

Registration form

BACKFLOW AWARENESS CEU TRAINING COURSE \$150.00
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

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# _____ **Class/Grade** _____

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

Water Treatment _____ Distribution _____ Collection _____ Wastewater Treatment _____
Pump Installer _____ CSI _____ AWWA Backflow _____ Other _____

Your certificate will be mailed to you in about two weeks.

Technical Learning College
Western Campus
PO Box 420, Payson AZ 85547-0420
(928) 468-0665 Fax (928) 272-0747 Toll Free (866) 557-1746

Discover card _____ **CCV code card** _____
American Express
Master Card / Visa Card # _____ **Exp. Date** _____

If you've paid on the Internet, please write your Customer # _____

We will stop mailing the certificate of completion so we need your or 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 also understand that this type of study program deals with dangerous conditions and that I will not hold Technical Learning College, Technical Learning Consultants, Inc. (TLC) liable for any errors or omissions or advice contained in this CEU education training course or for any violation or injury caused by this CEU education training course material.

I will 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. 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.

Check here to see if the course is was approved in your State, TLC does not guarantee if the course is accepted for credit because States change their rules. Look under Links for State Approval Listing

State Approval Listing URL...

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

You can obtain a printed version from TLC for an additional \$79.95 plus shipping charges.

AFFIDAVIT OF EXAM COMPLETION

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

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. TCEQ rules and decisions change frequently. (512) 239-4482 or (512) 239-0178.

Signature _____

There are no intention trick questions in the assignment.

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

**Backflow Awareness 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? _____

What would you do to improve the course?

How about the price of the course?

Poor ____ Fair ____ Average ____ Good ____ Great ____

How was your customer service?

Poor ____ Fair ____ Average ____ Good ____ Great ____

Any other concerns or comments.

Backflow Awareness CEU Course Answer Key

Name _____ Telephone # _____

Please select one answer. You can Bold, Circle, Underline or X your answer.

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| 4. A B C D E | 45. A B C D E | 86. A B C D E |
| 5. A B C D E | 46. A B C D E | 87. A B C D E |
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| 13. A B C D E | 54. A B C D E | 95. A B C D E |
| 14. A B C D E | 55. A B C D E | 96. A B C D E |
| 15. A B C D E | 56. A B C D E | 97. A B C D E |
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| 25. A B C D E | 66. A B C D E | 107. A B C D E |
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| 28. A B C D E | 69. A B C D E | 110. A B C D E |
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| 30. A B C D E | 71. A B C D E | 112. A B C D E |
| 31. A B C D E | 72. A B C D E | 113. A B C D E |
| 32. A B C D E | 73. A B C D E | 114. A B C D E |
| 33. A B C D E | 74. A B C D E | 115. A B C D E |
| 34. A B C D E | 75. A B C D E | 116. A B C D E |
| 35. A B C D E | 76. A B C D E | 117. A B C D E |
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You are finished, please fax or e-mail your assignment and registration page. Call us to ensure we received the assignment. Fax (928) 272-0747

BACKFLOW AWARENESS 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 70 % 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. You can find online assistance for this course on the in the Search function on Adobe Acrobat PDF to help find the answers.

Please include your name and address on your Answer Sheet.

One answer per question.

Backflow Introduction

1. Such _____ as adopted 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 level
 - C. State program regulations
 - D. None of the Above

2. The official definition of a _____ is "the link or channel connecting a source of pollution with a potable water supply."
 - A. Enforcement responsibility
 - B. Federal level
 - C. Program regulations
 - D. Cross-Connection
 - E. None of the Above

3. Backflow prevention, also referred to as _____, addresses a serious health issue.
 - A. Enforcement responsibility
 - B. Federal level
 - C. Program regulations
 - D. Cross-Connection Control
 - E. None of the Above

4. The above issue was addressed on the _____ by passage of the "Federal Safe Drinking Water Act" as developed by the Environmental Protection Agency (E.P.A.).
 - A. Enforcement responsibility
 - B. Federal level
 - C. Program regulations
 - D. Cross-Connection Control
 - E. None of the Above

5. This Act tasked each state with primary _____ for a program to assure access to safe drinking water by all citizens.
 - A. Enforcement responsibility
 - B. Federal level
 - C. Program regulations
 - D. Cross-Connection Control
 - E. None of the Above

6. There are two distinct levels of concern with this issue. The first is protection of the general _____ of persons subject to such risks involving service to a single customer, be that customer an individual residence or business.
- Internal or external piping
 - Public and the second is protection
 - Residential environment the pollutant source
 - Certainly not usually intentional
 - None of the Above
7. Sources of pollution which may result in a danger to health are not always obvious and such cross-connections are _____. They are usually the result of oversight or a non-professional installation.
- Internal or external piping
 - Public and the second is protection
 - Residential environment the pollutant source
 - Certainly not usually intentional
 - None of the Above
8. As source examples, within a business environment the pollutant source may involve the unintentional cross-connection of _____ with chemical processes or a heating boiler.
- Internal or external piping
 - Public and the second is protection
 - Residential environment the pollutant source
 - Certainly not usually intentional
 - None of the Above
9. In a _____ may be an improper cross-connection with a landscape sprinkler system or reserve tank fire protection system.
- Internal or external piping
 - Public and the second is protection
 - Residential environment the pollutant source
 - Certainly not usually intentional
 - None of the Above
10. A _____ a garden hose nozzle submerged in a bucket of liquid or attached to a chemical sprayer.
- Situation as simple as leaving
 - Public and the second is protection
 - Residential environment the pollutant source
 - Certainly not usually intentional
 - None of the Above
11. Another potential hazard source within any environment may be a cross-connection of piping _____ on the property.
- Involving a water well located
 - Public and the second is protection
 - Residential environment the pollutant source
 - Certainly not usually intentional
 - None of the Above
12. There are many other potential sources of pollutant hazards. Control of cross-connections is possible but _____.
- Only through knowledge and vigilance
 - Public and the second is protection
 - Residential environment the pollutant source
 - Certainly not usually intentional
 - None of the Above

13. Public education is essential, for _____ in piping and plumbing installations fail to recognize cross-connection dangers.
- A. Many that are educated
 - B. Public and the second is protection
 - C. Residential environment the pollutant source
 - D. Certainly not usually intentional
 - E. None of the Above

Hydraulics

14. Definition: Hydraulics is a branch of engineering concerned mainly with moving liquids. The term is applied commonly to the study of the _____, other liquids, and even gases when the effects of compressibility are small.

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

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

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

16. Hydraulics: The Engineering science pertaining to liquid _____ and flow.

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

17. The word _____ 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. Hydraulics
- B. Hydrostatics
- C. Hydrokinetics
- D. Mechanical properties of water
- E. None of the Above

18. Use of the word _____ has broadened its meaning to include the behavior of all liquids, although it is primarily concerned with the motion of liquids.

