon  
B. Inverted siphon          D. None of the above

### **Pressure and Force**

84. Which of the following terms is the force that pushes water through pipes?  
A. Absolute pressure          C. Volume  
B. Pressure                      D. None of the above

85. Which of the following along with and force are used extensively in the study of fluid power?  
A. Fluid(s)                      C. Volume  
B. Pressure                      D. None of the above

86. Which of the following represents the amount of push or pull applied to each unit area of the surface?  
A. Force                         C. Volume  
B. Pressure                      D. None of the above

87. Which of the following represents a total push or pull. It is the push or pull exerted against the total area of a particular surface?  
A. Force                         C. Volume  
B. Pressure                      D. None of the above

88. Which of the following terms maybe exerted in one direction, in several directions, or in all directions?  
A. Force                         C. Volume  
B. Pressure                      D. None of the above

### **Development of Hydraulics**

89. 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

90. One characteristic of a liquid is the tendency to keep its free surface level.

- A. True                      B. False

91. Liquids will flow in the direction that will tend to make the surface level, if the surface is not level.

- A. True                      B. False

92. Daniel Bernoulli conducted experiments to study the elements of force in the discharge of water through small openings in the sides of tanks and through short pipes.

- A. True                      B. False

93. Air, which is by no means incompressible. As we rise in the atmosphere and the pressure decreases, and the air expands.

- A. True                      B. False

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

### **Pascal's Law**

95. The indicated pressure is doubled, when the?  
A. Depth is doubled      C. Column is tripled  
B. Pressure will be less      D. None of the above
96. 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. Volume of a liquid      C. Liquid is equal to the weight  
B. Pressure of a liquid      D. None of the above
97. Which of the following produces the pressure is referred to as the fluid head of the liquid?  
A. Volume of a liquid      C. Liquid is equal to the weight  
B. Pressure of a liquid      D. None of the above
98. \_\_\_\_\_ is due to its fluid head is also dependent on the density of the liquid.  
A. Volume of a liquid      C. Liquid is equal to the weight  
B. Pressure of a liquid      D. None of the above
99. Pressure in a \_\_\_\_\_ of direction.  
A. Weight of a liquid      C. Liquid is independent  
B. Liquid at a specific depth      D. None of the above
100. Pressure due to the \_\_\_\_\_, at any level, depends on the depth of the fluid from the surface.  
A. Weight of a liquid      C. Liquid is independent  
B. Liquid at a specific depth      D. None of the above
101. If the exposed face of the pressure gauges are moved closer to the surface of the liquid, the indicated?  
A. Depth is doubled      C. Column is tripled  
B. Pressure will be less      D. None of the above
102. According to the text, pressure does not acts at right angles to the containing surfaces.  
A. True      B. False
103. 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 differently in different directions.  
A. True      B. False
104. Pascal discovered that pressure in a fluid acts equally in some directions.  
A. True      B. False

### **Static Pressure**

105. Static pressure exists in addition to gravity that may also be present at the same time.  
A. True      B. False

106. Pascal's law states that a pressure set up in a fluid acts equally in all directions and at right angles to the containing surfaces.

- A. True      B. False

107. 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. Pressure drop      C. Fluid power  
B. Static head      D. None of the above

108. 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      C. Fluid power  
B. Static head      D. None of the above

109. 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      C. Fluid power  
B. Static head      D. None of the above

### **Volume and Velocity of Flow**

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

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

111. 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      C. Volume of flow  
B. Volume of a liquid      D. None of the above

112. 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      C. Velocity of flow  
B. Volume of a liquid      D. None of the above

113. 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

### **Bernoulli's Principle**

114. Bernoulli's principle thus says that a rise (or fall) in pressure in a flowing fluid must always be accompanied by a decrease (or increase) in the speed, and conversely, if an increase (decrease) in, the speed of the fluid results in a decrease (or increase) in the pressure.

- A. True      B. False

115. Bernoulli's principle is responsible for the fact that a shower curtain gets "sucked inwards" when the water is first turned on. What happens is that the increased water/air velocity inside the curtain (relative to the still air on the other side) causes a pressure drop.

- A. True      B. False

### Types of Backflow Prevention Methods and Assemblies

116. An air gap is a physical disconnection between the free flowing discharge end of a potable water pipeline and the top of an?

- A. Open receiving vessel
- B. Air break
- C. Air gap
- D. None of the above

117. Which of the following must be at least two times the diameter of the supply pipe and not less than one inch?

- A. Open receiving vessel
- B. Air break
- C. Air gap
- D. None of the above

118. Which of the following must either be physically disconnected or have an approved backflow prevention device installed to protect the public water system?

- A. Cross-connection
- B. Open receiving vessel
- C. Indirect connection
- D. None of the above

119. When the air flow is restricted, such as the case of an air gap located near a wall, the air gap separation must be increased.

