Registration form

DISTRIBUTION BASICS II CEU TRAINING COURSE $200.00

48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL $40.00

Start and finish dates:_____
You will have 90 days from this date in order to complete this course

Name_____**Signature**_____
(This will appear on your certificate as above)

Address:_____

City_____**State**_____**Zip**_____**Email**_____

Phone:
Home ( )_____**Work ( )**_____**Fax ( )**_____

Operator ID #_____**Expiration Date**_____

Class/Grade_____

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

Water Treatment Water Distribution Wastewater Collection Wastewater Treatment

Plumbing Driller Pump Installer Other _____

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

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

Name

Phone Number

Address

Please circle or X

1.	A B C D E	46.	A B C D E	91.	A B C D E	136.	A B C D E
2.	A B C D E	47.	A B C D E	92.	A B C D E	137.	A B C D E
3.	A B C D E	48.	A B C D E	93.	A B C D E	138.	A B C D E
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9.	A B C D E	54.	A B C D E	99.	A B C D E	144.	A B C D E
10.	A B C D E	55.	A B C D E	100.	A B C D E	145.	A B C D E
11.	A B C D E	56.	A B C D E	101.	A B C D E	146.	A B C D E
12.	A B C D E	57.	A B C D E	102.	A B C D E	147.	A B C D E
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17.	A B C D E	62.	A B C D E	107.	A B C D E	152.	A B C D E
18.	A B C D E	63.	A B C D E	108.	A B C D E	153.	A B C D E
19.	A B C D E	64.	A B C D E	109.	A B C D E	154.	A B C D E
20.	A B C D E	65.	A B C D E	110.	A B C D E	155.	A B C D E
21.	A B C D E	66.	A B C D E	111.	A B C D E	156.	A B C D E
22.	A B C D E	67.	A B C D E	112.	A B C D E	157.	A B C D E
23.	A B C D E	68.	A B C D E	113.	A B C D E	158.	A B C D E
24.	A B C D E	69.	A B C D E	114.	A B C D E	159.	A B C D E
25.	A B C D E	70.	A B C D E	115.	A B C D E	160.	A B C D E
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28.	A B C D E	73.	A B C D E	118.	A B C D E	163.	A B C D E
29.	A B C D E	74.	A B C D E	119.	A B C D E	164.	A B C D E
30.	A B C D E	75.	A B C D E	120.	A B C D E	165.	A B C D E
31.	A B C D E	76.	A B C D E	121.	A B C D E	166.	A B C D E
32.	A B C D E	77.	A B C D E	122.	A B C D E	167.	A B C D E
33.	A B C D E	78.	A B C D E	123.	A B C D E	168.	A B C D E
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35.	A B C D E	80.	A B C D E	125.	A B C D E	170.	A B C D E
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38.	A B C D E	83.	A B C D E	128.	A B C D E	173.	A B C D E
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300. A B C D E

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

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 serve handling fee of $40.00. 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.

Thank you…

Please mail or fax this with your final exam

Distribution Basics II CEU Training Course

CUSTOMER SERVICE RESPONSE CARD

DATE: _____

NAME:_____

ADDRESS:_____

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?_____

5. What would you do to improve the Course?

_____

_____

_____

_____

Any other concerns or comments.

_____

_____

Distribution Basics II CEU Training Course Assignment

You will have 90 days in order to successfully complete this assignment with a score of 70% or better. If you need any assistance, please contact TLC's Student Services. Once you are finished, please, e-mail or fax your answer sheet along with your registration form.

Please use Answer key.

Contaminated Wells

1. Contaminated wells used for drinking water are especially dangerous. _____ can be tested to see what chemicals may be in the well and if they are present in dangerous quantities.
A. Unsaturated zone
B. Wells
C. Water table
D. Aquifers
E. None of the Above

2. _____ is withdrawn from wells to provide water for everything from drinking water for the home and business to water to irrigate crops to industrial processing water.
A. Unsaturated zone
B. Wells
C. Groundwater
D. Aquifers
E. None of the Above

3. When water is pumped from the ground, the dynamics of _____ flow change in response to this withdrawal.
A. Unsaturated zone
B. Wells
C. Water table
D. Groundwater
E. None of the Above

4. Groundwater flows slowly through water-bearing formations (_____) at different rates. In some places, where groundwater has dissolved limestone to form caverns and large openings, its rate of flow can be relatively fast, but this is exceptional.
A. Unsaturated zone
B. Wells
C. Water table
D. Aquifers
E. None of the Above

5. Many terms are used to describe the nature and extent of the groundwater resource. The level below which all the spaces are filled with water is called the _____.
A. Unsaturated zone
B. Wells
C. Water table
D. Aquifers
E. None of the Above

6. Above the water table lies the _____. Here the spaces in the rock and soil contain both air and water. Water in this zone is called soil moisture.
A. Unsaturated zone
B. Wells
C. Water table
D. Aquifers
E. None of the Above

7. The entire region below the water table is called the saturated zone and water in this saturated zone is called _____.
A. Unsaturated zone
B. Wells
C. Groundwater
D. Aquifers
E. None of the Above

8. _____ aquifers are rocks in which the groundwater moves through cracks, joints or fractures in otherwise solid rock.
A. Limestone terrain
B. Karst
C. Fractured
D. Aquifers
E. None of the Above

9. Examples of _____ aquifers include granite and basalt.
A. Limestone terrain
B. Karst
C. Fractured
D. Aquifers
E. None of the Above

10. Limestones are often fractured aquifers, but here the cracks and _____may be enlarged by solution, forming large channels or even caverns.
A. Limestone terrain
B. Karst
C. Fractures
D. Aquifers
E. None of the Above

11. Limestone terrain where solution has been very active is termed _____.
A. Limestone terrain
B. Karst
C. Fractured
D. Aquifers

12. Porous media such as sandstone may become so highly cemented or recrystalized that all of the _____is filled. In this case, the rock is no longer a porous medium.
A. Limestone terrain
B. Karst
C. Fractured
D. Aquifers
E. None of the Above

13. If it contains _____ it can still act as a fractured aquifer.
A. Limestone terrain
B. Karst
C. Fractured
D. Aquifers
E. None of the Above

14. Most of the _____ of importance to us are unconsolidated porous media such as sand and gravel.
A. Groundwater
B. Aquifers
C. Unconfined aquifers
D. Not permeable
E. None of the Above

15. Some very porous materials are _____. Clay, for instance, has many spaces between its grains, but the spaces are not large enough to permit free movement of water.
A. Groundwater
B. Aquifers
C. Unconfined aquifers
D. Not permeable
E. None of the Above

16. _____ usually flows downhill with the slope of the water table. Like surface water, groundwater flows toward, and eventually drains into, streams, rivers, lakes and the oceans.
A. Groundwater
B. Aquifers
C. Unconfined aquifers
D. Not permeable
E. None of the Above

17. Groundwater flow in the _____ underlying surface drainage basins, however, does not always mirror the flow of water on the surface.
A. Groundwater
B. Aquifers
C. Unconfined aquifers
D. Not permeable
E. None of the Above

18. Therefore, _____ may move in different directions below the ground than the water flowing on the surface.
A. Groundwater
B. Aquifers
C. Unconfined aquifers
D. Not permeable
E. None of the Above

19. _____are those that are bounded by the water table.
A. Groundwater
B. Aquifers
C. Unconfined aquifers
D. Not permeable
E. None of the Above

20. Some aquifers, however, lie beneath layers of impermeable materials. These are called confined aquifers, or sometimes _____.
A. Groundwater
B. Aquifers
C. Artesian aquifer
D. Artesian well
E. None of the Above

21. A well in such an aquifer is called an _____. The water in these wells rises higher than the top of the aquifer because of confining pressure.
A. Groundwater
B. Aquifers
C. Artesian aquifer
D. Artesian well
E. None of the Above

22. If the water level rises above the ground surface a flowing _____occurs.
A. Groundwater
B. Aquifers
C. Artesian aquifer
D. Artesian well
E. None of the Above

23. The piezometric surface is the level to which the water in an _____will rise.
A. Groundwater
B. Aquifers
C. Artesian aquifer
D. Artesian well
E. None of the Above