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

19. Hydraulics includes the manner in which _____ in tanks and pipes, deals with their properties, and explores ways to take advantage of these properties.

- A. Hydraulics
- B. Liquids act
- C. Hydrokinetics
- D. Pressure
- E. None of the Above

20. _____, the consideration of liquids at rest, involves problems of buoyancy and flotation, pressure on dams and submerged devices, and hydraulic presses. The relative incompressibility of liquids is one of its basic principles.
- A. Hydraulics
 - B. Hydrostatics
 - C. Hydrokinetics
 - D. Pressure
 - E. None of the Above
21. _____, the study of liquids in motion, is concerned with such matters as friction and turbulence generated in pipes by flowing liquids, the flow of water over weirs and through nozzles, and the use of hydraulic pressure in machinery.
- A. Hydrodynamics
 - B. Hydrostatics
 - C. Hydrokinetics
 - D. Pressure
 - E. None of the Above
22. _____ is about the pressures exerted by a fluid at rest. Any fluid is meant, not just water.
- A. Hydrodynamics
 - B. Hydrostatics
 - C. Hydrokinetics
 - D. Pressure
 - E. None of the Above
23. _____ is an excellent example of deductive mathematical physics, one that can be understood easily and completely from a very few fundamentals, and in which the predictions agree closely with experiment.
- A. Hydrodynamics
 - B. Hydrostatics
 - C. Hydrokinetics
 - D. Pressure
 - E. None of the Above
24. Although time is not a factor in _____, it enters in the approach to hydrostatic equilibrium. It is usually stated that a fluid is a substance that cannot resist a shearing stress, so that pressures are normal to confining surfaces.
- A. Hydrodynamics
 - B. Hydrostatics
 - C. Hydrokinetics
 - D. Pressure
 - E. None of the Above
25. _____ has now shown us clearly that there are substances which can resist shearing forces over short time intervals, and appear to be typical solids, but which flow like liquids over long time intervals.
- A. Hydrodynamics
 - B. Hydrostatics
 - C. Hydrokinetics
 - D. Pressure
 - E. None of the Above

Atmospheric Pressure

26. The atmosphere is the entire _____ of air that surrounds the earth.

- A. Column
- B. Troposphere
- C. Sea level
- D. Mass
- E. None of the Above

27. While the atmosphere 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. This layer is called the _____.

- A. Column
- B. Troposphere
- C. Sea level
- D. Mass
- E. None of the Above

28. If a column of air 1-inch square extending all the way to the "_____" of the atmosphere could be weighed, this column of air would weigh approximately 14.7 pounds at sea level.

- A. Troposphere
- B. Sea level
- C. Mass
- D. Column
- E. None of the Above

29. Atmospheric pressure at _____ is approximately 14.7 psi.

- A. Column
- B. Troposphere
- C. Sea level
- D. Mass
- E. None of the Above

30. As one ascends, the _____ decreases by approximately 1.0 psi for every 2,343 feet.

- A. Atmospheric pressure
- B. Sea level
- C. Mass
- D. Column
- E. None of the Above

31. Below _____, in excavations and depressions, atmospheric pressure increases.

- A. Troposphere
- B. Sea level
- C. Mass
- D. Column
- E. None of the Above

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

- A. Barometer
- B. Pressure(s)
- C. Height
- D. Altitude
- E. None of the Above

33. Atmospheric pressure can be measured by any of several methods. The common laboratory method uses the mercury _____ barometer.
- A. Barometer
 - B. Pressure(s)
 - C. Height
 - D. Altitude
 - E. None of the Above
34. The _____ of the mercury column serves as an indicator of atmospheric pressure. At sea level and at a temperature of 0° Celsius (C), the height of the mercury column is approximately 30 inches, or 76 centimeters. This represents a pressure of approximately 14.7 psi.
- A. Barometer
 - B. Pressure(s)
 - C. Height
 - D. Altitude
 - E. None of the Above
35. Another device used to measure atmospheric pressure is the aneroid _____.
- A. Barometer
 - B. Pressure(s)
 - C. Height
 - D. Altitude
 - E. None of the Above
36. The aneroid _____ uses the change in shape of an evacuated metal cell to measure variations in atmospheric pressure.
- A. Barometer
 - B. Pressure(s)
 - C. Height
 - D. Altitude
 - E. None of the Above
37. The thin metal of the aneroid cell moves in or out with the variation of pressure on its external surface. This movement is transmitted through a system of levers to a pointer, which indicates the _____.
- A. Barometer
 - B. Pressure(s)
 - C. Height
 - D. Altitude
 - E. None of the Above
38. The atmospheric pressure does not vary uniformly with _____. It changes very rapidly.
- A. Barometer
 - B. Pressure(s)
 - C. Height
 - D. Altitude
 - E. None of the Above
39. Atmospheric pressure is defined as the force per unit area exerted against a surface by the _____ of the air above that surface.
- A. Barometer
 - B. Pressure(s)
 - C. Weight
 - D. Altitude
 - E. None of the Above

Barometric Loop

40. The barometric loop consists of a continuous section of supply piping that abruptly rises to a height of approximately 35 feet and _____ to the originating level.

- A. Will not rise
- B. That effectively protects
- C. Then returns back down
- D. None of the Above

41. The barometric loop is a loop in the piping system _____ against backsiphonage.

- A. Then returns back down
- B. Referred to using
- C. Will not rise
- D. That effectively protects
- E. None of the Above

42. The barometric loop _____ to protect against back-pressure.

- A. Will not rise
- B. That effectively protects
- C. May not be used
- D. Referred to using
- E. None of the Above

43. Its operation, in the protection against backsiphonage, is based upon the principle that a water column, at sea level pressure, _____ above 33.9 feet. In general, barometric loops are locally fabricated, and are 35 feet high.

- A. Then returns back down
- B. Referred to using
- C. Will not rise
- D. That effectively protects
- E. None of the Above

44. Pressure may be _____ an absolute scale, pounds per square inch absolute (psia), or gauge scale, (psiag).

- A. Then returns back down
- B. Referred to using
- C. Will not rise
- D. That effectively protects
- E. None of the Above

45. Absolute pressure and gauge pressure _____. Absolute pressure is equal to gauge pressure plus the atmospheric pressure.

- A. Then returns back down
- B. Referred to using
- C. Are related
- D. That effectively protects
- E. None of the Above

46. At sea level, the _____ is 14.7 psai.

- A. Absolute pressure
- B. Fluid
- C. Volume
- D. Atmospheric pressure
- E. None of the Above

47. _____ is the total pressure.

