

Registration form

CROSS-CONNECTION ID CEU TRAINING COURSE \$100.00

AKA TCEQ 8Hour Hydraulic and CCC Basics

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 _____

Irrigator _____ Other _____

Your certificate will be emailed to you in about two weeks unless you pay for the rush service.

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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.

You can obtain a printed version of the course manual from TLC for an additional \$59.95 plus shipping charges.

Do not solely depend on TLC's Approval list for it may be outdated.

A second certificate of completion for a second State Agency \$50 processing fee.

All downloads are electronically tracked and monitored for security purposes.

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

Signature

Date

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

Additional certificate for another Agency – additional fee \$50

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

Cross-Connection CEU Course Answer Key

Name _____

Phone _____

*You are solely responsible in ensuring that this course is accepted 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? _____

Do not solely depend on TLC's Approval list for it may be outdated.

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.

1. A B C D E F

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150. A B C D E F

**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? _____

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.

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.

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.

The Assignment (Exam) is also available in Word on the Internet for your Convenience, please visit www.ABCTLC.com and download the assignment and e-mail it back to TLC.

You'll have 90 days from the start of this course to complete in order to receive your Professional Development Hours (**PDHs**) or Continuing Education Unit (**CEU**). A score of 70 % is necessary to pass this course. We prefer if this exam is proctored. No intentional trick questions. If you should need any assistance, please email all concerns and the completed manual to info@tlch2o.com.

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

1. Cross-Connection control 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 tasked 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 law is protection of the _____ of persons subject to such risks involving service to a single customer.
A. Internal or external piping
B. General public and the second is protection
C. Residential environment the pollutant source
D. Certainly not usually intentional
E. Certainly intentional
F. 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
B. Public and the second is protection
C. Residential environment the pollutant source
D. Certainly not usually intentional
E. Certainly intentional
F. None of the Above
5. Within a business environment, the pollutant source may involve the unintentional cross-connection of this condition with chemical processes or a heating boiler.
A. Direct piping D. Internal or external piping
B. Backflow E. Air break
C. Direct connection F. None of the Above

6. Which of the following may be an improper cross-connection with a landscape sprinkler system or reserve tank fire protection system?
- A. Internal or external piping
 - B. Public and the second is protection
 - C. Residential environment the pollutant source
 - D. Certainly not usually intentional
 - E. Indirect connection
 - F. None of the Above
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. Enforcement responsibility
 - B. Federal laws
 - C. State program regulations
 - D. Cross-Connection Control
 - E. Local level laws
 - F. None of the Above
8. 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. Backflow
 - C. Direct connection
 - D. Cross-Connection
 - E. Air break
 - F. None of the Above
9. Which of the following definition terms, also referred to as Cross-Connection Control, addresses a serious health issue?
- A. Direct piping
 - B. Backflow prevention
 - C. Direct connection
 - D. Cross-Connection
 - E. Water purveyor rules
 - F. None of the Above
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?
- A. With an air gap
 - B. Backwater
 - C. Without a direct connection
 - D. Involving a water well located on the property.
 - E. Air break
 - F. None of the Above
12. The proper control of cross-connections is possible but?
- A. Only through knowledge and vigilance
 - B. The key is public safety and the second is protection
 - C. Residential environment is always the pollutant source
 - D. Certainly not usually intentional
 - E. None of the Above
13. According to the text, 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 terms can have two forms-backpressure and backsiphonage?

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

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

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

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

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

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

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

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

19. _____ is a type of backflow caused by a downstream pressure that is greater than the upstream or supply pressure in a public water system or consumer's potable water system?

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

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

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

21. _____ is the means or mechanism to prevent backflow?

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

22. According to the text, basic means of preventing backflow is a(n) _____, which either eliminates a cross-connection or provides a barrier to backflow.

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

23. Which of the following terms 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. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Reductions
- F. None of the Above

24. _____ is any temporary or permanent connection between a public water system or consumer's potable water system and any source or system containing nonpotable water or other substances?

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

25. Which of the following terms is backflow caused by a negative pressure (i.e., a vacuum or partial vacuum) in a public water system or consumer's potable water system?

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

Hydraulics

26. Hydraulics is a branch of engineering concerned mainly with moving liquids.

- A. True
- B. False

27. Hydrostatics is based on the Greek word for water, and originally covered the study of the physical behavior of water at rest and in motion.

- A. True
- B. False

28. Hydraulics is applied commonly to the study of this missing term, other liquids, and even gases when the effects of compressibility are small.

