

Registration Form

Distribution Operations CEU Training Course \$150.00
48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL \$50.00

Start and Finish Dates: _____ *You will have 90 days from this date in order to complete this course*

Name _____ **Signature** _____
I have read and understood the disclaimer notice on page 2. Digitally sign XXX

Address: _____

City _____ **State** _____ **Zip** _____

Email _____ **Fax ()** _____

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

Operator ID # _____ **Exp. Date** _____

Class/Grade _____

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

Water Treatment _____ Distribution _____ Groundwater _____

Well Drillers _____ Pump Installer _____ Other _____

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

Technical Learning College
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info@tlch2o.com

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

Professional Engineers; Most states will accept our courses for credit but we do not officially list the States or Agencies. Please check your State for approval.

State Approval Listing URL...

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

You can obtain a printed version of the course manual 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.

Grading Information

In order to maintain the integrity of our courses we do not distribute test scores, percentages or questions missed. Our exams are based upon pass/fail criteria with the benchmark for successful completion set at 70%. Once you pass the exam, your record will reflect a successful completion and a certificate will be issued to you.

For security purposes, please fax or e-mail a copy of your driver's license and always call us to confirm we've received your assignment and to confirm your identity.

Thank you...

In the near future, we will stop mailing the certificate of completion so we need your e-mail address. We will e-mail the certificate to you, if no e-mail address; we will mail it to you.

Distribution Operations Answer Key Name _____

Phone _____

Please Circle, Underline or X or Bold One answer per question.

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Please fax or e-mail 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 service handling fee of \$50.00. This fee may not cover postage costs. If you need this service, simply write RUSH on the top of your Registration Form. We will place you in the front of the grading and processing line.

For security purposes, please fax or e-mail a copy of your driver's license and always call us to confirm we've received your assignment and to confirm your identity.

Thank you...

Grading Information

In order to maintain the integrity of our courses we do not distribute test scores, percentages or questions missed. Our exams are based upon pass/fail criteria with the benchmark for successful completion set at 70%. Once you pass the exam, your record will reflect a successful completion and a certificate will be issued to you.

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

**DISTRIBUTION OPERATIONS
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? _____

5. 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.

DISTRIBUTION OPERATIONS CEU TRAINING COURSE ASSIGNMENT

You will have 90 days from receipt of this manual to complete it in order to receive your Continuing Education Unit (CEU). A score of 70 % or better is necessary to pass this course. Use the search key or find in Adobe Acrobat if you cannot find the answer. If you should need any assistance, please email all concerns and the completed answer key to info@tlch2o.com.

Please use the Answer Key and Circle, Bold or X out the answer.

Multiple Choice, pick one answer only.

Bacteria

1. Only a small percentage of _____ cause disease in normal, healthy humans.
A. Bacteria
B. Salmonella
C. Nonhazardous fluids
D. Protozoans
E. None of the Above
2. Iron bacteria are undesirable in a water distribution system because the bacteria may cause red water and slime. Examples include; _____, Shigella, Bacillus, Vibri Cholera and Cholera.
A. Bacteria
B. Salmonella
C. Nonhazardous fluids
D. Protozoans
E. None of the Above
3. Small, _____ too small to be seen by the naked eye.
A. Bacteria
B. Salmonella
C. One-celled animals
D. Protozoan
E. None of the Above
4. Bacteria are found everywhere, including on and in the human body. Humans would be unable to live without the _____ that inhabit the intestines and assist in digesting food.
A. Bacteria
B. Salmonella
C. Nonhazardous fluids
D. Protozoan
E. None of the Above

Safe Drinking Water Act Terms

5. Community Water System (CWS). A public water system that serves at least 15 service connections used by year-round residents of the area served by the _____ serves at least 25 year-round residents.
A. Transient and non-transient
B. Enforce the law and related regulations
C. Identifying and inventorying
D. System or regularly
E. None of the Above