- A. Absolute pressure
- B. Atmospheric pressure
- C. Fluid
- D. Volume
- E. None of the Above

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

- A. Absolute pressure
- B. Atmospheric pressure
- C. Fluid
- D. Volume
- E. None of the Above

Pressure

49. By a _____, we have a material in mind like water or air, two very common and important fluids.

- A. Absolute pressure
- B. Fluid
- C. Volume
- D. Atmospheric pressure
- E. None of the Above

50. Water is incompressible, while air is very compressible, but both are _____.

- A. Absolute pressure
- B. Atmospheric pressure
- C. Fluid
- D. Volume
- E. None of the Above

51. Water has a definite _____; air does not.

- A. Absolute pressure
- B. Fluid
- C. Volume
- D. Atmospheric pressure
- E. None of the Above

52. Water and air have _____; that is, layers of them slide very easily on one another, and they quickly assume their permanent shapes when disturbed by rapid flows.

- A. Absolute pressure
- B. Fluid
- C. Atmospheric pressure
- D. Volume
- E. None of the Above

53. Other fluids, such as molasses, may have high viscosity and take a long time to come to equilibrium, but they are no less _____.

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

54. The coefficient of viscosity is the ratio of the _____ to the velocity gradient.
- A. Absolute pressure
 - B. Fluid
 - C. Volume
 - D. Shearing force
 - E. None of the Above
55. _____ 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. None of the Above
56. A fluid, therefore, is a substance that cannot exert any _____ to a boundary. Any force that it exerts on a boundary must be normal to the boundary.
- A. Pascal's Principle
 - B. Hydrostatics
 - C. Acting on the body of the fluid
 - D. Permanent forces tangential
 - E. None of the Above
57. A force is proportional to the _____, and is called a pressure.
- A. Pascal's Principle
 - B. Hydrostatics
 - C. Area on which it is exerted
 - D. Permanent forces tangential
 - E. None of the Above
58. In order for any small element of 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 _____, the pressure must be the same at all neighboring points.
- A. Pascal's Principle
 - B. Acting on the body of the fluid
 - C. Permanent forces tangential
 - D. Hydrostatics
 - E. None of the Above
59. 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. Acting on the body of the fluid
 - C. Permanent forces tangential
 - D. Hydrostatics
 - E. None of the Above
60. The _____ that if a certain volume of fluid were somehow made solid, the equilibrium of forces would not be disturbed is useful in reasoning about forces in fluids.
- A. Axiom
 - B. Gravitational body force
 - C. Pressure
 - D. Displaced fluid
 - E. None of the Above

61. _____ is an example of a body force that disturbs the equality of pressure in a fluid. The presence of the gravitational body force causes the pressure to increase with depth.

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

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

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

Free Surface Perpendicular to Gravity

63. It is easy to prove Archimedes's Principle that the buoyant force is equal to the weight of the displaced fluid, and passes through the center of mass of this _____.

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

Standard Atmospheric Pressure

64. It is convenient to measure pressure differences by measuring the height of liquid columns, a practice known as _____.

- A. Axiom
- B. Gravitational body force
- C. Pressure
- D. Manometry
- E. None of the Above

65. The _____ is a familiar example of this, and atmospheric pressures are traditionally given in terms of the length of a mercury column.

- A. Barometer
- B. Total vacuum
- C. Capillarity if the tube
- D. Partial vacuum
- E. None of the Above

66. To make a _____, the barometric tube, closed at one end, is filled with mercury and then inverted and placed in a mercury reservoir.

- A. Barometer
- B. Total vacuum
- C. Capillarity if the tube
- D. Partial vacuum
- E. None of the Above

67. Corrections must be made for temperature, because the density of mercury depends on the temperature, and the brass scale expands for _____ is less than about 1 cm in diameter, and even slightly for altitude, since the value of g changes with altitude.

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

68. An _____ 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 if the tube
 - D. Partial vacuum
 - E. None of the Above

Vacuum

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

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

70. A complete or _____ would mean a pressure of 0 psia or -14.7 psig.

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

71. It is impossible to produce a _____, the term vacuum, as used in this document, will mean all degrees of partial vacuum.

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

72. In a _____, the pressure would range from slightly less than 14.7 psia (0 psig) to slightly greater than 0 psia (-14.7 psig).

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

73. Backsiphonage results from _____ exerted on a liquid, forcing it toward a supply system that is under a vacuum.

- A. Aneroid barometer
- B. Partial vacuum
- C. Total vacuum
- D. Atmospheric pressure
- E. None of the Above

Water Pressure

74. The _____ 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.

- A. Friction
- B. Weight
- C. Pressure(s)
- D. Siphon
- E. None of the Above

75. _____ are very frequently stated in terms of the height of a fluid.
- A. Friction
 - B. Weight
 - C. Pressure(s)
 - D. Siphon
 - E. None of the Above
76. Water with a pressure head of 10 ft can _____ as an equal amount of water raised by 10 ft.
- A. Friction
 - B. Pressure(s)
 - C. Siphon
 - D. Weight
 - E. None of the Above
77. Water flowing in a pipe is subject to head loss because of _____.
- A. Friction
 - B. Pressure(s)
 - C. Siphon
 - D. Weight
 - E. None of the Above
78. Another application of pressure is the _____. The name is Greek for the tube that was used for drawing wine from a cask.
- A. Friction
 - B. Pressure(s)
 - C. Siphon
 - D. Weight
 - E. None of the Above
79. When a _____ goes below the free water levels, it is called an inverted siphon. If the levels in the two basins are not equal, fluid flows from the basin with the higher level into the one with the lower level, until the levels are equal.
- A. Friction
 - B. Pressure(s)
 - C. Siphon
 - D. Weight
 - E. None of the Above
80. A _____ can be made by filling the tube, closing the ends, and then putting the ends under the surface on both sides. Alternatively, the tube can be placed in one fluid and filled by sucking on it.
- A. Friction
 - B. Pressure(s)
 - C. Siphon
 - D. Weight
 - E. None of the Above
81. Differences in elevation are usually too great to use regular _____ to cross hills, so the fluids must be pressurized by pumps so the pressure does not fall to zero at the crests.
- A. Friction
 - B. Pressure(s)
 - C. Siphon
 - D. Weight
 - E. None of the Above

Pressure and Force

82. Pressure is the _____ that pushes water through pipes. Water pressure determines the flow of water from the tap. If pressure is not sufficient then the flow can reduce to a trickle and it will take a long time to fill a kettle or a cistern.

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

83. The terms force and _____ are used extensively in the study of fluid power. It is essential that we distinguish between the terms.

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

84. _____ means a total push or pull. It is the push or pull exerted against the total area of a particular surface and is expressed in pounds or grams.

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

85. _____ means the amount of push or pull (force) applied to each unit area of the surface and is expressed in pounds per square inch (lb/in^2) or grams per square centimeter (gm/cm^2).