- A. Fluids
- B. Hydrostatics
- C. Hydrokinetics
- D. Mechanical properties of water
- E. Flow
- F. None of the Above

29. Hydraulics can be divided into two areas, _____ and hydrokinetics.

- A. Fluids
- B. Hydrostatics
- C. Hydroceles
- D. Mechanical properties of water
- E. Flow
- F. None of the Above

30. Which of the following terms includes the behavior of all liquids, although it is primarily concerned with the motion of liquids?

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

31. _____ 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
- B. Hydrostatics
- C. Hydrokinetics
- D. Hydraulics
- E. Flow
- F. None of the Above

32. Which of the following terms includes the consideration of liquids at rest, involves problems of buoyancy and flotation?

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

33. _____ includes the study of liquids in motion, is concerned with such matters as friction and turbulence generated in pipes by flowing liquids.

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

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

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

35. _____ is an excellent example of deductive mathematical physics, and in which the predictions agree closely with experiment.

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

36. Which of the following terms states that a fluid is a substance that cannot resist a shearing stress, so that pressures are normal to confining surfaces?

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

37. 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

38. 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

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

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

40. If you were to ascend, the atmospheric pressure increases by approximately 1.0 psi for every 2,343 feet.
 A. True B. False
41. Which of the following terms that if you could be below, example- in excavations and depressions, atmospheric pressure increases?
 A. Static pressure D. Sea level
 B. Pressure E. Atmospheric pressure
 C. Gauge pressure F. None of the Above
42. The atmosphere is the entire mass of air that surrounds the earth.
 A. True B. False
43. _____ is the layer 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. Column D. Mass
 B. Troposphere E. Atmospheric pressure
 C. Sea level F. None of the Above
44. Pressures under water differ from those under air only because the weight of the water must be added to the _____ .
 A. Barometer D. Altitude
 B. Pressure(s) of the air E. Seal Level
 C. Height F. None of the Above
45. Which of the following terms can be measured by any of several methods, one method is the mercury column barometer?
 A. Static pressure D. Sea level
 B. Pressure E. Atmospheric pressure
 C. Gauge pressure F. None of the Above
46. At sea level and with 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
47. Which of the following terms could be measured with the aneroid barometer?
 A. Static pressure D. Sea level
 B. Pressure E. Atmospheric pressure
 C. Gauge pressure F. None of the Above
48. The atmospheric pressure does not vary uniformly with?
 A. Barometer D. Altitude
 B. Pressure(s) E. Equipment
 C. Weight F. None of the Above
49. Atmospheric pressure is defined as the force per unit area exerted against a surface by the _____ of the air above that surface.
 A. Barometer D. Altitude
 B. Pressure(s) E. Equipment
 C. Weight F. None of the Above

Barometric Loop

50. 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

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

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

52. 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

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

A. True B. False

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

A. True B. False

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

A. True B. False

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

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

57. _____ at sea level is 14.7 psia.

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

58. Which of the following terms is the total pressure?

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

59. 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

60. _____ would be equal to 14.7 psi, which is the atmospheric pressure,

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

Pressure

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

A. True B. False

62. Which of the following terms does water and air both possess; that is, layers of them slide very easily on one another?

- A. Low viscosity
- B. Atmospheric pressure
- C. Fluid(s)
- D. Volume
- E. Shearing force
- F. None of the Above

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

- A. Absolute pressure
- B. Atmospheric pressure
- C. Fluid(s)
- D. Volume
- E. Shearing force
- F. None of the Above

64. Both air and water are considered to be?

- A. Absolute pressure
- B. Atmospheric pressure
- C. Fluid(s)
- D. Volume
- E. Shearing force
- F. None of the Above

65. Which of the following terms does water possess but air does not?

- A. Absolute pressure
- B. Atmospheric pressure
- C. Fluid(s)
- D. Volume
- E. Shearing force
- F. None of the Above

66. _____ deals with permanent, time-independent states of fluids, so viscosity does not appear.

- A. Pascal's Principle
- B. Hydrostatics
- C. Acting on the body of the fluid
- D. Permanent forces tangential
- E. Area on which it is exerted
- F. None of the Above

67. 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

68. According to the text, a force is proportional to the _____, and is called a pressure.

- A. Pascal's Principle
- B. Hydrostatics
- C. Acting on the body of the fluid
- D. Permanent forces tangential
- E. Area on which it is exerted
- F. None of the Above

69. 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
- B. Hydrostatics
- C. Acting on the body of the fluid
- D. Permanent forces tangential
- E. Area on which it is exerted
- F. None of the Above

70. 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. Acting on the body of the fluid
- D. Permanent forces tangential
- E. Area on which it is exerted
- F. None of the Above

71. Which of the following terms 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. Pressure
- D. Displaced fluid
- E. Gravitation
- F. None of the Above

72. _____ is an example of a body force that disturbs the equality of pressure in a fluid.