6. Cryptosporidium. A _____ associated with the disease cryptosporidiosis in humans. The disease can be transmitted through ingestion of drinking water, person-to-person contact, or other exposure routes.
- A. Bacteria
 - B. Salmonella
 - C. Nonhazardous fluids
 - D. Protozoan
 - E. None of the Above
7. Cryptosporidiosis may cause acute diarrhea, abdominal pain, vomiting, and fever that last 1-2 weeks in healthy adults, but may be chronic or fatal in _____ people.
- A. Bacteria
 - B. Salmonella
 - C. Immuno-compromised
 - D. Protozoan
 - E. None of the Above
8. Giardia lamblia. A protozoan, which can survive in water for 1 to 3 months, associated with the disease _____.
- A. Bacteria
 - B. Salmonella
 - C. Giardiasis
 - D. Gastrointestinal disease
 - E. None of the Above
9. Ingestion of this protozoan in contaminated drinking water, exposure from person-to-person contact, and other exposure routes may cause _____.
- A. Bacteria
 - B. Salmonella
 - C. Giardiasis
 - D. Gastrointestinal disease
 - E. None of the Above
10. The symptoms of this _____ may persist for weeks or months and include diarrhea, fatigue, and cramps.
- A. Bacteria
 - B. Salmonella
 - C. Giardiasis
 - D. Gastrointestinal disease
 - E. None of the Above
11. _____. In the SDWA, an MCL is defined as "the maximum permissible level of a contaminant in water which is delivered to any user of a public water system." MCLs are enforceable standards.
- A. Maximum Contaminant Level Goal (MCLG)
 - B. Nephelometric Turbidity Units (NTU)
 - C. Maximum Contaminant Level (MCL)
 - D. Methemoglobinemia
 - E. None of the Above

12. _____ The maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health effect of persons would occur, and which allows for an adequate margin of safety.

- A. Maximum Contaminant Level Goal (MCLG)
- B. Nephelometric Turbidity Units (NTU)
- C. Maximum Contaminant Level (MCL)
- D. Methemoglobinemia
- E. None of the Above

13. _____ are non-enforceable public health goals.

- A. Maximum Contaminant Level Goal (MCLG)
- B. Nephelometric Turbidity Units (NTU)
- C. Maximum Contaminant Level (MCL)
- D. Methemoglobinemia
- E. None of the Above

14. _____ A unit of measure used to describe the turbidity of water. Turbidity is the cloudiness in water.

- A. Maximum Contaminant Level Goal (MCLG)
- B. Nephelometric Turbidity Units (NTU)
- C. Maximum Contaminant Level (MCL)
- D. Methemoglobinemia
- E. None of the Above

New EPA Water Rules

15. When people either drink this water or eat animals and plants that drink it, they are exposed to _____. In the U.S., eating and drinking are the most common ways that people are exposed to arsenic, although it can also come from industrial sources.

- A. Trihalomethanes
- B. Arsenic
- C. Microbial contaminants
- D. Haloacetic Acids
- E. None of the Above

16. Studies have linked long-term exposure of _____ in drinking water to a variety of cancers in humans.

- A. Trihalomethanes
- B. Arsenic
- C. Microbial contaminants
- D. Haloacetic Acids
- E. None of the Above

17. _____ is a chemical that occurs naturally in the earth's crust. When rocks, minerals, and soil erode, they release arsenic into water supplies.

- A. Trihalomethanes
- B. Arsenic
- C. Microbial contaminants
- D. Haloacetic Acids
- E. None of the Above

Disinfection (Chlorination, Ozonation)

18. Water is then disinfected to ensure that dangerous _____. Chlorine-based disinfectants or ozone are used because they are very effective.

- A. Provide residual protection
- B. Withdrawn from wells
- C. Contaminate the groundwater
- D. Microbes are killed
- E. None of the Above

19. Chlorine-based disinfectants also _____ against biological contamination in the water distribution system. This is a critical step to assure our water is safe all the way to the consumer's tap.

- A. Provide residual protection
- B. Withdrawn from wells
- C. Contaminate the groundwater
- D. Microbes are killed
- E. None of the Above

Groundwater and Wells

20. A well can be easily contaminated if it is not properly constructed or if toxic materials are released into the well. Toxic material spilled or dumped near a well can leach into the aquifer and _____ drawn from that well.

- A. Provide residual protection
- B. Withdrawn from wells
- C. Contaminate the groundwater
- D. Kill microbes
- E. None of the Above

Contaminated Wells

21. Contaminated wells used for drinking water are _____. Wells can be tested to see what chemicals may be in the well and if they are present in dangerous quantities.

- A. Can provide residual protection
- B. Approved
- C. Contaminating the groundwater
- D. Especially dangerous
- E. None of the Above

22. Groundwater is _____ to provide water for everything from drinking water for the home and business to water to irrigate crops to industrial processing water.

- A. Providing residual protection
- B. Withdrawn from wells
- C. Contaminated
- D. Filled with microbes
- E. None of the Above

23. When water is pumped from the ground, the _____ flow change in response to this withdrawal.

- A. Drawdown
- B. Withdrawn
- C. Dynamics of groundwater
- D. Pressure
- E. None of the Above

24. 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. Saturated zone
- B. Water table
- C. Aquifers
- D. Karst
- E. None of the Above

Aquifer

25. Water in this zone is called soil moisture. The entire region below the water table is called the _____ and water in this saturated zone is called groundwater.

- A. Saturated zone
- B. Water table
- C. Aquifers
- D. Karst
- E. None of the Above

26. Fractured _____ are cracks, joints, or fractures in solid rock, through which groundwater moves. Examples of fractured aquifers include granite and basalt.