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

86. _____ maybe exerted in one direction, in several directions, or in all directions.

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

Computing Force, Pressure, and Area

87. A formula is used in computing force, pressure, and area in fluid power systems. In this formula, P refers to pressure, F indicates force, and A represents area. _____ equals pressure times area.

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

Development of Hydraulics

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

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

89. During the same period, Blaise Pascal, a French scientist, discovered the fundamental law for the science of _____.
- A. Pressure
 - B. Experiments
 - C. Hydraulics
 - D. Force
 - E. None of the Above

The next 10 questions you can use the full name to answer the question...

90. _____ 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
- B. Evangelista Torricelli
- C. Blaise Pascal
- D. Aristotle
- E. None of the Above

91. For _____ to be made effective for practical applications, it was necessary to have a piston that "fit exactly."

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

92. Since that time, _____, pumps, actuating cylinders, and motors have been developed and refined to make hydraulics one of the leading methods of transmitting power.

- A. Evangelista Torricelli
- B. Blaise Pascal
- C. Aristotle
- D. Otto von Guericke
- E. None of the Above

93. Another _____ is the tendency to keep its free surface level. If the surface is not level, liquids will flow in the direction which will tend to make the surface level.

- A. Evangelista Torricelli
- B. Blaise Pascal
- C. Aristotle
- D. Otto von Guericke
- E. None of the Above

94. _____, Galileo's student and secretary, and a member of the Florentine Academy of Experiments, invented the mercury barometer in 1643, and brought the weight of the atmosphere to light.

- A. Evangelista Torricelli
- B. Blaise Pascal
- C. Aristotle
- D. Otto von Guericke
- E. None of the Above

95. The mercury column was held up by the pressure of the atmosphere, not by horror vacui as Aristotle had supposed. Torricelli's early death was a blow to science, but his ideas were furthered by _____.

- A. Aristotle
- B. Otto von Guericke
- C. Evangelista Torricelli
- D. Blaise Pascal
- E. None of the Above

96. _____ had a barometer carried up the 1465 m high Puy de Dôme, an extinct volcano in the Auvergne just west of his home of Clermont-Ferrand in 1648 by Périer, his brother-in-law.
- A. Aristotle
 - B. Otto von Guericke
 - C. Evangelista Torricelli
 - D. Blaise Pascal
 - E. None of the Above
97. _____ experimentum crucis is one of the triumphs of early modern science. The Puy de Dôme is not the highest peak in the Massif Central--the Puy de Sancy, at 1866 m is, but it was the closest. Clermont is now the centre of the French pneumatics industry.
- A. Aristotle
 - B. Otto von Guericke
 - C. Evangelista Torricelli
 - D. Blaise Pascal
 - E. None of the Above
98. The remarkable _____, Burgomeister of Magdeburg, Saxony, took up the cause, making the first vacuum pump, which he used in vivid demonstrations of the pressure of the atmosphere to the Imperial Diet at Regensburg in 1654.
- A. Aristotle
 - B. Otto von Guericke
 - C. Evangelista Torricelli
 - D. Blaise Pascal
 - E. None of the Above
99. Famously, he evacuated a sphere consisting of two well-fitting hemispheres about a foot in diameter, and showed that _____, 8 on each side, could not pull them apart.
- A. Aristotle
 - B. Otto von Guericke
 - C. Evangelista Torricelli
 - D. Blaise Pascal
 - E. None of the Above
100. _____ demonstrated that the siphon worked by atmospheric pressure, not by horror vacui. The two beakers of mercury are connected by a three-way tube, with the upper branch open to the atmosphere.
- A. Aristotle
 - B. Otto von Guericke
 - C. Evangelista Torricelli
 - D. Blaise Pascal
 - E. None of the Above
101. The fluid in question here is air, which is by no means incompressible. As we rise in the atmosphere and the _____ decreases, the air also expands.
- A. Stratosphere
 - B. Tropopause
 - C. Atmosphere
 - D. Pressure
 - E. None of the Above
102. This quantity gives the rough scale of the decrease of _____ with height.
- A. Stratosphere
 - B. Tropopause
 - C. Atmosphere
 - D. Pressure
 - E. None of the Above

103. The real _____ is by no means isothermal close to the ground, but cools with height nearly linearly at about 6.5°C/km up to an altitude of about 11 km at middle latitudes, called the tropopause.

- A. Stratosphere
- B. Tropopause
- C. Atmosphere
- D. Atmospheric pressure
- E. None of the Above

104. Above this is a region of nearly constant temperature, the _____, and then at some higher level the atmosphere warms again to near its value at the surface.

- A. Stratosphere
- B. Tropopause
- C. Atmosphere
- D. Atmospheric pressure
- E. None of the Above

Meteorology

105. The _____ is of great importance in meteorology, since it determines the winds, which generally move at right angles to the direction of most rapid change of pressure, that is, along the isobars, which are contours of constant pressure.

- A. Stratosphere
- B. Tropopause
- C. Barometric pressure
- D. Atmospheric pressure
- E. None of the Above

106. Certain typical weather patterns are associated with relatively high and relatively low _____, and how they vary with time.

- A. Stratosphere
- B. Tropopause
- C. Pressures
- D. Atmospheric pressure
- E. None of the Above

107. The _____ may be given in popular weather forecasts, though few people know what to do with it.

- A. Stratosphere
- B. Tropopause
- C. Barometric pressure
- D. Atmospheric pressure
- E. None of the Above

108. The _____ quoted in the news are reduced to sea level by standard formulas that amount to assuming that there is a column of air from your feet to sea level with a certain temperature distribution, and adding the weight of this column to the actual barometric pressure.

- A. Stratosphere
- B. Tropopause
- C. Barometric pressure
- D. None of the Above

Pascal's Law

109. The foundation of _____ was established when Pascal discovered that pressure in a fluid acts equally in all directions.

- A. Modern hydraulics
- B. Liquid at a specific depth
- C. Liquid is independent
- D. None of the Above

110. This pressure acts at right angles to the containing surfaces. If some type of pressure gauge, with an exposed face, is placed beneath the surface of a _____ and pointed in different directions, the pressure will read the same.

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

111. We can say that pressure in a _____ of direction.

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

112. 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. None of the Above

113. 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. None of the Above

114. When the _____, the indicated pressure is doubled. Thus the pressure in a liquid is directly proportional to the depth.

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

115. Since there are 144 square inches in 1 square foot, this can be stated as follows: the weight of a column of water 1 foot high, having a cross-sectional area of 1 square inch, is 0.433 pound. If the depth of the _____, the weight of the column will be 3×0.433 , or 1.299 pounds, and the pressure at the bottom will be 1.299 lb/in^2 (psi), since pressure equals the force divided by the area.