24. When pumping begins, water begins to flow towards the well in contrast to the natural direction of _____ movement.
A. Groundwater
B. Aquifers
C. Artesian aquifer
D. Artesian well
E. None of the Above

25. The water level in the well falls below the water table in the surrounding aquifer. As a result, water begins to move from the _____ into the well.
A. Groundwater
B. Aquifer
C. Cone of depression
D. Artesian well
E. None of the Above

26. As pumping continues, the water level in the well continues to increase until the rate of flow into the _____ equals the rate of withdrawal from pumping.
A. Groundwater
B. Aquifer
C. Artesian aquifer
D. Drawdown
E. None of the Above

27. The movement of water from an aquifer into a well results in the formation of a _____.
A. Groundwater
B. Aquifer
C. Artesian aquifer
D. Drawdown
E. None of the Above

28. The _____describes a three-dimensional inverted cone surrounding the well that represents the volume of water removed as a result of pumping.
A. Groundwater
B. Aquifer
C. Artesian aquifer
D. Drawdown
E. None of the Above

29. _____ is the vertical drop in the height between the water level in the well prior to pumping and the water level in the well during pumping.
A. Groundwater
B. Aquifer
C. Artesian aquifer
D. Drawdown
E. None of the Above

30. When a well is installed in an unconfined aquifer, water moves from the _____ into the well through small holes or slits in the well casing or, in some types of wells, through the open bottom of the well.
A. Groundwater
B. Aquifer
C. Artesian aquifer
D. Drawdown
E. None of the Above

31. The level of the water in the well is the same as the water level in the _____. Groundwater continues to flow through and around the well in one direction in response to gravity.
A. Groundwater
B. Aquifer
C. Artesian aquifer
D. Drawdown
E. None of the Above

32. The quantity of water _____varies from 50 to 500 gallons per person per day.
A. Be capable of meeting consumers' needs
B. Represent a rather significant
C. Used in any community
D. Design assumption is to use
E. None of the Above

33. A common _____from 100 to 150 gallons per person per day for average domestic use.
A. Be capable of meeting consumers' needs
B. Represent a rather significant
C. Used in any community
D. Design assumption is to use
E. None of the Above

34. The maximum daily use is approximately 2 to 3 times the average daily use. Maximum daily use is usually encountered during the summer months and _____ on irrigation practices.
A. Be capable of meeting consumers' needs
B. Can vary widely depending
C. Used in any community
D. Design assumption is to use
E. None of the Above

35. Water system demand comes from a number of sources including residential, commercial, industrial and public consumers as well as some unavoidable loss and waste. If fire protection is desired, that could also _____ (although not continuous) demand upon the system.
A. Be capable of meeting consumers' needs
B. Represent a rather significant
C. Used in any community
D. Design assumption is to use
E. None of the Above

36. The combination of storage reservoirs and distribution lines must be _____for quality, quantity and pressure at all times.
A. Be capable of meeting consumers' needs
B. Represent a rather significant
C. Used in any community
D. Design assumption is to use
E. None of the Above

Water Pressure

37. For ordinary domestic use, water pressure should be between ____ and 45 psi.
A. 20
B. 25
C. 75
D. 2.31
E. None of the Above

38. A minimum of 60 psi at a fire hydrant is usually adequate, since that allows for up to ____ psi pressure drop in fire hoses.
A. 20
B. 25
C. 75
D. 2.31
E. None of the Above

39. In commercial and industrial districts, it may be common to have ____ psi or higher.
A. 20
B. 25
C. 75
D. 2.31
E. None of the Above

40. _____ is considered the minimum required at any point in the water system, so that backflow and infiltration is prevented.
A. 20
B. 25
C. 75
D. 2.31
E. None of the Above

41. Pressure is provided by the direct force of the water (such as water from a pump), or by the height of the water (such as a storage reservoir). ____feet of water is equal to 1 psi, or 1 foot of water is equal to about a half a pound (.433 pounds to be exact).
A. 20
B. 25
C. 75
D. 2.31
E. None of the Above

42. The cost of supplying water to the users of any water system includes the installation of ____ and distribution facilities.
A. Joints
B. Facilities
C. Source
D. Foreign material
E. None of the Above

43. There are _____ associated with cleaning, repairing and replacing these facilities.
A. Joints
B. Facilities
C. Source
D. Foreign material
E. None of the Above

44. The distribution system must also protect water quality between the _____ and the customer's tap.
A. Joints
B. Facilities
C. Source
D. Foreign material
E. None of the Above

45. _____is important in maintaining system integrity. Care must be taken that no foreign material is introduced into the system during pipe laying operations.
A. Joints
B. Facilities
C. Proper construction
D. Foreign material
E. None of the Above

46. _____should be covered at the end of the work day or during interruptions of construction.
A. Joints
B. Facilities
C. Pipe ends
D. Foreign material
E. None of the Above

47. All pipes, joints and fittings should be pressure tested and disinfected with a 5% chlorine solution such as _____before backfilling.
A. Joints
B. Facilities
C. Source
D. Foreign material
E. None of the Above

Water Storage Facilities
48. _____ and tanks vary in size, shape, and application.
A. Energy
B. Water storage facilities
C. Release
D. Tanks
E. None of the Above

49. There are different types that are used in the water distribution systems, such as stand pipes, _____ and reservoirs, hydropneumatic tanks and surge tanks.
A. Energy
B. Water Hammer
C. Elevated tanks
D. Tanks
E. None of the Above

50. These tanks serve _____ in the distribution system. Just the name alone can give you an idea of its purpose.
A. Energy
B. Water Hammer
C. Multiple purposes
D. Tanks
E. None of the Above

51. What really causes water main breaks - _____ - when released in a confined space, such as a water distribution system.
A. Energy
B. Water Hammer
C. Release
D. Tanks
E. None of the Above

52. _____are created when hydrants, valves, or pumps are opened and closed quickly, trapping the kinetic energy of moving water within the confined space of a piping system.
A. Energy
B. Water Hammer
C. Release
D. Shock waves
E. None of the Above

53. These _____can create a turbulence that travels at the speed of sound, seeking a point of release.
A. Energy
B. Water Hammer
C. Release
D. Shock waves
E. None of the Above

54. The release the surge usually finds is an elevated tank, but the surge doesn't always find this _____ quickly enough.
A. Energy
B. Water Hammer
C. Release
D. Shock waves
E. None of the Above

55. Something has to give, and oftentimes, it's your pipe fittings. Distribution operators are aware of this phenomenon! It's called _____.
A. Energy
B. Water Hammer
C. Release
D. Shock waves
E. None of the Above

56. This banging can be heard as _____.
A. Energy
B. Water Hammer
C. Release
D. Shock waves
E. None of the Above

57. The definition of '_____' is a reverse flow condition that causes water or mixtures of water and other liquids, gases, or substances to flow back into the distribution system.
A. Backflow
B. Reverse
C. Relief valve
D. Maximum time period
E. None of the Above

58. To _____ the natural and normal directional flow of a liquid, gases, or solid substances back in to the public potable (drinking) water supply. This is normally an undesirable effect.
A. Backflow
B. Reverse
C. Relief valve
D. Maximum time period
E. None of the Above

59. The difference between a reduced pressure principle backflow device and a double check backflow device is that RP has a _____.
A. Backflow
B. Reverse
C. Relief valve
D. Maximum time period
E. None of the Above

60. 1 year is the _____between having a backflow device tested by a certified backflow tester.
A. Backflow
B. Reverse
C. Relief valve
D. Maximum time period
E. None of the Above

61. A _____should not be used for water storage.
A. Cross-connection
B. Surge tank
C. Volume of storage
D. Meet the fluctuations
E. None of the Above

62. The goal of the water tower or stand pipe is to store water high in the air, where it has lots of gravitational potential energy. This _____to pressure potential energy or kinetic energy for delivery to homes.
A. Cross-connection
B. Stored energy can be converted
C. Volume of storage
D. Meet the fluctuations
E. None of the Above

63. Since height is everything, _____ a cylindrical water tower is inefficient. Most of the water is then near the ground. By making the tower wider near the top, it puts most of its water high up.
A. Cross-connection
B. Building
C. Volume of storage
D. Meet the fluctuations
E. None of the Above