- A. Saturated zone
- B. Water table
- C. Aquifers
- D. Karst
- E. None of the Above

27. Limestones are often fractured _____, but here the cracks and fractures may be enlarged by solution, forming large channels or even caverns.

- A. Saturated zone
- B. Water table
- C. Aquifers
- D. Karst
- E. None of the Above

28. Limestone terrain where solution has been very active is termed _____.

- A. Saturated zone
- B. Water table
- C. Aquifers
- D. Karst
- E. None of the Above

29. 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. Saturated zone
- B. Water table
- C. Aquifers
- D. Karst
- E. None of the Above

30. Above the _____ lies the unsaturated zone. Here the spaces in the rock and soil contain both air and water.

- A. Saturated zone
- B. Water table
- C. Aquifers
- D. Karst
- E. None of the Above

31. Porous media such as sandstone may become so highly cemented or recrystallized that all of the original space is filled. In this case, the rock is no longer a _____.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Karst
 - E. None of the Above
32. If it contains cracks it can still act as a fractured _____.
- A. Saturated zone
 - B. Water table
 - C. Aquifer
 - D. Karst
 - E. None of the Above
33. Most of the _____ of importance to us are unconsolidated porous media such as sand and gravel.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Karst
 - E. None of the Above
34. Some very porous materials are not _____. Clay, for instance, has many spaces between its grains, but the spaces are not large enough to permit free movement of water.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Karst
 - E. None of the Above
35. Groundwater usually flows downhill with the slope of the _____.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above
36. Like surface water, _____ flows toward, and eventually drains into, streams, rivers, lakes and the oceans.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above
37. _____ flow in the aquifers underlying springs or surface drainage basins, however, does not always mirror the flow of water on the surface.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above

38. _____ may move in different directions below the ground than the water flowing on the surface.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above
39. Unconfined aquifers are those that are bounded by the _____.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above
40. The movement of water from a(n) _____ into a well results in the formation of a cone of depression.
- A. Cone of depression
 - B. Water table
 - C. Aquifer
 - D. Groundwater
 - E. None of the Above
41. The _____ describes a three-dimensional inverted cone surrounding the well that represents the volume of water removed as a result of pumping.
- A. Cone of depression
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above
42. _____ 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. Cone of depression
 - B. Water level
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above
43. 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. Cone of depression
 - B. Water level
 - C. Aquifer
 - D. Groundwater
 - E. None of the Above

44. Some aquifers, however, lie beneath layers of impermeable materials. These are called confined _____, or some-times artesian aquifers.
- A. Saturated zone
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above
- 45 A well in such an aquifer is called a(n) _____.
- A. Artesian well
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above
46. The water in these wells rises higher than the top of the aquifer because of confining pressure. If the water level rises above the ground surface a flowing _____ occurs.
- A. Artesian well
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above
47. The piezometric surface is the level to which the water in a(n) _____ aquifer will rise.
- A. Artesian
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above
48. When pumping begins, water begins to flow towards the well in contrast to the natural direction of _____ movement.
- A. Artesian well
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above
49. The water level in the well falls below the _____ in the surrounding aquifer.
- A. Artesian well
 - B. Water table
 - C. Aquifers
 - D. Groundwater
 - E. None of the Above
50. As a result, water begins to move from the _____ into the well. As pumping continues, the water level in the well continues to increase until the rate of flow into the well equals the rate of withdrawal from pumping.
- A. Artesian well
 - B. Water table
 - C. Aquifer
 - D. Groundwater
 - E. None of the Above

51. 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. Cone of depression
 - B. Water level
 - C. Aquifer
 - D. Groundwater
 - E. None of the Above

Water Use or Demand

52. A minimum of 60 psi at a fire hydrant is usually adequate, since that allows for up to 20 psi _____ in fire hoses.

- A. Water pressure
- B. Minimum required
- C. Maximum daily use
- D. Pressure drop
- E. None of the Above

53. In commercial and industrial districts, it may be common to have 75 psi or higher. 20 psi is considered the _____ at any point in the water system, so that backflow and infiltration is prevented.

- A. Water pressure
- B. Minimum required
- C. Maximum daily use
- D. Demand
- E. None of the Above

54. Pressure is provided by the _____ of the water (such as water from a pump), or by the height of the water (such as a storage reservoir). 2.31 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. Water pressure
- B. Minimum required
- C. Maximum daily use
- D. Direct force
- E. None of the Above

55. Water system _____ comes from a number of sources including residential, commercial, industrial and public consumers as well as some unavoidable loss and waste.