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

116. Thus, the pressure at any depth in a _____ 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. Liquid is equal to the weight
- C. Pressure of a liquid
- D. Column is tripled
- E. None of the Above

117. The _____ that produces the pressure is referred to as the fluid head of the liquid.

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

118. The _____ 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. Column is tripled
- E. None of the Above

Gravity

119. Gravity is one of the four forces of nature. The strength of the gravitational force between two objects depends on their _____.

- A. Gravity
- B. Directions
- C. Masses
- D. Force
- E. None of the Above

120. The more _____ the objects are, the stronger the gravitational attraction.

- A. Gravity
- B. Directions
- C. Massive
- D. Force
- E. None of the Above

121. When you pour water out of a container, the earth's _____ pulls the water towards the ground.

- A. Gravity
- B. Directions
- C. Masses
- D. Force
- E. None of the Above

122. _____, applied forces, and atmospheric pressure are static factors that apply equally to fluids at rest or in motion, while inertia and friction are dynamic factors that apply only to fluids in motion.

- A. Gravity
- B. Directions
- C. Masses
- D. Force
- E. None of the Above

123. The mathematical sum of _____, applied force, and atmospheric pressure is the static pressure obtained at any one point in a fluid at any given time.

- A. Gravity
- B. Directions
- C. Masses
- D. Force
- E. None of the Above

Static Pressure

124. Static pressure exists in addition to any _____ that may also be present at the same time.

- A. Gravity
- B. Directions
- C. Masses
- D. Force
- E. None of the Above

125. Pascal's law states that a pressure set up in a fluid acts equally in all _____ and at right angles to the containing surfaces. This covers the situation only for fluids at rest or practically at rest. It is true only for the factors making up static head.

- A. Gravity
- B. Directions
- C. Masses
- D. Force
- E. None of the Above

126. When velocity becomes a factor it must have a direction, and as previously explained, 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. Gravity
- B. Fluid power
- C. Masses
- D. Force
- E. None of the Above

127. 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. Gravity
- B. Directions
- C. Friction head
- D. Force
- E. None of the Above

128. _____, which can be produced by pressure or head when dealing with fluids, is necessary to start a body moving if it is at rest, and is present in some form when the motion of the body is arrested.

- A. Gravity
- B. Directions
- C. Masses
- D. Force
- E. None of the Above

Volume and Velocity of Flow

129. The _____ passing a point in a given time is known as its volume of flow or flow rate.

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

130. The _____ 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. Velocity of flow
- C. Volume of flow
- D. Speed
- E. None of the Above

131. The _____ or velocity of the fluid 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. Velocity of flow
- C. Volume of flow
- D. Speed
- E. None of the Above

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

- A. Pressure drop
- B. Velocity of flow
- C. Volume of flow
- D. Speed
- E. None of the Above

133. Volume and _____ are often considered together. With other conditions unaltered—that is, with volume of input unchanged—the velocity of flow increases as the cross section or size of the pipe decreases, and the velocity of flow decreases as the cross section increases.

- A. Pressure drop
- B. Velocity of flow
- C. Volume of flow
- D. Speed
- E. None of the Above

Bernoulli's Principle

134. 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 _____, and conversely, if an increase (decrease) in, the speed of the fluid results in a decrease (or increase) in the pressure.

- A. Pressure drop
- B. Velocity of flow
- C. Volume of flow
- D. Speed
- E. None of the Above

135. 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 _____ inside the curtain (relative to the still air on the other side) causes a pressure drop.

- A. Pressure
- B. Velocity
- C. Volume of flow
- D. Speed
- E. None of the Above

136. The _____ difference between the outside and inside causes a net force on the shower curtain which sucks it inward.

- A. Pressure
- B. Velocity of flow
- C. Volume of flow
- D. Speed
- E. None of the Above

137. A more useful example is provided by the functioning of a perfume bottle: squeezing the bulb over the fluid creates a low _____ area due to the higher speed of the air, which subsequently draws the fluid up.

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

138. _____ also tells us why windows tend to explode, rather than implode in hurricanes: the very high speed of the air just outside the window causes the pressure just outside to be much less than the pressure inside, where the air is still.

- A. Venturi
- B. Bernoulli's principle
- C. Velocity changes
- D. Conservation of energy
- E. None of the Above

139. The difference in force pushes the windows outward, and hence they explode. If you know that a hurricane is coming it is therefore better to open as many windows as possible, to equalize the _____.

- A. Venturi
- B. Bernoulli's principle
- C. Velocity changes
- D. Conservation of energy
- E. None of the Above

140. Another example of _____ at work is in the lift of aircraft wings and the motion of "curve balls" in baseball. In both cases the design is such as to create a speed differential of the flowing air past the object on the top and the bottom.

- A. Venturi
- B. Bernoulli's principle
- C. Velocity changes
- D. Conservation of energy
- E. None of the Above

Understanding the Venturi

141. It is not easy to understand the reason low pressure occurs in the small diameter area of the venturi. This explanation may seem to help the _____.

- A. Venturi
- B. Principle
- C. Velocity changes
- D. Conservation of energy
- E. None of the Above

142. It is clear that all the flow must pass from the _____ to the smaller section.

- A. Venturi
- B. Bernoulli's principle
- C. Velocity changes
- D. Conservation of energy
- E. None of the Above

143. In other words, the _____ will remain the same in the large and small portions of the tube.

- A. Venturi
- B. Bernoulli's principle
- C. Velocity changes
- D. Conservation of energy
- E. None of the Above

144. The flow rate is the same rate, but the _____. The velocity is greater in the small portion of the tube.

- A. Venturi
- B. Bernoulli's principle
- C. Velocity changes
- D. Conservation of energy
- E. None of the Above

145. There is a relationship between the pressure energy and the _____ energy; if velocity increases the pressure energy must decrease.

- A. Venturi
- B. Bernoulli's principle
- C. Velocity
- D. Conservation of energy
- E. None of the Above

146. This is known as the principle of _____ at work which is also Bernoulli's law.

- A. Venturi
- B. Bernoulli's principle
- C. Velocity changes
- D. Conservation of energy
- E. None of the Above

147. Pressure and _____ energies behave in the same way. In the large part of the pipe the pressure is high and velocity is low, in the small part, pressure is low and velocity high.

- A. Venturi
- B. Bernoulli's principle
- C. Velocity
- D. Conservation of energy
- E. None of the Above

148. 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. None of the Above

149. There are two types of backflow--_____ and backsiphonage.

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

150. A _____ is any temporary or permanent connection between a public water system or consumer's potable (i.e., drinking) water system and any source or system containing nonpotable water or other substances.

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

151. _____ 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. None of the Above

152. _____ can occur when there is a stoppage of water supply due to nearby fire fighting, a break in a water main, etc.