64. Storage reservoirs allow the system to _____in demand.
A. Cross-connection
B. Flow by gravity
C. Volume of storage
D. Meet the fluctuations
E. None of the Above

65. It is recommended that the _____be equal to from one to three days of the system's average daily use.
A. Cross-connection
B. Flow by gravity
C. Volume of storage
D. Meet the fluctuations
E. None of the Above

66. It is also recommended that storage reservoirs be located at a high enough elevation to allow the water to _____to the distribution system.
A. Cross-connection
B. Flow by gravity
C. Volume of storage
D. Meet the fluctuations
E. None of the Above

67. This, coupled with restricted usage on the part of the consumers, should provide an uninterrupted water supply in the event of pump failure, loss of power or an acute contamination event or _____.
A. Cross-connection
B. Flow by gravity
C. Volume of storage
D. Meet the fluctuations
E. None of the Above

68._____ are also used as detention basins to provide the required chlorine contact time necessary to ensure adequate disinfection.
A. Cathodic protection
B. Repainted
C. Reservoirs
D. Baffles
E. None of the Above

69. As such, the contact time in a reservoir is greatly improved when the reservoir is constructed with a _____, preferably located on opposite sides of the reservoir and at different levels.
A. Cathodic protection
B. Repainted
C. Separate inlet and outlet pipe
D. Baffles
E. None of the Above

70. Also, _____ inside the reservoir (walls, curtains, or spirals) increase the contact time by preventing the water from leaving the reservoir too quickly (known as “short-circuiting”).
A. Cathodic protection
B. Repainted
C. Steel reservoirs
D. Baffles
E. None of the Above

71. _____or tanks generally have lower construction and installation costs than concrete, but require more maintenance.
A. Cathodic protection
B. Repainted
C. Steel reservoirs
D. Baffles
E. None of the Above

72. To protect against corrosion, the _____ should be kept cleaned and painted.
A. Coal-tar linings
B. Exterior
C. Steel reservoirs
D. Baffles
E. None of the Above

73. Interiors of steel reservoirs are commonly coated with an _____finish.
A. Coal-tar linings
B. Exterior
C. Steel reservoirs
D. Baffles
E. None of the Above

74. Some _____used in the past have apparently degraded over time and are implicated in the release of small amounts of solvents into the stored water.
A. Coal-tar linings
B. Exterior
C. Steel reservoirs
D. Baffles
E. None of the Above

75. _____are usually welded or bolted together and are manufactured in a variety of sizes.
A. Coal-tar linings
B. Exterior
C. Steel reservoirs
D. Baffles
E. None of the Above

76. Small _____can be manufactured off-site and then trucked and lifted into place.
A. Coal-tar linings
B. Exterior
C. Steel reservoirs
D. Baffles
E. None of the Above

77. Steel tanks should be inspected once a year and _____ every 5-7 years.
A. Cathodic protection
B. Repainted
C. Steel reservoirs
D. Baffles
E. None of the Above

78. Steel tanks should also have _____and be screened to keep birds and insects out.
A. Cathodic protection
B. Repainted
C. Steel reservoirs
D. Baffles
E. None of the Above

79. The maintenance program for reservoir tanks should call for _____for a complete inspection of the interior.
A. Inspection
B. Repainted
C. Steel reservoirs
D. Baffles
E. None of the Above

80. Cleaning and disinfection prior to placing the reservoir or tank back in _____is necessary
A. Cathodic protection
B. Repainted
C. Cleaning and disinfection
D. Baffles
E. None of the Above

System Elements

81. The elements of a water distribution system include distribution mains, arterial mains, storage reservoirs, and _____.
A. Storage reservoirs
B. System accessories
C. Arterial mains
D. Hydropneumatic tank
E. None of the Above

82. _____are the pipelines that make up the distribution system. Their function is to carry water from the water source or treatment works to users.
A. Storage reservoirs
B. Distribution mains
C. Arterial mains
D. Hydropneumatic tank
E. None of the Above

83. _____are distribution mains of large size. They are interconnected with smaller distribution mains to form a complete gridiron system.
A. Storage reservoirs
B. Distribution mains
C. Arterial mains
D. Hydropneumatic tank
E. None of the Above

84. _____are structures used to store water. They also equalize the supply or pressure in the distribution system.
A. Storage reservoirs
B. Distribution mains
C. Arterial mains
D. Hydropneumatic tank
E. None of the Above

85. A common example of a _____is an aboveground water storage tank.
A. Storage reservoirs
B. Distribution mains
C. Arterial mains
D. Hydropneumatic tank
E. None of the Above

86. The purpose of a _____is to provide air for the water system.
A. Storage reservoirs
B. Distribution mains
C. Arterial mains
D. Hydropneumatic tank
E. None of the Above

87. _____are used to increase water pressure from storage tanks for low-pressure mains.
A. Treelike system
B. Booster stations
C. Arterial mains
D. Regulating system
E. None of the Above

88. _____ control the flow of water in the distribution system by isolating areas for repair or by regulating system flow or pressure.
A. Treelike system
B. Valves
C. Arterial mains
D. Regulating system

89. Older water systems frequently were expanded without planning and developed into _____.
A. Treelike system
B. Booster stations
C. Arterial mains
D. Regulating system
E. None of the Above

90. This consists of a single _____ that decreases in size as it leaves the source and progresses through the area originally served.
A. Treelike system
B. Booster stations
C. Main
D. Regulating system

91. Smaller pipelines branch off the main and divide again, much like the trunk and branches of a _____.
A. Tree
B. Booster stations
C. Arterial mains
D. Regulating system
E. None of the Above

92. A _____is not desirable because the size of the old main limits the expansion of the system needed to meet increasing demands.
A. Treelike system
B. Booster stations
C. Arterial mains
D. Regulating system
E. None of the Above

93. There are many _____in the system where water remains for long periods, causing undesirable tastes and odors in nearby service lines.
A. Treelike system
B. Dead ends
C. Arterial mains
D. Regulating system
E. None of the Above

94. The most reliable means to provide water for fire fighting is by _____into the system.
A. Treelike system
B. Designing redundancy
C. Arterial mains
D. Regulating system
E. None of the Above

95. There are several advantages gained by laying out water mains in a loop or grid, with feeder and _____ interconnecting at roadway intersections and other regular intervals.
A. Treelike system
B. Loop or grid
C. Distributor mains
D. Regulating system
E. None of the Above

Distribution Valves

96. The purpose of installing _____in water mains at various locations within the distribution system is to allow sections of the system to be taken out of service for repairs or maintenance without significantly curtailing service over large areas.
A. Distribution system
B. Branch mains
C. Shutoff valves
D. Distribution loops
E. None of the Above

97. Valves should be installed at intervals not greater than 5,000 feet in long supply lines and 1,500 feet in main _____or feeders.
A. Distribution system
B. Branch mains
C. Shutoff valves
D. Distribution loops
E. None of the Above

98. All _____connecting to feeder mains or feeder loops should have valves installed as close to the feeders as practical. In this way, branch mains can be taken out of service without interrupting the supply to other locations.
A. Distribution system
B. Branch mains
C. Shutoff valves
D. Distribution loops
E. None of the Above

99. In the areas of greatest water demand or when the dependability of the _____is particularly important, valve spacing of 500 feet maybe appropriate.
A. Distribution system
B. Branch mains
C. Shutoff valves
D. Distribution loops
E. None of the Above

100. At intersections of distribution mains, the number of valves required is normally one less than the number of _____.
A. Distribution system
B. Radiating mains
C. Shutoff valves
D. Distribution loops
E. None of the Above

101. The _____ omitted from the line is usually the one that principally supplies flow to the intersection.
A. Distribution system
B. Branch mains
C. Valve
D. Distribution loops
E. None of the Above

102. _____should be installed in standardized locations (that is, the northeast comer of intersections or a certain distance from the center line of streets), so they can be easily found in emergencies.
A. Distribution system
B. Branch mains
C. Shutoff valves
D. Distribution loops
E. None of the Above

103. All buried small- and medium-sized valves should be installed in _____.
A. Distribution system
B. Branch mains
C. Valve boxes
D. Distribution loops
E. None of the Above

104. Large _____ (about 30 inches in diameter and larger), it may be necessary to surround the valve operator or entire valve within a vault or manhole to allow repair or replacement.
A. Distribution system
B. Branch mains
C. Shutoff valves
D. Distribution loops
E. None of the Above