- A. Axiom
- B. Gravitational body force
- C. Pressure
- D. Displaced fluid
- E. Gravitation
- F. None of the Above

73. When the barometric equation is integrated, we find the variation of pressure with?

- A. Height or depth
- B. Gravitational body force
- C. Pressure
- D. Displaced fluid
- E. Gravitation
- F. None of the Above

Free Surface Perpendicular to Gravity

74. 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. Gravitational body force
- C. Pressure
- D. Displaced fluid
- E. Gravitation
- F. None of the Above

Standard Atmospheric Pressure

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

- A. Barometer measurement
- B. Total vacuum
- C. Capillarity
- D. Partial vacuum measurement
- E. Manometer
- F. None of the Above

76. _____ uses a partially evacuated chamber of thin metal that expands and contracts according to the external pressure.

- A. Aneroid barometer
- B. Total vacuum
- C. Capillarity tube
- D. Partial vacuum
- E. Barometric loop
- F. None of the Above

Vacuum

77. The term vacuum indicates that the absolute pressure is less than the atmospheric pressure and that the _____ is negative.

- A. Static pressure
- B. Pressure
- C. Gauge pressure
- D. Total vacuum
- E. Atmospheric pressure
- F. None of the Above

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

- A. Static pressure
- B. Pressure
- C. Gauge pressure
- D. Total vacuum
- E. Atmospheric pressure
- F. None of the Above

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

- A. True
- B. False

80. Which of the following terms the pressure would range from slightly less than 14.7 psia to slightly greater than 0 psia?
- A. Static pressure
 - B. Pressure
 - C. Gauge pressure
 - D. Total vacuum
 - E. Partial vacuum
 - F. None of the Above

81. Backsiphonage results from _____ exerted on a liquid, forcing it toward a supply system that is under a vacuum.
- A. Static pressure
 - B. Pressure
 - C. Gauge pressure
 - D. Atmospheric pressure
 - E. Partial vacuum
 - F. None of the Above

Water Pressure

82. 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

Pressure and Force

83. Which of the following terms is the force that pushes water through pipes?
- A. Absolute pressure
 - B. Pressure
 - C. Fluid(s)
 - D. Volume
 - E. Shearing force
 - F. None of the Above
84. Water pressure determines the flow of water from the tap.
- A. True
 - B. False
85. Which of the following terms along with force are used extensively in the study of fluid power?
- A. Absolute pressure
 - B. Pressure
 - C. Fluid(s)
 - D. Volume
 - E. Shearing force
 - F. None of the Above
86. _____ means a total push or pull. It is the push or pull exerted against the total area of a particular surface.
- A. Absolute pressure
 - B. Pressure
 - C. Fluid(s)
 - D. Volume
 - E. Force
 - F. None of the Above
87. Which of the following terms means the amount of push or pull applied to each unit area of the surface?
- A. Absolute pressure
 - B. Pressure
 - C. Fluid(s)
 - D. Volume
 - E. Force
 - F. None of the Above
88. _____ maybe exerted in one direction, in several directions, or in all directions?
- A. Absolute pressure
 - B. Pressure
 - C. Fluid(s)
 - D. Volume
 - E. Force
 - F. None of the Above

Computing Force, Pressure, and Area

89. A formula is used in computing force, volume, and area in fluid power systems. In this formula, P refers to pressure, F indicates volume, and A represents area.

- A. True B. False

Development of Hydraulics

90. 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

91. Blaise Pascal, a French scientist, discovered the fundamental law for the science of?

- A. Pressure D. Force
B. Experiments E. Physics
C. Hydraulics F. None of the Above

92. Which of the following terms 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 D. Aristotle' law
B. Evangelista Torricelli E. Archimedes' law
C. Blaise Pascal F. None of the Above

93. Which of the following terms to be made effective for practical applications, it was necessary to have a piston that "fit exactly?"