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

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

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

154. _____ (i.e., downstream pressure that is greater than the potable water supply pressure) 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. None of the Above

155. _____ in potable water supply pressure occur whenever the amount of water being used exceeds the amount of water being supplied, such as during water line flushing, fire fighting, or breaks in water mains.

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

156. A _____ is a means or mechanism to prevent backflow.

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

157. Basic means of preventing backflow is an _____, 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. None of the Above

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

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

159. 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. Air gap
- C. Backflow preventer
- D. Backflow
- E. None of the Above

Types of Backflow Prevention Methods and Assemblies

160. _____ 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. None of the Above

161. The type of device selected for a _____ on several factors.

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

162. The _____ must be assessed.

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

163. An _____ 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. High hazard installations
- B. Backflow preventer
- C. Barrier to backflow
- D. Approved air gap
- E. None of the Above

164. These air gap separations must be vertically orientated a distance of at least twice the inside diameter of the _____, but never less than one inch.

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

165. 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. None of the Above

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

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

167. A building where the air pressure is artificially increased above atmospheric, such as a sports stadium with a flexible roof kept in place by air blowers, the _____ separation must be increased.

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

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

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

169. The _____ must be at least two times the diameter of the supply pipe and not less than one inch.

- A. High hazard installations
- B. Air gap
- C. Backflow preventer
- D. None of the Above

170. This type of protection is acceptable for _____ and is theoretically the most effective protection.

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

171. However, this method of prevention can be circumvented if the _____ is extended.

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

Vacuum Breakers

172. There are two types of _____, atmospheric and pressure.

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

173. The difference between the two types them is that the pressure _____ is spring loaded to assist the device's opening.

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

174. Both devices open the pipeline to atmosphere in the event of backsiphonage only. Neither _____ is approved for backpressure conditions.

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

175. Both devices are only suitable for low _____. Their primary purpose is to protect the water system from cross connections due to submerged inlets, such as irrigation systems and tank applications.

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

176. Shutoff valves may not be installed _____ of atmospheric vacuum breakers but are allowed on pressure vacuum breakers.

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

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

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

178. Atmospheric Vacuum Breaker (AVB) contains a float check (_____), a check seat, and an air inlet port.

- A. Air inlet
- B. Atmospheric vacuum breakers
- C. Device
- D. Hazard applications
- E. None of the Above

179. The _____ allows air to enter the water line when the line pressure is reduced to a gauge pressure of zero or below.

- A. Air inlet
- B. Atmospheric vacuum breakers
- C. Device
- D. Hazard applications
- E. None of the Above

180. The _____ valve is not internally loaded.

- A. Air inlet
- B. Atmospheric vacuum breakers
- C. Device
- D. Hazard applications
- E. None of the Above

181. To prevent the _____ from sticking closed, the device must not be installed on the pressure side of a shutoff valve, or wherever it may be under constant pressure more than 12 hours during a 24 hour period.

- A. Air inlet
- B. Atmospheric vacuum breakers
- C. Device
- D. Hazard applications
- E. None of the Above

182. _____ are designed to prevent backflow caused by backsiphonage only from low health hazards.

- A. Air inlet
- B. Atmospheric vacuum breakers
- C. Device
- D. Hazard applications
- E. None of the Above

183. _____ Uses: Irrigation systems, commercial dishwasher and laundry equipment, chemical tanks and laboratory sinks (backsiphonage only, nonpressurized connections.)

- A. Air inlet
- B. Atmospheric vacuum breakers
- C. Device
- D. Hazard applications
- E. None of the Above

184. Pressure Vacuum Breaker Assembly (PVB) consists of a spring loaded check valve, an independently operating air inlet valve, two resilient seated shutoff valves, and two properly located resilient seated _____. It shall be installed as a unit as shipped by the manufacturer.

- A. Valve assembly
- B. Test cocks
- C. Air inlet valve
- D. Internally weighted
- E. None of the Above

185. The _____ is internally loaded to the open position, normally by means of a spring, allowing installation of the assembly on the pressure side of a shutoff valve.

- A. Valve assembly
- B. Test cocks
- C. Air inlet valve
- D. Internally weighted
- E. None of the Above

186. The PVB needs to be installed 12 inches above the _____ to work correctly.

- A. Valve assembly
- B. Test cocks
- C. Air inlet valve
- D. Internally weighted
- E. None of the Above

187. 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 _____.

- A. Valve assembly
- B. Test cocks
- C. Air inlet valve
- D. Internally weighted
- E. None of the Above

188. The double check _____ is designed to prevent backflow caused by backpressure and backsiphonage from low health hazards or pollutional concerns only.

- A. Valve assembly
- B. Test cocks
- C. Air inlet valve
- D. None of the Above

189. The double check valve should be installed in an _____ and protected from freezing.

- A. Spring loaded
- B. Accessible location
- C. Above the ground
- D. None of the Above

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

- A. Spring loaded
- B. Is maintained at a lower pressure
- C. Above the ground
- D. None of the Above

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

- A. Spring loaded
- B. Accessible location
- C. Is maintained at a lower pressure
- D. Above the ground
- E. None of the Above

192. During normal operation, the pressure between the two check valves, referred to as the zone of reduced pressure, _____ than the supply pressure.

- A. Spring loaded
- B. Accessible location
- C. Is maintained at a lower pressure
- D. Above the ground
- E. None of the Above

193. 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 _____ between the two check valves by discharging water to atmosphere.

- A. Zone
- B. Reduced pressure backflow assembly or RP
- C. Backpressure and backsiphonage
- D. Air gaps
- E. None of the Above

194. The _____ is designed to prevent backflow caused by backpressure and backsiphonage from low to high health hazards. The RP needs to be installed 12 inches above the ground for testing purposes only.

- A. Reduced pressure zone port
- B. Reduced pressure backflow assembly or RP
- C. Backpressure and backsiphonage
- D. Air gaps
- E. None of the Above

195. The _____ consists of two internally loaded (weighted or spring loaded) check valves separated by a reduced pressure zone with a relief port to vent water to the atmosphere.

- A. Reduced pressure zone port
- B. Reduced pressure backflow assembly or RP
- C. Backpressure and backsiphonage
- D. Air gaps
- E. None of the Above

196. The _____ device can be used for high hazard situations under both backpressure and backsiphonage conditions. Under normal conditions, the second check valve should prevent backflow.

- A. Reduced pressure zone port
- B. Reduced pressure
- C. Backpressure and backsiphonage
- D. Air gaps
- E. None of the Above

197. If the second check valve fails or becomes fouled and backflow into the reduced pressure zone occurs, the relief port vents the _____ to atmosphere.