105. There are two major classifications of _____: Rotary and Linear.
A. Distribution system
B. Branch mains
C. Water valves
D. Distribution loops
E. None of the Above

106. _____are used when a straight-line flow of fluid and minimum flow restriction are needed.
A. Gate valves
B. Thermal binding
C. Pressure equalizer
D. Over-pressurization
E. None of the Above

107. _____are so-named because the part that either stops or allows flow through the valve acts somewhat like a gate. The gate is usually wedge-shaped.
A. Gate valves
B. Thermal binding
C. Pressure equalizer
D. Over-pressurization
E. None of the Above

108. When the valve is wide open the gate is_____ into the valve bonnet. This leaves an opening for flow through the valve the same size as the pipe in which the valve is installed.
A. Fully drawn up
B. Thermal binding
C. Pressure equalizer
D. Over-pressurization
E. None of the Above

109. Gate valves are not suitable for _____. The control of flow is difficult because of the valve's design, and the flow of fluid slapping against a partially open gate can cause extensive damage to the valve.
A. Gate valves
B. Throttling purposes
C. Pressure equalizer
D. Over-pressurization
E. None of the Above

110. _____ in the temperature and/or pressure of the working fluid are often the cause of a valve failing to open.
A. Gate valves
B. Variations
C. Pressure equalizer
D. Over-pressurization
E. None of the Above

111. _____ can occur in high temperature situations depending on the seat and wedge material, length of exposure and closing torque applied.
A. Gate valves
B. Thermal binding
C. Pressure equalizer
D. Over-pressurization
E. None of the Above

112. _____can cause galling on the valve sealing surfaces as well as on the guides.
A. Gate valves
B. Thermal binding
C. Pressure equalizer
D. Over-pressurization
E. None of the Above

113. A valve can lock in the closed position when high pressure enters the cavity and has no way to escape. This is known as _____.
A. Gate valves
B. Thermal binding
C. Pressure equalizer
D. Over-pressurization
E. None of the Above

114. _____ in the temperature and/or pressure of the working fluid are often the cause of a valve failing to open.
A. Gate valves
B. Thermal binding
C. Pressure equalizer
D. Variations
E. None of the Above

115. _____can occur in high temperature situations depending on the seat and wedge material, length of exposure and closing torque applied.
A. Gate valves
B. Thermal binding
C. Pressure equalizer
D. Over-pressurization
E. None of the Above

116. _____can cause galling on the valve sealing surfaces as well as on the guides.
A. Gate valves
B. Thermal binding
C. Pressure equalizer
D. Over-pressurization
E. None of the Above

117. A valve can lock in the closed position when high pressure enters the cavity and has no way to escape. This is known as _____.
A. Single direction sealing
B. Thermal binding
C. Pressure equalizer
D. Over-pressurization
E. None of the Above

118. _____ gate valves have a nameplate on the side of the valve that has a relief hole or pressure equalizer. This should be the high pressure side when the valve is closed.
A. Single direction sealing
B. Thermal binding
C. Pressure equalizer
D. Over-pressurization
E. None of the Above

119. Most Globe valves have compact _____type, bolted bonnet, rising stem, with renewable seatring valves.
A. Globe valves
B. Bonnet
C. Seat
D. Throttling
E. None of the Above

120. A Check Valve spring loaded disc resulting with most advanced design features provides the _____ in dependable, economical flow control.
A. Globe valves
B. Bonnet
C. Seat
D. Throttling
E. None of the Above

121. _____should usually be installed with the inlet below the valve seat.
A. Globe valves
B. Bonnet
C. Seat
D. Throttling
E. None of the Above

122. For severe throttling service, the valve may be installed so that the flow enters over the top of the _____ and goes down through it. Note that in this arrangement, the packings will be constantly pressurized.
A. Globe valves
B. Bonnet
C. Seat
D. Throttling
E. None of the Above

123. If the valve is to be installed near _____ service, verify with an outside contractor or a skilled valve technician.
A. Globe valves
B. Bonnet
C. Seat
D. Throttling
E. None of the Above

124. The valve should be welded onto the line with the disc in the fully _____. Leaving it even partially open can cause distortion and leaking. Allow time for the weld to cool before operating the valve the first time in the pipeline.
A. Globe valves
B. Bonnet
C. Seat
D. Throttling
E. None of the Above

125. The preferred orientation of a _____is upright. The valve may be installed in other orientations, but any deviation from vertical is a compromise.
A. Globe valve
B. Bonnet
C. Seat
D. Throttling
E. None of the Above

126. Installation upside down is not recommended because it can cause dirt to accumulate in the_____.
A. Globe valves
B. Bonnet
C. Seat
D. Throttling
E. None of the Above

127. _____is trapped on threads and/or in the packing area: This is a common problem when valves are installed outdoors in sandy areas and area not cleaned before operating.
A. Valve components
B. Quick-acting
C. Foreign debris
D. Handwheel
E. None of the Above

128. Always inspect threads and packing area for particle obstructions, even seemingly small amounts of sand trapped on the drive can completely stop large valves from _____.
A. Valve components
B. Quick-acting
C. Foreign debris
D. Handwheel
E. None of the Above

129. The valve may stop abruptly when a cycle is attempted. With the line pressure removed from the valve, disconnect the actuator, gear operator or _____ and inspect the drive nut, stem, bearings and yoke bushing.
A. Valve components
B. Quick-acting
C. Foreign debris
D. Handwheel
E. None of the Above

130. Contaminated parts should be cleaned with a lint-free cloth using alcohol, varsol or equivalent. All parts should be re-lubricated before re-assemble. If the valves are installed outdoors in a sandy area, it may be desirable to cover the _____with jackets.
A. Valves
B. Quick-acting
C. Foreign debris
D. Handwheel
E. None of the Above

131. If the _____are faulty or damaged: If you suspect that the valve components are damaged or faulty contact specialized services or an outside contractor.
A. Valve components
B. Quick-acting
C. Foreign debris
D. Handwheel
E. None of the Above

132. If the valves _____ is too small: Increasing the size of the handwheel will reduce the amount of torque required to operate the valve. If a larger handwheel is installed, the person operating the valve must be careful not to over-torque the valve when closing it.
A. Valve components
B. Quick-acting
C. Foreign debris
D. Handwheel

133. Most ball valves are the _____type. They require only a 90-degree turn to either completely open or close the valve.
A. Valve components
B. Quick-acting
C. Foreign debris
D. Handwheel
E. None of the Above

134. Many ball valves are operated by _____. This type of gearing allows the use of a relatively small handwheel and operating force to operate a fairly large valve. Always follow standard safety procedures when working on a valve.
A. Valve components
B. Quick-acting
C. Foreign debris
D. Planetary gears
E. None of the Above

135. Butterfly Valves are usually found in both treatment plants and throughout the distribution system. If the valve is not broken, it is relatively easy to operate. It is usually accompanied by a Gate valve used as a by-pass to prevent _____.
A. Bypass
B. Water Hammer
C. Valve
D. Disc
E. None of the Above

136. These are _____ types of valves usually found on large transmission lines. They may also have an additional valve beside it known as a “bypass” to prevent a water hammer.
A. Bypass
B. Rotary
C. Valve
D. Disc
E. None of the Above

137. Some of these _____ valves can require 300-600 turns to open or close.
A. Bypass
B. Butterfly
C. Valve
D. Disc
E. None of the Above

138. Most Valvemen or the politically correct term Valve Operators will use a machine to open or close a _____ Valve, the machine will count the turns required to open or close the valve.
A. Bypass
B. Butterfly
C. Valve
D. Disc
E. None of the Above

139. _____ valves should be installed with the valve shaft horizontal or inclined from vertical. Always follow standard safety procedures when working on a valve.
A. Bypass
B. Butterfly
C. Valve
D. Disc
E. None of the Above

140. The valve should be mounted in the_____, with the "HP" marking. Thermal insulation of the valve body is recommended for operating temperatures above 392°F (200°C).
A. Bypass
B. Butterfly
C. Valve
D. Disc
E. None of the Above