- A. Pascal's law D. Aristotle' law
B. Evangelista Torricelli E. Archimedes' law
C. Blaise Pascal F. None of the Above

94. 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

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

- A. True B. False

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

- A. True B. False

97. The mercury column was held up by the pressure of horror vacui as Aristotle had supposed.

- A. True B. False

Pascal's Law

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

- A. True B. False

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

- A. True B. False

100. 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

101. Pressure in a _____ of direction.

- A. Modern hydraulics
- B. Liquid at a specific depth
- C. Liquid is independent
- D. Weight of a liquid
- E. Height of a liquid
- F. None of the Above

102. 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. Liquid is independent
- D. Weight of a liquid
- E. Height of a liquid
- F. None of the Above

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

- A. Depth is doubled
- B. Pressure will be less
- C. Pressure of a liquid
- D. Column is tripled
- E. Is equal
- F. None of the Above

104. The indicated pressure is doubled, when the?

- A. Depth is doubled
- B. Pressure will be less
- C. Pressure of a liquid
- D. Column is tripled
- E. Is equal
- F. None of the Above

105. 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 will be less
- C. Pressure of a liquid
- D. Liquid is equal to the weight
- E. Is equal
- F. None of the Above

106. Which of the following terms produces the pressure referred to as the fluid head of the liquid?

- A. Depth is doubled
- B. Pressure will be less
- C. Pressure of a liquid
- D. Volume of a liquid
- E. Is equal
- F. None of the Above

107. _____ is due to its fluid head is also dependent on the density of the liquid.

- A. Depth is doubled
- B. Pressure will be less
- C. Pressure of a liquid
- D. Volume of a liquid
- E. Is equal
- F. None of the Above

Static Pressure

108. Static pressure exists in addition to Gravity and may be present at the same time.

- A. True
- B. False

109. 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

110. 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
- B. Velocity of flow
- C. Volume of a liquid
- D. Speed
- E. Static head
- F. None of the Above

Volume and Velocity of Flow

111. 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. Friction head
- C. Volume of a liquid
- D. Velocity of flow
- E. Volume of flow
- F. None of the Above

112. _____ 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. Friction head
- C. Volume of a liquid
- D. Velocity of flow
- E. Volume of flow
- F. None of the Above

113. 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. Volume of a liquid
- D. Velocity of flow
- E. Volume of flow
- F. None of the Above

114. _____ is an important consideration in sizing the hydraulic lines.

- A. Pressure drop
- B. Friction head
- C. Volume of a liquid
- D. Velocity of flow
- E. Volume of flow
- F. None of the Above

115. 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

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. Backflow preventer
- C. Barrier to backflow
- D. Air gap
- E. Air break
- F. None of the Above

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

- A. Open receiving vessel
- B. Backflow preventer
- C. Barrier to backflow
- D. Air gap
- E. Air break
- F. None of the Above

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

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

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

- A. True
- B. False

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

- A. Open receiving vessel
- B. Backflow preventer
- C. Barrier to backflow
- D. Air gap
- E. Air break
- F. None of the Above

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. According to the text, air gap separations must 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. Backflow
- E. Depends
- F. None of the Above

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

- A. High hazard installations
- B. Backflow preventer
- C. Barrier to backflow
- D. Air gap
- E. Air break
- F. None of the Above

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

- A. High hazard installations
- B. Backflow preventer
- C. Barrier to backflow
- D. Low pollutional hazards
- E. High pollutional concerns
- F. None of the Above

Vacuum Breakers

125. _____ can have two types: atmospheric and pressure.

- A. Downstream piping
- B. Atmospheric vacuum breakers
- C. Vacuum breaker(s)
- D. Hazard application(s)
- E. Backflow preventor(s)
- F. 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. Valve assembly
- B. Test cocks
- C. Air inlet valve
- D. Internally weighted
- E. Shut offs
- F. None of the Above

127. The devices must be installed above the highest _____.

- A. Downstream piping
- B. Atmospheric vacuum breakers
- C. Vacuum breakers
- D. Hazard applications
- E. Mountain
- F. None of the Above

128. Which of the following terms contains a float check, a check seat, and an air inlet port?

- A. Double check
- B. Atmospheric vacuum breaker
- C. Breaker(s)
- D. RP
- E. Backflow preventor(s)
- F. 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 zero or below.

A. True B. False

134. Which of the following terms is not internally loaded?

A. Air inlet valve D. Test cock
B. Check valve E. Atmospheric vacuum breakers
C. Device F. 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 terms are designed to prevent backflow caused by backsiphonage only from low health hazards?

A. Downstream piping D. Hazard application(s)
B. Atmospheric vacuum breakers E. Backflow preventor(s)
C. RPs F. 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 12 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 D. In a pit
B. Accessible location E. Is maintained at a lower pressure
C. Above the ground F. None of the Above

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

- A. In a Confined space D. In a pit
B. Accessible location E. Above the highest downstream outlet
C. Above the ground F. 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