- A. Non-restricted - Increased
- B. Restricted - Decreased
- C. Restricted - Increased
- D. None of the above

120. The type of device selected for a particular installation depends on several factors.

- A. True
- B. False

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

- A. True
- B. False

122. Air gap separations shall be vertically orientated a distance of at least twice the inside diameter of the supply, but never less than?

- A. 1 inch
- B. 2 inches
- C. 3 inches
- D. None of the above

123. An obstruction around or near an Air gap may restrict the flow of air into the outlet pipe and nullify the effectiveness of the air gap to prevent \_\_\_\_\_.

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

124. An air gap is acceptable for \_\_\_\_\_ and is theoretically the most effective protection.

- A. High hazard installations
- B. High polluttional concerns
- C. Low polluttional hazards
- D. None of the above

### Vacuum Breakers

125. Vacuum breaker(s) can have two types?

- A. Atmospheric and pressure
- B. Atmospheric and spring
- C. Hazard and polluttional application(s)
- D. None of the above

126. Which of the following terms may not be installed downstream of atmospheric vacuum breakers but are allowed on pressure vacuum breakers?
- A. Test cocks            C. Shut offs  
B. Air inlet valve        D. None of the above
127. Vacuum breaker(s) must be installed above the highest?
- A. Downstream piping        C. Hazard applications  
B. Upstream piping         D. None of the above
128. Which of the following contains a float check, a check seat, and an air inlet port?
- A. Double check                C. RP  
B. Atmospheric vacuum breaker    D. None of the above
129. Both vacuum breakers devices primary purpose is to protect the water system from cross connections due to submerged inlets, such as irrigation systems and tank applications.
- A. True            B. False
130. The difference between the two types them is that the pressure vacuum breaker \_is spring loaded to assist the device's opening.
- A. True            B. False
131. Both vacuum breakers devices open the pipeline to atmosphere in the event of backsiphonage only.
- A. True            B. False
132. Both vacuum breakers devices are approved for backpressure conditions.
- A. True            B. False
133. The Atmospheric vacuum breaker allows air to enter the water line when the line pressure is reduced to a gauge pressure of ten or below.
- A. True            B. False
134. Which of the following terms is not internally loaded?
- A. Air inlet valve        C. Dump relief  
B. Check valve            D. None of the above
135. To prevent the Air inlet from sticking open, the device must not be installed on the pressure side of a shutoff valve, or wherever it may be under constant pressure more than 2 hours during a 12-hour period.
- A. True            B. False
136. Which of the following are designed to prevent backflow caused by backsiphonage only from low health hazards?
- A. Atmospheric vacuum breakers    C. Backflow preventor(s)  
B. RPs                                    D. None of the above
137. Atmospheric vacuum breakers Uses: Irrigation systems, commercial dishwasher and laundry equipment, chemical tanks and laboratory sinks.
- A. True            B. False

138. Pressure Vacuum Breaker Assembly (PVB) consists of a weighted check valve, an independently operating relief valve, two resilient seated shutoff valves, and two properly located resilient seated test cocks.

A. True      B. False

139. The PVB needs to be installed 24 inches above the service or supply line to work correctly.

A. True      B. False

140. Double Check Valve Assembly (DC) consists of two internally loaded check valves, either spring loaded or internally weighted, two resilient seated full ported shutoff valves, and four properly located resilient seated test cocks

A. True      B. False

141. The double check valve assembly is designed to prevent backflow caused by backpressure and backsiphonage from high health hazards.

A. True      B. False

142. The double check valve should be installed in an \_\_\_\_\_ and protected from freezing.

A. Confined space      C. Above the ground  
B. Accessible location      D. None of the above

143. The DC needs to be installed 12 inches \_\_\_\_\_ for testing purposes only.

A. Accessible location      C. Above the highest downstream outlet  
B. Above the ground      D. None of the above

144. Reduced Pressure Backflow Assembly (RP) consists of two independently acting spring loaded check valves separated by a Spring loaded differential pressure relief valve, two resilient seated full ported shutoff valves, and four properly located resilient seated test cocks.

A. True      B. False

145. During normal operation, the pressure between the two check valves, referred to as the air inlet zone, is maintained at a higher pressure than the supply pressure.

A. True      B. False

146. If either reduced pressure backflow assembly check valve leaks, the differential pressure relief valve maintains a differential pressure of at least two (2) psi between the supply pressure and the zone between the two check valves by discharging water to atmosphere.

A. True      B. False

147. According to the text, the reduced pressure backflow assembly or RP is designed to prevent backflow caused by backpressure and backsiphonage from low to high health hazards.

A. True      B. False

148. According to the text, the RP needs to be installed 12 inches above the ground for testing purposes only.

A. True      B. False

149. The reduced pressure backflow assembly can be used for high hazard situations under backpressure only. Under normal conditions, the second check valve should never close.

A. True      B. False

150. According to the text, the reduced pressure zone port opens anytime pressure in the zone comes within 2 psi of the supply pressure.  
A. True      B. False

## **When Finished with Your Assignment**

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