- A. Reduced pressure zone port
- B. Reduced pressure backflow assembly or RP
- C. Backflow
- D. Air gaps
- E. None of the Above

198. The _____ opens anytime pressure in the zone comes within 2 psi of the supply pressure.

- A. Reduced pressure zone port
- B. Reduced pressure backflow assembly or RP
- C. Backpressure and backsiphonage
- D. Air gaps
- E. None of the Above

Why do Backflow Preventors have to be Tested Periodically?

199. Mechanical backflow preventors have internal _____ that are subject to fouling, wear, or fatigue.

- A. Reduced pressure zone port
- B. Reduced pressure backflow assembly or RP
- C. Backpressure and backsiphonage
- D. Air gaps
- E. None of the Above

200. Mechanical backflow preventors and _____ can be bypassed.

- A. Reduced pressure zone port
- B. Reduced pressure backflow assembly or RP
- C. Backpressure and backsiphonage
- D. Air gaps
- E. None of the Above

Confined Space and Excavation Section

201. This term means a device which provides adequate protection from falling or collapsing earth loads.

- A. Buried Structures
- B. Shielding
- C. Sheeting
- D. Shoring
- E. None of the Above

202. This term means the main method of stabilizing and supporting a trench wall to prevent cave-ins. It consists of uprights, stingers and braces.

- A. Trench box
- B. Shielding
- C. Sheeting
- D. Shoring
- E. None of the Above

203. This term means manholes, junction boxes or catch basins beneath the ground or any other installations that may be encountered during trenching.

- A. Buried Structures
- B. Utilizes
- C. Utilities
- D. Blue stake
- E. None of the Above

204. This term means a limited or restricted means of entry or exit, is large enough for an employee to enter and perform assigned work, and is not designed for continuous occupancy by the employee. These spaces may include, but not limited to, underground vaults, tanks, storage bins, pits, and diked areas, vessels, and silos.

- A. Restricted space
- B. Difficult to enter space
- C. Trench
- D. Confined Space
- E. None of the Above

205. This term means a ditch cut around the work site to keep water from entering the trench.

- A. Diversion Ditches
- B. Dewatering system
- C. Pumper
- D. None of the Above

206. This term means one that meets the definition of a confined space and has one or more of these characteristics: (1) contains or has potential to contain a hazardous atmosphere, (2) contains a material that has the potential for engulfing an entrant, (3) has an internal configuration that might cause an entrant to be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section, and/or (4) contains any other recognized serious safety or health hazards.

- A. Wales
- B. Personal Protective Equipment
- C. Trench box
- D. Permit Required Confined Space
- E. None of the Above

207. This term means: safety goggles and glasses, reflective clothing, work gloves, hard hat, safety shoes, rubber boots, earplugs or protectors, face shield and face mask or respirator.

- A. Class B suit
- B. Personal Protective Equipment
- C. Class C suit
- D. Class A suit
- E. None of the Above

208. This term means a person who is registered as a professional engineer in the state where the work is to be performed.

- A. Civil engineer
- B. Civil servant
- C. Registered Professional Engineer
- D. Construction manager
- E. None of the Above

209. This term means empty spaces between particles of rocks.

- A. Spaces
- B. Gaps
- C. Zones
- D. Voids
- E. None of the Above

210. This term means parts of a shoring system. They are positioned horizontally and help to brace vertical beams and supports. Wales can be fastened to studs with nails, clips or brackets.

- A. Wales
- B. Personal Protective Equipment
- C. Registered Professional Engineer
- D. Voids
- E. None of the Above

211. This term means the relative strength and capacity of walls of a trench.

- A. Wales
- B. Personal Protective Equipment
- C. Registered Professional Engineer
- D. Voids
- E. None of the above

212. This term means pumps, pipe or channel used to drain off rain or groundwater from inside the trench.

- A. Dewater
- B. Pump
- C. Swell
- D. Dry dock
- E. None of the above

213. This term means any man-made cut, cavity trench or depression in an earth surface, formed by earth removal.

- A. Fissure
- B. Excavation
- C. Trench
- D. Cave-in
- E. None of the above

214. This term means a long narrow opening or crack in the rock or soil. Fissures are often a sign of trench wall failure.

- A. Fissure
- B. Cave-in
- C. Drilling
- D. Swelling
- E. None of the above

215. This term means Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.

- A. Handy work
- B. Electrical work
- C. Servicing and/or maintenance
- D. Setting up
- E. None of the above

216. This term means any work performed to prepare a machine or equipment to perform its normal production operation.

- A. Calibrating
- B. Adjusting
- C. Servicing and/or maintenance
- D. Setting up
- E. None of the above

217. This term means the placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

- A. Lock
- B. Tagout
- C. Tagout device
- D. None of the above

218. This term means a prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

- A. Fissure
- B. Excavation
- C. Servicing and/or maintenance
- D. Setting up
- E. None of the above

219. This term means the type C soil with small, loose grains of disintegrated rock.

- A. Sand
- B. Rock
- C. Soil
- D. Dirt
- E. None of the above

220. This term means granular soil with enough silt and clay to make it slightly cohesive

- A. Sand
- B. Rock
- C. Soil
- D. Dirt
- E. None of the above

221. This term means any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

- A. Energy
- B. Kinetic
- C. Magnetic
- D. Hot tap
- E. None of the above

222. This term means a procedure used in the repair, maintenance and services activities which involves welding on a piece of equipment (pipelines, vessels or tanks) under pressure, in order to install connections or appurtenances. it is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

- A. Hot work
- B. Tagout
- C. Tagout device
- D. Hot tap
- E. None of the above

223. This term means the placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

- A. Lockout
- B. Tagout
- C. Tagout device
- D. None of the Above

224. This term means a device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

- A. Lockout device
- B. Tagout
- C. Tagout device
- D. None of the Above

225. This term means the utilization of a machine or equipment to perform its intended production function.

- A. Lockout device
- B. Tagout
- C. Tagout device
- D. Normal production operations
- E. None of the above

226. This term means soil which contains fine particles and is very smooth.

- A. Silty Clay
- B. Silt
- C. Sloping
- D. Sloughing
- E. None of the above

227. This term means a plastic soil that will appear rough or broken when rubbed over the thumb and finger.

- A. Silty Clay
- B. Silt
- C. Sloping
- D. Sloughing
- E. None of the above

228. This term means the process of cutting back the sides of a trench to avoid a cave-in.

- A. Silty Clay
- B. Silt
- C. Sloping
- D. Sloughing
- E. None of the above

229. This term means when loose soil begins to run in from the lower part of the wall into the excavation. It is the first step to a wall collapse.

- A. Silty Clay
- B. Cave-in
- C. Sloping
- D. Sloughing
- E. None of the above

230. This term means visible warning barriers that keep vehicles and pedestrians from entering a construction site.

- A. Construction zone
- B. Upright signage
- C. Stop sign
- D. Barricades
- E. None of the above

231. This term means devices that hold or fasten two or more parts together or in place. Braces are diagonal or horizontal. They may be made of wood or metal.