- A. Per person usage
- B. Average daily use
- C. Quantity and pressure
- D. Demand
- E. None of the Above

56. If fire protection is desired, that could also represent a rather significant (although not continuous) _____.

- A. Per person usage
- B. Average daily use
- C. Quantity and pressure
- D. Demand upon the system
- E. None of the Above

57. The combination of storage reservoirs and distribution lines must be capable of meeting consumers' needs for quality, _____ at all times.
- A. Per person usage
 - B. Average daily use
 - C. Quantity and pressure
 - D. Demand upon the system
 - E. None of the Above
58. The _____ of water used in any community varies from 50 to 500 gallons per person per day.
- A. Per person usage
 - B. Average daily use
 - C. Quantity
 - D. Demand upon the system
 - E. None of the Above
59. A common design assumption is to use from 100 to 150 gallons _____ per day for average domestic use.
- A. Per person
 - B. Average daily use
 - C. Of water
 - D. Demand
 - E. None of the Above
60. The _____ is approximately 2 to 3 times the average daily use.
- A. Water pressure
 - B. Minimum required
 - C. Maximum daily use
 - D. Demand
 - E. None of the Above
61. _____ is usually encountered during the summer months and can vary widely depending on irrigation practices.
- A. Water pressure
 - B. Minimum required
 - C. Maximum daily use
 - D. Demand
 - E. None of the Above

Water Pressure

62. For ordinary domestic use, _____ should be between 25 and 45 psi.
- A. Water pressure
 - B. Minimum required
 - C. Maximum daily use
 - D. Demand
 - E. None of the Above

Water Use or Demand

63. Water system demand comes from a(n) _____ including residential, commercial, industrial and public consumers as well as some unavoidable loss and waste.
- A. Quality, quantity and pressure
 - B. Unavoidable loss and waste
 - C. Common design assumption
 - D. Number of sources
 - E. None of the Above

64. If fire protection is desired, that could also represent a rather significant (although not continuous) _____.
- A. Quality, quantity and pressure
 - B. Unavoidable loss and waste
 - C. Common design assumption
 - D. Rather significant
 - E. None of the Above
65. The combination of storage reservoirs and distribution lines must be capable of meeting consumers' needs for _____ at all times.
- A. Quality, quantity and pressure
 - B. Unavoidable loss and waste
 - C. Common design assumption
 - D. Rather significant demand
 - E. None of the Above
66. The quantity of water used in any community varies from 50 to 500 gallons per person per day. A _____ is to use from 100 to 150 gallons per person per day for average domestic use.
- A. Quality, quantity and pressure
 - B. Unavoidable loss and waste
 - C. Common design assumption
 - D. Rather significant demand
 - E. None of the Above
67. The _____ is approximately 2 to 3 times the average daily use. Maximum daily use is usually encountered during the summer months and can vary widely depending on irrigation practices.
- A. Quality, quantity and/or pressure
 - B. Unavoidable loss and waste
 - C. Maximum daily use
 - D. GPD
 - E. None of the Above

Water Pressure

68. For ordinary _____, water pressure should be between 25 and 45 psi.
- A. Domestic use
 - B. Commercial and industrial districts
 - C. Water supplying
 - D. On-going maintenance costs
 - E. None of the Above
69. A minimum of 60 psi at a fire hydrant is _____, since that allows for up to 20 psi pressure drop in fire hoses.
- A. The minimum required
 - B. Normal in commercial and industrial districts
 - C. Approved for supplying water
 - D. Usually adequate
 - E. None of the Above

70. In _____, it may be common to have 75 psi or higher.

- A. Minimum required zones
- B. Commercial and industrial districts
- C. Supplying water
- D. Hills and mountains
- E. None of the Above

71. 20 psi is considered the minimum required at any point in the water system, so that backflow and _____.

- A. Infiltration is prevented
- B. Cross-Connections
- C. Pumping is limited
- D. Water hammer
- E. None of the Above

72. Pressure is provided by the _____ of the water (such as water from a pump), or by the height of the water (such as a storage reservoir). 2.31 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. Pumping
- B. Surging
- C. Storing
- D. Direct force
- E. None of the Above

Storage and Distribution

73. The _____ water to the users of any water system includes the installation of storage and distribution facilities.

- A. Minimum required
- B. Commercial and industrial districts
- C. Cost of supplying
- D. On-going maintenance costs
- E. None of the Above

74. There are _____ associated with cleaning, repairing and replacing these facilities.

- A. Many factors
- B. Commercial and industrial districts concerns
- C. Supplying water issues
- D. On-going maintenance costs
- E. None of the Above

75. The distribution system must also _____ between the source and the customer's tap.

- A. Protect water quality
- B. Be aware of this phenomenon
- C. Provide pressure potential energy
- D. Maintain system integrity
- E. None of the Above

76. Proper construction is important in maintaining system integrity. Care must be taken that no foreign material is _____ during pipe laying operations.