141. The Butterfly Valve should be installed in the closed position to ensure that the laminated seal in the _____is not damaged during installation.
A. Bypass
B. Butterfly
C. Valve
D. Disc
E. None of the Above

142. If the pipe is lined, make sure that the valve _____ does not contact the pipe lining during the opening stroke. Contact with lining can damage the valve disc.
A. Bypass
B. Butterfly
C. Valve
D. Disc
E. None of the Above

Butterfly Valve Problems
A butterfly valve may have jerky operation for the following reasons:

143. If the packing is too tight: _____ the packing torque until it is only hand tight. Tighten to the required level and then cycle the valve. Re-tighten, if required. CAUTION: Always follow safety instructions when operating on valve.
A. Re-tighten
B. Clean or replace
C. Increase
D. Remove
E. None of the Above

144. If the shaft seals are dirty or worn out: _____components, as per assembly-disassembly procedure. CAUTION: Always follow safety instructions when operating on valve.
A. Re-tighten
B. Clean or replace
C. Increase
D. Remove
E. None of the Above

145. If the shaft is _____: The shaft must be replaced. Remove valve from service and contact an outside contractor or your expert fix it person.
A. Re-tighten
B. Clean or replace
C. Increase
D. Remove
E. None of the Above

146. If the actuator/shaft adaptor is _____: Remove the actuator mounting and realign.
A. Re-tighten
B. Clean or replace
C. Increase
D. Remove
E. None of the Above

147. If the valve has a pneumatic actuator, the air supply may be inadequate: Increase the air supply pressure to standard operating level. Any combination of the following may prevent the valve shaft from _____.
A. Re-tighten
B. Clean or replace
C. Increase
D. Remove
E. None of the Above

148. If the actuator is not working: _____ or repair the actuator as required. Please contact specialized services or an outside contractor for assistance.
A. Re-tighten
B. Replace
C. Increase
D. Remove
E. None of the Above

149. If the valve is packed with debris: _____ the valve and then flush to remove debris. A full cleaning may be required if flushing the valve does not improve valve shaft rotation. Flush or clean valve to remove the debris.
A. Re-tighten
B. Clean or replace
C. Increase
D. Remove
E. None of the Above

Water Meters
150. It is important to account for the water produced and supplied. A master meter should be installed on each source, with service meters placed at each point of use. These should be _____periodically.
A. Un-metered
B. Read and recorded
C. Compute the amount
D. Losses
E. None of the Above

151. Totals from the master meters should be compared to totals from the service meters to _____of water lost in the distribution system. This information is important in locating and eliminating leaks and unauthorized taps.
A. Un-metered
B. Read and recorded
C. Compute the amount
D. Losses
E. None of the Above

152. _____ of 10 to 20 percent are not uncommon in many distribution systems.
A. Un-metered
B. Read and recorded
C. Compute the amount
D. Losses
E. None of the Above

153. It has been shown that a system which is not _____ is likely to have a water usage up to three times as great as a metered system.
A. Metered
B. Read and recorded
C. Compute the amount
D. Losses
E. None of the Above

154. _____ water users tend to water freely and have little incentive to repair plumbing leaks.
A. Un-metered
B. Read and recorded
C. Compute the amount
D. Losses
E. None of the Above

155. Most meters will _____ lower than normal, never higher. All meters will create "head loss" on the water service except for a "Magnetic Meter".
A. Un-metered
B. Read
C. Compute the amount
D. Losses
E. None of the Above

156. Most water utilities will charge the customer a fee to _____ of the meter.
A. Un-metered
B. Read and recorded
C. Check the accuracy
D. Losses
E. None of the Above

Backflow Prevention and Cross-Connection Principles
Atmospheric Pressure

157. The _____ is the entire mass of air that surrounds the earth.
A. Troposphere
B. Atmosphere
C. Mercury column barometer
D. Pressures
E. None of the Above

158. It 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. Troposphere
B. Atmosphere
C. Mercury column barometer
D. Pressures
E. None of the Above

159. If a column of air 1-inch square extending all the way to the "**top**" of the _____ could be weighed, this column of air would weigh approximately 14.7 pounds at sea level.
A. Troposphere
B. Atmosphere
C. Mercury column barometer
D. Pressures
E. None of the Above

160. _____ at sea level is approximately 14.7 psi.
A. Troposphere
B. Atmospheric pressure
C. Mercury column barometer
D. Pressures
E. None of the Above

161. As one ascends, the _____decreases by approximately 1.0 psi for every 2,343 feet.
A. Troposphere
B. Atmospheric pressure
C. Mercury column barometer
D. Pressures
E. None of the Above

162. Below sea level, in excavations and depressions, _____increases.
A. Troposphere
B. Atmospheric pressure
C. Mercury column barometer
D. Pressures
E. None of the Above

163. _____ under water differ from those under air only because the weight of the water must be added to the pressure of the air.
A. Troposphere
B. Atmospheric pressure
C. Mercury column barometer
D. Pressures
E. None of the Above

164. Atmospheric pressure can be measured by any of several methods. The common laboratory method uses the _____.
A. Troposphere
B. Atmospheric pressure
C. Mercury column barometer
D. Pressure of the air
E. None of the Above

165. The height of the _____serves as an indicator of atmospheric pressure.
A. Troposphere
B. Atmospheric pressure
C. Mercury column
D. Pressure of the air
E. None of the Above

166. At sea level and at a temperature of 0° Celsius (**C**), the height of the _____is approximately 30 inches, or 76 centimeters. This represents a pressure of approximately 14.7 psi. The 30-inch column is used as a reference standard.
A. Sea level
B. Atmospheric pressure
C. Mercury column
D. Aneroid barometer
E. None of the Above

167. Another device used to measure atmospheric pressure is the _____.
A. Sea level
B. Atmospheric pressure
C. Mercury column barometer
D. Aneroid barometer
E. None of the Above

168. The _____uses the change in shape of an evacuated metal cell to measure variations in atmospheric pressure.
A. Sea level
B. Atmospheric pressure
C. Mercury column barometer
D. Aneroid barometer
E. None of the Above

169. The _____does not vary uniformly with altitude.
A. Sea level
B. Atmospheric pressure
C. Mercury column barometer
D. Aneroid barometer

170. _____changes are more rapid. Atmospheric pressure is defined as the force per unit area exerted against a surface by the weight of the air above that surface.
A. Sea level
B. Atmospheric pressure
C. Mercury column barometer
D. Aneroid barometer
E. None of the Above

171. _____ may be referred to using an absolute scale, pounds per square inch absolute (psia), or gauge scale, (psiag).
A. Absolute
B. Pressure
C. Gauge
D. Vacuum
E. None of the Above

172. Absolute pressure and gauge pressure are related. Absolute pressure is equal to _____ pressure plus the atmospheric pressure. At sea level, the atmospheric pressure is 14.7 psai.
A. Absolute
B. Pressure
C. Gauge
D. Vacuum
E. None of the Above

173. Absolute pressure is the _____.
A. Absolute
B. Pressure
C. Gauge
D. Vacuum
E. None of the Above

174. _____ 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 absolute pressure would be equal to 14.7 psi, which is the atmospheric pressure.
A. Absolute
B. Pressure
C. Gauge
D. Vacuum
E. None of the Above

175. The term vacuum indicates that the absolute pressure is less than the atmospheric pressure and that the _____ pressure is negative.
A. Absolute
B. Pressure
C. Gauge
D. Vacuum

176. A complete or total _____ would mean a pressure of 0 psia or –14.7 psig.
A. Absolute
B. Pressure
C. Gauge
D. Vacuum

177. Since it is impossible to produce a total vacuum, the term vacuum, will mean all degrees of _____ vacuum.
A. Absolute
B. Pressure
C. Gauge
D. Vacuum
E. None of the Above

178. In a _____ vacuum, the pressure would range from slightly less than 14.7 psia (0 psig) to slightly greater than 0 psia (-14.7 psig).
A. Absolute
B. Pressure
C. Gauge
D. Vacuum

179. Backsiphonage results from atmospheric pressure exerted on a liquid forcing it toward a supply system that is under a _____.
A. Absolute
B. Pressure
C. Gauge
D. Vacuum
E. None of the Above