- A. Uprights
- B. T square
- C. Sloping
- D. Braces
- E. None of the above

232. This term means a system of braces which applies pressure against trench walls to stabilize them. A bracing system is part of a trench shoring system used to prevent trench walls from collapsing.

- A. Saturation
- B. Bracing System
- C. Benching
- D. Bulge
- E. None of the above

233. This term means a method of cutting back the sides of a trench into horizontal steps to prevent cave-ins.

- A. Saturation
- B. Bracing System
- C. Benching
- D. Bulge
- E. None of the above

234. This term means an outward swelling in the soil of a trench may be a warning sign of trench failure.

- A. Saturation
- B. Bracing System
- C. Benching
- D. Bulge
- E. None of the above

235. This term means the process of a soil being filled to capacity with moisture.

- A. Saturation
- B. Bracing System
- C. Benching
- D. Bulge
- E. None of the above

236. This term means a system of classifying soils and rock deposits. Soil must be classified by a qualified person as: Stable rock, Type-A, Type-B, Type-C.

- A. Type-A Soil
- B. Soil Type
- C. Spoil Pile/Spoilage
- D. Classification
- E. None of the above

237. This term means when a soil begins to crack or flake due to pressure, or from moisture from within the trench.

- A. Saturation
- B. Bracing System
- C. Benching
- D. Spall
- E. None of the above

238. This term means rock waste, banks and dumps from the excavation.

- A. Type-A Soil
- B. Soil Type
- C. Spoil Pile/Spoilage
- D. Dirt
- E. None of the above

239. This term means part of a shoring system which helps to bear the weight of braces and other parts of the shoring system.

- A. Trench box
- B. Soil system
- C. Spoil Pile/Spoilage
- D. Supports
- E. None of the above

240. This term means a prefabricated moveable box usually constructed of metal plates welded to a heavy steel frame. The box is moved along as work progresses. It is able to withstand the forces imposed on it by a cave-in and thereby protects trench workers.

- A. Type-A Soil
- B. Soil Type
- C. Spoil Pile/Spoilage
- D. Trench Box
- E. None of the above

241. This term means the most stable and cohesive type of soil while working at a trench site. Examples are clay, silty clay and hardpan.

- A. Type-A Soil
- B. Type-B Soil
- C. Spoil Pile/Spoilage
- D. Clay
- E. None of the above

242. This term means this soil is next to the most stable soil. Silt, silt loam, sandy loam, medium clay and unstable rock would be good examples of Type-B soils.

- A. Type-A Soil
- B. Type-B Soil
- C. Type-C Soil
- D. Compressible soil
- E. None of the above

243. This term means the least stable type of soil. Examples of Type-C soils are gravel, loamy sand, soft clay, submerged silt and heavy unstable rock.

- A. Type-A Soil
- B. Type-B Soil
- C. Type-C Soil
- D. Gravel
- E. None of the above

244. This term means through a variety of tests, a soil's strength is found. The unconfined compressive strength is the soil's measure of bearing capacity and shearing resistance. Measured as the amount of weight per square foot needed to collapse a soil sample.

- A. Type-A Soil
- B. Type-B Soil
- C. Type-C Soil
- D. Wettness
- E. None of the above

245. This term means vertical members of a trench shoring system placed in contact with the earth. These members usually are not placed in direct contact with one another.

- A. Wales
- B. V Supports
- C. T supports
- D. Uprights
- E. None of the above

246. This term means when a soil or excavation site trembles and shakes rapidly due to forces such as loud noises or heavy equipment or traffic.

- A. Swelling
- B. Vibration
- C. Movement
- D. Spillage
- E. None of the above

247. This term means particles that once were large rocks, but have been broken down through time and the effects of weathering. The size of the grain of a soil determines the stability and cohesiveness of a soil. The larger the grain, the more unstable the soil.

- A. Stones
- B. Sandy rock
- C. Grain
- D. Gravel
- E. None of the above

248. This term means a loose mixture of pebbles and rock fragments, which is coarser than sand.

- A. Mud balls
- B. Grain
- C. Grainy Sand
- D. Gravel
- E. None of the above

249. This term means a layer of hard subsoil or clay that does not allow water in. _____ is classified as a Type A soil.

- A. Hardpan
- B. Type A
- C. Type B
- D. Gravel
- E. None of the above

250. This term means the swelling of a soil.

- A. Hardpan
- B. Compression
- C. Wetting
- D. Pumping
- E. None of the above

Special Notice to Help the Less Fortunate



Kavi and the believers in his church prayed fervently and lifted up praise to God before digging the well.

We here in the U.S. have it very good. Here is a story of and drilling a well just to have drinking water in India.

Kavi Viresh was accustomed to rejection. A Gospel for Asia missionary, Kavi knew he was laboring in hard soil in his village in Andhra Pradesh, India and the spiritual drought experienced by its people was worse than the physical drought they suffered in the summers. The people of this village lived hard lives focused on daily survival, and most did not have faith in any god.

By God's grace, Kavi has seen a church planted there—and believers who are eager to help him with outreach. Still, the hearts of many in the village have remained hard. Kavi has suffered beatings several times for sharing the Good News of Jesus. One time, a group of 30 people came to his house to attack him. The Gospel tracts he handed out were torn into pieces on many occasions.

"People told me, 'Your God is a great God.'"

But Kavi knew the people weren't really rejecting *him*—they were rejecting *Jesus* who sent him. And he knew there just had to be some way to get through to these people whom Jesus loved so much. That way turned out to be a Jesus Well. Before the Jesus Well was dug in this village, the people's only source of water was one government-built water tank that was not nearly enough to meet their basic needs. Kavi knew the Jesus Well would be a tangible way to show the villagers that Jesus loved them.

Sudhir Rao, a new Christian in the village, gladly provided his services as a mason to help with construction. The digging of the Jesus Well was in itself a miracle. Others had attempted to dig a well in the village but not seen water even at depths of 300 feet. So when Kavi saw water at around 100 feet, villagers were amazed.

"People told me, 'Your God is a great God,'" Kavi recalls. Even the village leader expressed heartfelt appreciation to Kavi for providing his people with water—and that he desired to see another well dug in a nearby area. Although the well was just dug in recent months, Kavi has already seen God wash away barriers in the villagers' hearts through its refreshing waters. Hearts have been brought that much closer to being able to receive the message of hope in Christ. And he has a vision of faith for how God will continue to work. "Through this Jesus Well, surely those who have beaten me and are against me will come to know the Lord Jesus," Kavi shared.

For more information, we welcome you to visit...

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