- A. In the water distribution system
- B. Aware of this phenomenon
- C. Introduced into the system
- D. Maintaining integrity
- E. None of the Above

77. Pipe ends should be covered at the end of the work day or during _____.
- A. Interruptions of construction
 - B. Work
 - C. Potential delays
 - D. Maintaining system integrity
 - E. None of the Above

78. All _____ should be pressure tested and disinfected with a 5% chlorine solution such as household bleach before backfilling.
- A. Fire hydrants
 - B. Phenomenon's
 - C. Pressure zones
 - D. Well sites
 - E. None of the Above

Water Storage Facilities

79. Water storage facilities and tanks vary in _____. There are different types that are used in the water distribution systems, such as stand pipes, elevated tanks and reservoirs, hydropneumatic tanks and surge tanks.
- A. The water distribution system
 - B. Size, shape, and application
 - C. Pressure potential energy
 - D. None of the Above

Surge Tanks

80. What really causes _____ - ENERGY - when released in a confined space, such as a water distribution system.
- A. Break dances
 - B. Water hammer
 - C. Pressure potential energy
 - D. Water main breaks
 - E. None of the Above

81. Shock waves are created when hydrants, valves, or pumps are opened and closed quickly, _____ of moving water within the confined space of a piping system.
- A. Water distribution
 - B. Trapping the kinetic energy
 - C. Pressure potential energy
 - D. Maintaining flow
 - E. None of the Above

82. _____ can create a turbulence that travels at the speed of sound, seeking a point of release.
- A. Water distribution systems
 - B. These shock waves
 - C. Pressure potential energy
 - D. Maintaining water hammers
 - E. None of the Above

83. The _____ usually finds is an elevated tank, but the surge doesn't always find this release quickly enough. Something has to give, and oftentimes, it's your pipe fittings. Distribution operators are aware of this phenomenon! It's called WATER HAMMER.
- A. Water distribution system
 - B. Release the surge
 - C. Pressure potential energy
 - D. System integrity
 - E. None of the Above
84. A Surge tank should not be used for _____.
- A. Stored energy
 - B. Storing water high
 - C. Water storage
 - D. Storage be equal
 - E. None of the Above
85. The goal of the water tower or stand pipe is to _____ in the air, where it has lots of gravitational potential energy.
- A. Stored energy
 - B. Store water high
 - C. Park under it or hide during the day
 - D. Storage be equal
 - E. None of the Above
86. This _____ can be converted to pressure potential energy or kinetic energy for delivery to homes.
- A. Stored energy
 - B. Facility
 - C. Water storage
 - D. Power
 - E. None of the Above
87. Since height is everything, building 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 _____.
- A. Stored energy
 - B. Water up high
 - C. Water storage
 - D. Storage
 - E. None of the Above

Storage Reservoirs

88. Storage reservoirs allow the system to meet the fluctuations in demand described earlier. It is recommended that the volume of storage be equal to from one to three days of the system's ____.
- A. Stored energy
 - B. Store water high
 - C. Average daily use
 - D. Storage be equal
 - E. None of the Above
89. It is also recommended that storage reservoirs be located at a high enough elevation to allow the water to _____ to the distribution system.
- A. Store energy
 - B. Store water high
 - C. Flow by gravity
 - D. Storage be equal
 - E. None of the Above

90. 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 _____. Also, if applicable, some storage for fire protection should be provided.

- A. Pump failure
- B. Cross-connection
- C. Power failure
- D. Construction
- E. None of the Above

91. Reservoirs are also used as detention basins to provide the required chlorine contact time necessary to ensure the _____.

- A. Water tastes good
- B. Adequacy of disinfection
- C. Maximum potential
- D. Pressure
- E. None of the Above

92. As such, the contact time in a reservoir is _____ when the reservoir is constructed with a separate inlet and outlet pipe, preferably located on opposite sides of the reservoir and at different levels.

- A. Greatly improved
- B. On opposite sides
- C. Apparently degraded
- D. Acceptable
- E. None of the Above

93. Baffles inside the reservoir (walls, curtains, or spirals) increase the contact time by preventing the water from leaving the reservoir too quickly (known as “_____”).

- A. Partial contact
- B. Jamming
- C. Jumping
- D. Short-circuiting
- E. None of the Above

Steel Reservoirs

94. Steel reservoirs or tanks generally have lower construction and installation costs than concrete, but _____.

- A. Require more maintenance
- B. Are heavy
- C. Apparently larger
- D. Lower construction costs
- E. None of the Above

95. To protect against corrosion, the exterior should be kept cleaned and painted. Interiors of steel reservoirs are _____ with an epoxy or enamel-type finish.