180. The weight of a cubic foot of water is 62.4 pounds per square foot. The base can be sub-divided into 144-square inches with each subdivision being subjected to a _____ of 0.433 psig.
A. Absolute
B. Pressure
C. Gauge
D. Vacuum
E. None of the Above

181. 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. Hydrodynamics
B. Hydraulics
C. Hydrostatics
D. Pascal's law
E. None of the Above

182. 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. Hydrodynamics
B. Hydraulics
C. Hydrostatics
D. Pascal's law
E. None of the Above

183. _____ 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. Hydrodynamics
B. Hydraulics
C. Hydrostatics
D. Pascal's law
E. None of the Above

184. _____ is a branch of engineering concerned mainly with moving liquids. The term is applied commonly to the study of the mechanical properties of water, other liquids, and even gases when the effects of compressibility are small.
A. Hydrodynamics
B. Hydraulics
C. Hydrostatics
D. Pascal's law
E. None of the Above

185. Hydraulics can be divided into two areas, _____ and hydrokinetics.
A. Hydrodynamics
B. Hydraulics
C. Hydrostatics
D. Pascal's law
E. None of the Above

186. Hydrostatics, the consideration of liquids at rest, involves problems of buoyancy and flotation, pressure on dams and submerged devices, and _____ presses.
A. Hydrodynamics
B. Hydraulic
C. Hydrostatics
D. Pascal's law
E. None of the Above

187. _____, 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. Hydraulics
C. Hydrostatics
D. Pascal's law
E. None of the Above

188. _____states that increase in pressure on the surface of a confined fluid is transmitted undiminished throughout the confining vessel or system.
A. Hydrodynamics
B. Hydraulics
C. Hydrostatics
D. Pascal's law
E. None of the Above

189. For Pascal's law to be made effective for practical applications, it was necessary to have a piston that "**fit exactly**." It was not until the latter part of the eighteenth century that methods were found to make these snugly fitted parts required in _____ systems.
A. Hydrodynamics
B. Hydraulic
C. Hydrostatics
D. Pascal's law
E. None of the Above

190. Components such as valves, pumps, actuating cylinders, and motors have been developed and refined to make _____ one of the leading methods of transmitting power.
A. Fluids
B. Hydraulics
C. Liquids
D. Water
E. None of the Above

191. _____ are almost incompressible.
A. Fluids
B. Hydraulics
C. Liquids
D. Water
E. None of the Above

192. If a pressure of 100 pounds per square inch (**psi**) is applied to a given volume of water that is at atmospheric pressure, the volume will decrease by only 0.03 percent. It would take a force of approximately 32 tons to reduce its volume by 10 percent; however, when this _____ is removed, the water immediately returns to its original volume.
A. Force
B. Hydraulics
C. Liquids
D. Water
E. None of the Above

193. Other _____ behave in about the same manner as water.
A. Fluids
B. Hydraulics
C. Liquids
D. Water
E. None of the Above

194. Another characteristic of a _____ 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. Fluids
B. Hydraulics
C. Liquid
D. Water
E. None of the Above

195. In studying _____ at rest, we are concerned with the transmission of force and the factors which affect the forces in liquids. Additionally, pressure in and on liquids and factors affecting pressure are of great importance.
A. Fluids
B. Hydraulics
C. Liquids
D. Water
E. None of the Above

196. Pressure is the _____ that pushes water through pipes.
A. Volume
B. Pressure
C. Force
D. Fluid acts
E. None of the Above

197. Water _____ 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. Volume
B. Pressure
C. Force
D. Fluid acts
E. None of the Above

198. The terms force and pressure are used extensively in the study of _____ power.
A. Volume
B. Pressure
C. Force
D. Fluid
E. None of the Above

199. _____ 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. Volume
B. Pressure
C. Force
D. Fluid acts
E. None of the Above

200. _____ 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. Volume
B. Pressure
C. Force
D. Fluid acts
E. None of the Above

201. _____ maybe exerted in one direction, in several directions, or in all directions.
A. Volume
B. Pressure
C. Force
D. Fluid acts

202. The foundation of modern hydraulics was established when Pascal discovered that pressure in a _____equally in all directions.
A. Volume
B. Pressure
C. Force
D. Fluid acts
E. None of the Above

203. Pressure due to the _____ of a liquid, at any level, depends on the depth of the fluid from the surface. If the exposed faces of the pressure gauges are moved closer to the surface of the liquid, the indicated pressure will be less.
A. Volume
B. Pressure
C. Force
D. Fluid acts
E. None of the Above

204. When the depth is doubled, the indicated _____ is doubled.
A. Volume
B. Pressure
C. Force
D. Fluid acts
E. None of the Above

205. The pressure in a liquid is directly _____ to the depth.
A. Volume
B. Pressure
C. Force
D. Fluid acts
E. None of the Above

206. Consider a container with vertical sides that is 1 foot long and 1 foot wide. Let it be filled with water 1 foot deep, providing 1 cubic foot of water. 1 cubic foot of water _____ 62.4 pounds.
A. Volume
B. Pressure
C. Force
D. Fluid acts
E. None of the Above

207. Using this information and the equation, P = F/A, we can calculate the _____ on the bottom of the container.
A. Volume
B. Pressure
C. Force
D. Fluid acts
E. None of the Above

208. Thus, the pressure at any depth in a liquid is equal to the _____of the column of liquid at that depth divided by the cross-sectional area of the column at that depth.
A. Volume
B. Pressure
C. Force
D. Fluid acts
E. None of the Above

209. The volume of a liquid that produces the pressure is referred to as the _____ head of the liquid.
A. Volume
B. Pressure
C. Force
D. Fluid
E. None of the Above

210. The _____ of a liquid due to its fluid head is also dependent on the density of the liquid.
A. Volume
B. Pressure
C. Force
D. Fluid acts
E. None of the Above

211. _____ is one of the four forces of nature. The strength of the gravitational force between two objects depends on their masses.
A. Static pressure
B. Gravity
C. Pressure
D. Velocity
E. None of the Above

212. The more _____ the objects are, the stronger the gravitational attraction.
A. Static pressure
B. Gravity
C. Pressure
D. Velocity
E. None of the Above

213. _____, 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. Static pressure
B. Gravity
C. Pressure
D. Velocity
E. None of the Above

214. The mathematical sum of gravity, applied force, and atmospheric pressure is the _____obtained at any one point in a fluid at any given time.
A. Static pressure
B. Gravity
C. Pressure
D. Velocity
E. None of the Above

215. _____exists in addition to any dynamic factors that may also be present at the same time.
A. Static pressure
B. Gravity
C. Pressure
D. Velocity
E. None of the Above

216. 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. This covers the situation only for fluids at rest or practically at rest. It is true only for the factors making up _____ head.
A. Static
B. Gravity
C. Pressure
D. Velocity
E. None of the Above

217. When _____ 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 fluid power.
A. Static pressure
B. Gravity
C. Pressure
D. Velocity
E. None of the Above

218. The dynamic factors of inertia and friction are related to the _____ factors.
A. Static
B. Gravity
C. Pressure
D. Velocity
E. None of the Above

219. Velocity head and friction head are obtained at the expense of static head. However, a portion of the _____ head can always be reconverted to static head.
A. Static pressure
B. Gravity
C. Pressure
D. Velocity
E. None of the Above

220. _____, 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. Velocity
B. Volume
C. Force
D. Pressure
E. None of the Above

221. Whenever a fluid is given velocity, some part of its original static head is used to impart this _____, which then exists as velocity head.
A. Velocity
B. Volume
C. Force
D. Pressure
E. None of the Above

222. The volume of a liquid passing a point in a given time is known as its _____ of flow or flow rate.
A. Velocity
B. Volume
C. Force
D. Pressure
E. None of the Above

223. The volume of flow is usually expressed in gallons per minute (gpm) and is associated with relative _____ of the liquid, such as 5 gpm at 40 psi.
A. Velocity
B. Volume
C. Force
D. Pressures
E. None of the Above

224. The _____ of flow 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. Velocity
B. Volume
C. Force
D. Pressure
E. None of the Above

225. _____ of flow is an important consideration in sizing the hydraulic lines.
A. Velocity
B. Volume
C. Force
D. Pressure
E. None of the Above

226. Volume and _____of flow are often considered together.
A. Velocity
B. Volume
C. Force
D. Pressure
E. None of the Above