- A. Filled
- B. Commonly coated
- C. Apparently sprayed
- D. Hand painted
- E. None of the Above

96. Some coal-tar linings used in the past have apparently degraded over time and are implicated in the release of small _____ into the stored water.

- A. Pieces of coal
- B. Amounts of solvents
- C. Objects
- D. Tastes
- E. None of the Above

97. Steel reservoirs are usually welded or bolted together and are manufactured in a variety of sizes. Small steel reservoirs can be _____ and then trucked and lifted into place.

- A. Heavy
- B. Carried
- C. Lifted
- D. Manufactured off-site
- E. None of the Above

98. Steel tanks should be inspected once a year and _____ every 5-7 years.

- A. Repainted
- B. Moved
- C. Changed
- D. Expanded
- E. None of the Above

99. Steel tank should also have cathodic protection and be screened to keep birds and insects out. The maintenance program for reservoir tanks should call for _____ for a complete inspection of the interior.

- A. Scuba divers
- B. Annual draining
- C. Bird inspection
- D. Certified operator
- E. None of the Above

100. Cleaning and disinfection _____ the reservoir or tank back in service is necessary.

- A. Is not my job at
- B. Is rarely completed
- C. Prior to placing
- D. Has no effect
- E. None of the Above

Disinfection by chlorine can be accomplished by one of three methods:

101. Fill the tank or reservoir with a 25 mg/1 _____ and leave it for 24 hours.

- A. Chlorine solution
- B. Chlorinated water
- C. HOCL
- D. HCL
- E. None of the Above

102. Fill the reservoir with a 50 mg/1 _____ and leave it for 3 hours.

- A. Chlorine solution
- B. Chlorinated water
- C. HOCL
- D. HCL
- E. None of the Above

103. Spray or brush on a 200 mg/1 _____ and allow it to remain for 3 hours.

- A. Chlorine solution
- B. Chlorinated water
- C. HOCL
- D. HCL
- E. None of the Above

104. The _____ shall be disposed of in a manner that will not have an adverse effect on the environment. Check with your state environmental, health or drinking water section.

- A. Chlorine solution
- B. Chlorinated water
- C. HOCL
- D. HCL
- E. None of the Above

105. The distribution system is the piping that delivers water to service connections. There are several types of piping material that can be used. Each has its _____.

- A. Problems
- B. Service maintenance
- C. Advantages and disadvantages
- D. Corrosion resistant exteriors
- E. None of the Above

106. The pipe material must have adequate strength to withstand external loads from backfill, traffic and earth movement, high burst strength to withstand high water pressure, smooth interior surfaces, _____ and tight joints.

- A. Mechanical glands
- B. Service maintenance
- C. Advantages and disadvantages
- D. Corrosion resistant exteriors
- E. None of the Above

Hydropneumatic Tank Section

Effects on the Water Supply

107. Whenever a tank must be taken out of _____, the operator should insure that the water pressure is maintained by other back-up tanks in the system.

- A. The trench
- B. Service for maintenance
- C. The pressure zone
- D. Operation
- E. None of the Above

108. If this is not possible, _____ should be given as much advance notice as possible, maintenance should be conducted during periods of low water demand, and the maintenance should be conducted as quickly as possible to reduce the time without water service.

- A. Operator(s)
- B. Superintendents
- C. Individuals
- D. Customers
- E. None of the Above

Troubleshooting Hydropneumatic Tank Problems

109. _____ should not hesitate to seek assistance if they are uncomfortable with a particular problem or situation.

- A. Operator(s)
- B. Superintendent(s)
- C. Individuals
- D. Interrupting the supply to other locations
- E. None of the Above

110. The goal is to provide a safe and consistent supply of water and this cannot always be accomplished by one or two _____ who may have many other responsibilities. Corrective action should only be performed by individuals who are trained and skilled in that particular area.

- A. Operator(s)
- B. Superintendent(s)
- C. Individuals
- D. Interrupting the supply to other locations
- E. None of the Above

111. The purpose of a(n) _____ is to provide air for the water system. It is the responsibility of the operator to perform basic troubleshooting of problems in hydropneumatic tank systems.

- A. Operator(s)
- B. Hydropneumatic tank
- C. Surge tank
- D. Supply tank
- E. None of the Above

112. The _____ has to decide, based on his/her own training and capability when a problem requires assistance from another operator or an outside expert.

- A. Operator(s)
- B. Superintendent(s)
- C. Individuals
- D. Interrupting the supply to other locations
- E. None of the Above

Distribution Valves

113. 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. Shutoff valves
- B. A frames
- C. Fire Hydrants
- D. Vaults or manholes
- E. None of the Above

114. _____ should be installed at intervals not greater than 5,000 feet in long supply lines, and 1,500 feet in main distribution loops or feeders.