227. The _____ 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. Velocity
B. Volume
C. Force
D. Pressure
E. None of the Above

228. The _____of flow is slow at wide parts of a stream and rapid at narrow parts, yet the volume of water passing each part of the stream is the same.
A. Velocity
B. Volume
C. Force
D. Pressure
E. None of the Above

229. Bernoulli's principle thus says that a rise (fall) in _____ in a flowing fluid must always be accompanied by a decrease (increase) in the speed, and conversely, an increase (decrease) in the speed of the fluid results in a decrease (increase) in the pressure.
A. Velocity
B. Volume
C. Force
D. Pressure
E. None of the Above

230. _____is responsible for the fact that a shower curtain gets ``**sucked inwards**'' when the water is first turned on.
A. Velocity
B. Volume
C. Force
D. Pressure
E. None of the Above

231. 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. Backsiphonage
B. Backpressure
C. Control contamination
D. Cross-connection
E. None of the Above

232. 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. Backsiphonage
B. Backpressure
C. Control contamination
D. Cross-connection
E. None of the Above

233. There are two types of _____--**backpressure** and **backsiphonage.**
A. Backsiphonage
B. Backpressure
C. Control contamination
D. Cross-connection
E. None of the Above

234. _____ 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. Backsiphonage
B. Backpressure
C. Control contamination
D. Cross-connection
E. None of the Above

235. _____ can occur when there is a stoppage of water supply due to nearby fire fighting, a break in a water main, etc.
A. Backsiphonage
B. Backpressure
C. Control contamination
D. Cross-connection
E. None of the Above

236. _____ 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. Backsiphonage
B. Backpressure
C. Control contamination
D. Cross-connection
E. None of the Above

237. _____ (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. Increases in downstream pressure can be created by pumps, temperature increases in boilers, elevation, etc.
A. Backsiphonage
B. Backpressure
C. Control contamination
D. Cross-connection
E. None of the Above

238. The primary responsibility of the _____is to develop and maintain a program to prevent or control contamination from water sources of lesser quality or other contamination sources from entering into the public water system.
A. Federal Government
B. Water purveyor
C. Safe Drinking Water Act
D. Separate states
E. None of the Above

239. Under the provisions of the Safe Drinking Water Act of 1974, (SDWA) and current Groundwater Protection rules the _____through the EPA, (Environmental Protection Agency), set national standards of safe drinking water.
A. Federal Government
B. Water purveyor
C. Safe Drinking Water Act
D. Separate states
E. None of the Above

240. The _____are responsible for the enforcement of these standards as well as the supervision of public water systems and the sources of drinking water.
A. Federal Government
B. Water purveyor
C. Safe Drinking Water Act
D. Separate states
E. None of the Above

241. The water purveyor or supplier is held responsible for compliance to the provisions of the _____, to provide a warranty that water quality by their operation is in conformance with EPA standards at the source, and is delivered to the customer without the quality being compromised as its delivery through the distribution system.
A. Federal Government
B. Water purveyor
C. Safe Drinking Water Act
D. Separate states

242. _____, means the permissible level of a contaminant in water which is delivered to the free flowing outlet of the ultimate user of a public water system.
A. Cross-connections
B. Contaminants
C. Maximum contaminant level
D. Backflow
E. None of the Above

243. _____ added to the water under circumstances controlled by the user, except those resulting from corrosion of piping and plumbing caused by water quality, are excluded.
A. Cross-connections
B. Contaminants
C. Maximum contaminant level
D. Backflow
E. None of the Above

244. The Water Consumer has the responsibility to prevent _____ from entering into the public water system by way of their individual plumbing system, and retain the expenses of installation, maintenance, and testing of the approved backflow prevention assemblies installed on their individual water service line.
A. Cross-connections
B. Contaminants
C. Maximum contaminant level
D. Backflow
E. None of the Above

245. Backflow into a public water system can pollute or contaminate the water in that system (i.e., _____ into a public water system can make the water in that system unusable or unsafe to drink), and each water supplier has a responsibility to provide water that is usable and safe to drink under all foreseeable circumstances.
A. Cross-connections
B. Contaminants
C. Maximum contaminant level
D. Backflow
E. None of the Above

246. Consumers generally have absolute faith that _____to them through a public water system is always safe to drink.
A. Cross-connections
B. Contaminants
C. Maximum contaminant level
D. Backflow
E. None of the Above

247. Each water supplier must take reasonable precautions to protect its public water system against _____.
A. Cross-connections
B. Contaminants
C. Maximum contaminant level
D. Backflow

248. Water suppliers usually do not have the authority or capability to repeatedly inspect every consumer's premises for _____and backflow protection.
A. Cross-connections
B. Contaminants
C. Maximum contaminant level
D. Backflow
E. None of the Above

249. Each water supplier should ensure that a proper backflow preventer is installed and maintained at the water service connection to each system or premises that poses a _____to the public water system.
A. Cross-connections
B. Contaminants
C. Maximum contaminant level
D. Backflow
E. None of the Above

250. An approved _____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. Air Gap
B. Atmospheric Vacuum Breaker
C. Pressure Vacuum Breaker Assembly
D. Double Check Valve Assembly
E. Reduced pressure backflow assembly

251. An approved _____must be vertically orientated a distance of at least twice the inside diameter of the inlet pipe, but never less than one inch.
A. Air Gap
B. Atmospheric Vacuum Breaker
C. Pressure Vacuum Breaker Assembly
D. Double Check Valve Assembly
E. Reduced pressure backflow assembly

252. 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. Air Gap
B. Atmospheric Vacuum Breaker
C. Pressure Vacuum Breaker Assembly
D. Double Check Valve Assembly
E. Reduced pressure backflow assembly

253. When the air flow is restricted, such as the case of an air gap located near a wall, the _____separation must be increased.
A. Air Gap
B. Atmospheric Vacuum Breaker
C. Pressure Vacuum Breaker Assembly
D. Double Check Valve Assembly
E. Reduced pressure backflow assembly

254. The _____contains a float check (poppet), a check seat, and an air inlet port.
A. Air Gap
B. Atmospheric Vacuum Breaker
C. Pressure Vacuum Breaker Assembly
D. Double Check Valve Assembly
E. Reduced pressure backflow assembly

255. _____are designed to prevent backflow caused by backsiphonage only from low health hazards.
A. Air Gap
B. Atmospheric Vacuum Breaker
C. Pressure Vacuum Breaker Assembly
D. Double Check Valve Assembly
E. Reduced pressure backflow assembly

256. _____Uses: Irrigation systems, commercial dishwasher and laundry equipment, chemical tanks and laboratory sinks (backsiphonage only, nonpressurized connections)
A. Air Gap
B. Atmospheric Vacuum Breaker
C. Pressure Vacuum Breaker Assembly
D. Double Check Valve Assembly
E. Reduced pressure backflow assembly

257. The _____consists of a spring loaded check valve, an independently operating air inlet valve, two resilient seated shutoff valves, and two properly located resilient seated test cocks.
A. Air Gap
B. Atmospheric Vacuum Breaker
C. Pressure Vacuum Breaker Assembly
D. Double Check Valve Assembly
E. Reduced pressure backflow assembly

258. The _____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. Air Gap
B. Atmospheric Vacuum Breaker
C. Pressure Vacuum Breaker Assembly
D. Double Check Valve Assembly
E. Reduced pressure backflow assembly

259. The_____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. Air Gap
B. Atmospheric Vacuum Breaker
C. Pressure Vacuum Breaker Assembly
D. Double Check Valve Assembly
E. Reduced pressure backflow assembly

260. During normal operation, the pressure between the two check valves, referred to as the zone of _____, is maintained at a lower pressure than the supply pressure. If either 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. Air Gap
B. Atmospheric Vacuum Breaker
C. Pressure Vacuum Breaker Assembly
D. Double Check Valve Assembly
E. Reduced pressure

261. The _____is designed to prevent backflow caused by backpressure and backsiphonage from low to high health hazards.
A. Air Gap
B. Atmospheric Vacuum Breaker
C. Pressure Vacuum Breaker Assembly
D. Double Check Valve Assembly
E. Reduced pressure backflow assembly