- A. Valves
- B. A frames
- C. Fire Hydrants
- D. Vaults or manholes
- E. None of the Above

115. All branch mains connecting to feeder mains or feeder loops should have valves installed as close to the feeders as practical. In this way, _____ can be taken out of service without interrupting the supply to other locations.

- A. Valves
- B. A frames
- C. Fire Hydrants
- D. Branch mains
- E. None of the Above

116. In the areas of greatest water demand, or when the dependability of the distribution system is particularly important, _____ of 500 feet may be appropriate.

- A. Valves
- B. A frames
- C. Valve spacing
- D. Vaults or manholes
- E. None of the Above

117. At intersections of distribution mains, the number of _____ required is normally one less than the number of radiating mains.

- A. Fire Hydrants
- B. Mains
- C. Valves
- D. Vaults or manholes
- E. None of the Above

118. The _____ omitted from the line is usually the one that principally supplies flow to the intersection.

- A. Stoneline
- B. POE
- C. Valve
- D. Tie
- E. None of the Above

119. Shutoff _____ should be installed in standardized locations (that is, the northeast corner of intersections or a certain distance from the center line of streets), so they can be easily found in emergencies.

- A. Installing shutoff valves
- B. Interrupting the supply
- C. Valve(s)
- D. Vault or manhole
- E. None of the Above

120. All buried small and medium-sized valves should be installed in valve boxes. For large shutoff valves (about 30 inches in diameter and larger), it may be necessary to surround the valve operator or entire _____ within a vault or manhole to allow repair or replacement.

- A. Cu-de-sac
- B. Resetter
- C. Valve
- D. Bypass
- E. None of the Above

Classification of Valves

121. There are two major classifications of water _____: Rotary and Linear. Linear is a fancy word for up and down or blade movement.

- A. Hydrants
- B. Hammers
- C. Valve(s)
- D. Vaults or manholes
- E. None of the Above

Gate Valve Linear Valve Our primary Linear valve

122. The most common valve in the distribution system. Primarily used for _____. Should be exercised on annual basis.

- A. Installing
- B. Interrupting the supply
- C. Main line shut downs
- D. Exercising
- E. None of the Above

123. _____ are used when a straight-line flow of fluid and minimum flow restriction are needed.

- A. Wedge-shaped
- B. Pressure drop
- C. Gate valve
- D. Rotary
- E. None of the Above

124. _____ are so-named because the part that either stops or allows flow through the valve acts somewhat like a gate.

- A. Wedge-shaped
- B. Pressure drop
- C. Gate valve
- D. Rotary
- E. None of the Above

125. The gate is usually _____. When the valve is wide open the gate is fully drawn up into the valve bonnet.

- A. Wedge-shaped
- B. Pressure sensitive
- C. Flat
- D. Rounded
- E. None of the Above

126. This leaves an opening for flow through the valve the _____ as the pipe in which the valve is installed.

- A. Same size
- B. Pressure drop
- C. Pressure
- D. Bonnet
- E. None of the Above

127. Therefore, there is little _____ or flow restriction through the valve. Gate valves are not suitable for throttling purposes.

- A. Error
- B. Pressure drop
- C. Problem
- D. Velocity
- E. None of the Above

128. The _____ 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. Bonnet
- B. Specifically sized stem
- C. Creating a water hammer
- D. Control of flow
- E. None of the Above

129. Except as specifically authorized, gate valves _____.

- A. Should not shut the water off
- B. Should not be used for throttling
- C. Can create a water hammer
- D. Are jammed-tight
- E. None of the Above

130. Dr. Rusty Randall likes to listen to the Valve Key when shutting down a Gate valve. You will easily hear it sing as you _____ or leak by.

- A. Shut the water off
- B. Turn the key on after five turns
- C. Create a water hammer
- D. Jam it
- E. None of the Above

131. It is very easy to _____ with opening or closing a Gate valve. Always take your time when operating a gate valve or any valve.

- A. Shut the water off
- B. Get fired
- C. Create a water hammer
- D. Jam-tight
- E. None of the Above

Problems

Valve Jammed Open

132. Dr. Rusty recommends that opened valves should not be _____ on the backseat.

- A. Left
- B. Hammered
- C. Over pressurized
- D. Jammed-tight
- E. None of the Above

133. Always back the valve-off a _____ from the fully opened position.

- A. Three turns
- B. Torque
- C. Little
- D. Quarter turn
- E. None of the Above

134. Note that motor operated valves coast inevitably to the backseat by tripping on a limit switch. Valve should not be _____ on torque.