Water Main Installation Procedures

262. Installation of new or replacement pipe sections _____ with good construction practices. The line must be buried a minimum of 30" below the ground surface to prevent freezing.
A. Is required
B. Insuring protection
C. Should be in accordance
D. Not necessary
E. None of the Above

263. The line must be bedded and backfilled properly _____from weather and surface loadings.
A. Is required
B. Insuring protection
C. Essential to hold
D. Not necessary
E. None of the Above

264. Thrust blocking (**Kickers**) at all bends, tees, and valves is _____the pipe in place and prevent separation of line sections.
A. Is required
B. Insuring protection
C. Essential to hold
D. Not necessary
E. None of the Above

265. Thrust blocking is _____if the pipe is welded.
A. Is required
B. Insuring protection
C. Essential to hold
D. Not necessary
E. None of the Above

266. Disinfection of new installations or repaired sections _____prior to placing them in service. This can be accomplished by filling the line with a 25 mg/1 free chlorine solution and allowing it to stand for 24 hours.
A. Is required
B. Should be placed
C. Should be installed
D. Be scheduled
E. None of the Above

267. Valves and fittings used in the waterworks industry _____cast iron, steel, brass, stainless and fiberglass.
A. Is required
B. Should be placed
C. Should be installed
D. Be scheduled
E. None of the Above

268. Enough gate valves _____throughout the system to enable problem areas (leaks, etc.) to be isolated and repaired with minimal service disruption.
A. Is required
B. Should be placed
C. Should be installed
D. Be scheduled
E. None of the Above

269. Air relief valves _____at high points in the system.
A. Is required
B. Should be placed
C. Should be installed
D. Be scheduled
E. None of the Above

270. Valves _____with valve boxes and covers.
A. Is required
B. Should be placed
C. Should be installed
D. Be scheduled
E. None of the Above

271. Regardless of the type of pipe installed, certain maintenance routines _____ on the distribution system to maintain water quality and optimal service. These programs should be scheduled and performed on a regular basis.
A. Is required
B. Should be placed
C. Should be performed
D. Be scheduled
E. None of the Above

272. Flushing at _____on dead end lines and at fire hydrants throughout the system should be done at least twice per year.
A. Minimum cleansing velocity
B. Capacity is decreasing
C. Blowoffs
D. Flushing
E. None of the Above

273. Flushing is needed to remove _____ in dead ends and to remove accumulated sediment that results from turbidity, iron, manganese, etc.
A. Minimum cleansing velocity
B. Capacity is decreasing
C. Stagnant water
D. Flushing
E. None of the Above

274. _____ should always be done from the source to the ends of the system. Affected customers should be notified of this process in advance.
A. Minimum cleansing velocity
B. Capacity is decreasing
C. Pressure tests
D. Flushing
E. None of the Above

275. To do an adequate job of flushing, the flow should reach a velocity of at least 2.5 feet per second, known as the "_____" of the system (at hydrant locations).
A. Minimum cleansing velocity
B. Capacity is decreasing
C. Pressure tests
D. Flushing
E. None of the Above

276. These tests are important to determine the adequacy of the distribution system in transmitting water, particularly during days of peak demand. Also, these tests can help determine if pipe _____over time due to internal corrosion or deposits.
A. Minimum cleansing velocity
B. Capacity is decreasing
C. Pressure tests
D. Flushing
E. None of the Above

277. _____should be done at various locations in the distribution system several times per year. This helps to monitor the performance of the system and alert the operator to problems such as leaks or internal deposits.
A. Minimum cleansing velocity
B. Capacity is decreasing
C. Pressure tests
D. Flushing
E. None of the Above

Shoring Section

Before any work is performed and before any employees enter the excavation, a number of items must be checked and ensured:

278. Before any excavation, _____must be determined. This can be accomplished by either contacting the local utility companies or the local "**one-call'** center for the area.
A. Surface encumbrances
B. Adequate protective systems
C. Underground installations
D. Assure their protection
E. None of the Above

279. All underground utility locations must be documented on the proper forms. All overhead hazards (_____) that create a hazard to employees must be removed or supported to eliminate the hazard.
A. Surface encumbrances
B. Adequate protective systems
C. Underground installations
D. Assure their protection
E. None of the Above

280. If the excavation is to be over 20 feet deep, it_____ a registered professional engineer who is registered in the state where work will be performed.
A. Surface encumbrances
B. Adequate protective systems
C. Underground installations
D. Assure their protection
E. None of the Above

281. Adequate protective systems _____ protect employees. This can be accomplished through sloping, shoring, or shielding.
A. Surface encumbrances
B. Will be utilized to
C. Underground installations
D. Assure their protection
E. None of the Above

282. The worksite must be analyzed in order to design _____and prevent cave-ins. There must also be an excavation safety plan developed to protect employees.
A. Surface encumbrances
B. Adequate protective systems
C. Underground installations
D. Assure their protection
E. None of the Above

283. Workers must be supplied with and wear any personal protective equipment deemed necessary to _____.
A. Surface encumbrances
B. Adequate protective systems
C. Underground installations
D. Assure their protection

284. All spoil piles will be _____ of **two (2) feet from** the sides of the excavation. The spoil pile must not block the safe means of egress.
A. Stored a minimum
B. Adequate protective systems
C. Underground installations
D. Assure their protection
E. None of the Above

285. If a trench or excavation is 4 feet or deeper, stairways, ramps, or ladders will be used as a _____ access and egress.
A. Safe means of
B. Adequate protective systems
C. Underground installations
D. Assure their protection
E. None of the Above

286. For trenches, the _____ must not have to travel any more than 25 feet of lateral travel to reach the stairway, ramp, or ladder.
A. Employee
B. Competent person
C. Pedestrians
D. None of the Above

287. No _____ will work in an excavation where water is accumulating unless adequate measures are used to protect the employees.
A. Employee
B. Competent person
C. Pedestrians
D. None of the Above

288. A _____will inspect all excavations and trenches daily, prior to employee exposure or entry, and after any rainfall, soil change, or any other time needed during the shift.
A. Employee
B. Competent person
C. Pedestrians
D. None of the Above

289. The _____must take prompt measures to eliminate any and all hazards.
A. Employee
B. Competent person
C. Pedestrians
D. None of the Above

290. Excavations and trenches 4 feet or deeper that have the potential for toxic substances or hazardous atmospheres _____ at least daily. If the atmosphere is inadequate, protective systems will be utilized.
A. Will be tested
B. Adequate protective systems
C. Underground installations
D. Assure their protection
E. None of the Above

291. If work is in or around traffic, _____must be supplied with and wear orange reflective vests.
A. Employees
B. Competent person
C. Pedestrians
D. None of the Above

292. Signs and barricades must be utilized to ensure the safety of _____, vehicular traffic, and pedestrians.
A. Employees
B. Competent person
C. Pedestrians
D. None of the Above

293. The OSHA Standards require that the _____must be capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and have authorization to take prompt corrective measures to eliminate them and, if necessary, to stop the work.
A. Employee
B. Competent person
C. Pedestrians
D. None of the Above

A competent person is required to:
Have a complete understanding of the applicable safety standards and any other data provided.

294. _____ the proper locations of underground installations or utilities, and that the proper utility companies have been contacted.
A. Approve
B. Assure
C. Conduct
D. Determine
E. None of the Above

295. _____ soil classification tests and reclassify soil after any condition changes.
A. Approve
B. Assure
C. Conduct
D. Determine
E. None of the Above

296. _____ adequate protective systems (sloping, shoring, or shielding systems) for employee protection.
A. Approve
B. Assure
C. Conduct
D. Determine
E. None of the Above

297. _____ all air monitoring for potential hazardous atmospheres.
A. Approve
B. Assure
C. Conduct
D. Determine
E. None of the Above

298. _____daily and periodic inspections of excavations and trenches.
A. Approve
B. Assure
C. Conduct
D. Determine
E. None of the Above

299. _____ design of structural ramps, if used.
A. Approve
B. Assure
C. Conduct
D. Determine
E. None of the Above

300. An excavation safety plan is _____ in written form. This plan is to be developed to the level necessary to ensure complete compliance with the OSHA Excavation Safety Standard and state and local safety standards.
A. Approve
B. Assure
C. Conduct
D. Determine
E. None of the Above

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

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