- A. Back seated
- B. Applied
- C. Worked
- D. Valve sealed
- E. None of the Above

Valve Jammed Closed

135. Variations in the temperature and/or pressure of the working fluid are often the cause of a valve _____.

- A. Back seated
- B. Torqued
- C. Failing to open
- D. Valve sealing
- E. None of the Above

136. _____ can occur in high temperature situations depending on the seat and wedge material, length of exposure and closing torque applied.

- A. Back seating
- B. Torque applying
- C. Thermal binding
- D. Valve sealing
- E. None of the Above

137. Thermal binding can cause galling on the _____ surfaces as well as on the guides.

- A. Port
- B. Stem
- C. Bonnet
- D. Valve sealing
- E. None of the Above

138. 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. Back seating
- B. Hammer toe
- C. Over-pressurization
- D. Valve sealing
- E. None of the Above

If Excessive Torque is Needed to Work the Valve

139. Variations in the temperature and/or pressure of the working fluid are often the cause of a valve _____.

- A. Seated
- B. Failing to open
- C. Exploding
- D. Sealing
- E. None of the Above

140. _____ can occur in high temperature situations depending on the seat and wedge material, length of exposure and closing torque applied.

- A. Back seating
- B. Implosion
- C. Thermal binding
- D. Valve sealing
- E. None of the Above

141. _____ can cause galling on the valve sealing surfaces as well as on the guides.

- A. Back seating
- B. Imploding
- C. Thermal binding
- D. Valve sealing
- E. None of the Above

142. 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. Back seating
- B. Imploding
- C. Thermal binding
- D. Over-pressurization
- E. None of the Above

143. Single direction sealing gate valves have a nameplate on the side of the valve that has a relief hole or _____. This should be the high pressure side when the valve is closed.

- A. Back seat
- B. Torque applied
- C. Thermal binding
- D. Pressure equalizer
- E. None of the Above

Globe Valve Rotary Valve

144. It is primarily used for _____, and works similar to a faucet. Rare to find in most distribution systems, but can be found at treatment plants.

- A. Flow regulation
- B. Standard procedures
- C. Renewing seat ring
- D. Economical flow control
- E. None of the Above

145. Always follow _____ when working on a valve.

- A. Flow regulation direction
- B. Standard safety procedures
- C. Lead Operator
- D. Flow control
- E. None of the Above

146. Most Globes have compact OS & Y type, bolted bonnet, rising stem, with _____ valves.

- A. Flow regulation
- B. Big
- C. Cla-Val
- D. Economical flow control
- E. None of the Above

147. A Check Valve spring loaded disc resulting with most advanced design features provides the ultimate in dependable, _____.

- A. Flow regulation
- B. Usage
- C. Stem wear
- D. Economical flow control
- E. None of the Above

148. Globe valves should usually be installed with the inlet below the valve _____.

- A. Stem
- B. Inlet
- C. Packing
- D. Seat
- E. None of the Above

149. For severe _____, the valve may be installed so that the flow enters over the top of the seat and goes down through it. Note that in this arrangement, the packings will be constantly pressurized.

- A. Stem use
- B. Throttling service
- C. Packing
- D. Wear
- E. None of the Above

150. If the valve is to be installed near throttling service, verify with an outside contractor or a skilled valve technician. Globe valves, per se, are not suitable for _____.

- A. Stem
- B. Inlet or wearing
- C. Packings
- D. Throttling service
- E. None of the Above

151. The valve should be welded onto the line with the disc in the fully closed position. Leaving it even partially open can cause distortion and leaking. Allow time for the weld to cool before operating the _____ the first time in the pipeline. The preferred orientation of a globe valve is upright.

- A. Bonnet
- B. Valve
- C. Packings
- D. Inlet or wearing
- E. None of the Above

152. The valve may be installed in other orientations, but any deviation from vertical is a compromise. Installation upside down is not recommended because it can cause dirt to accumulate in the _____.

- A. Stem
- B. Mechanism
- C. Packings
- D. Bonnet
- E. None of the Above

Globe Valve Problems and Solutions

153. If the valve _____ is improperly lubricated or damaged: disassemble the valve and inspect the stem.

- A. Stem
- B. Valves
- C. Packings
- D. Mechanism
- E. None of the Above

154. Acceptable deviation from theoretical centerline created by joining center points of the ends of the stem is 0.005"/ft of _____. Inspect the threads for any visible signs of damage.

- A. Stem
- B. Valves
- C. Packings
- D. Mechanism
- E. None of the Above

155. Small _____ less than 0.005" can be polished with an Emory cloth.

- A. Stem
- B. Valves
- C. Packings
- D. Upright
- E. None of the Above

156. Contact specialized services or an outside contractor if run-out is unacceptable or large grooves are discovered on the surface of the _____.

- A. Stem
- B. Valves
- C. Packings
- D. Upright
- E. None of the Above

157. If the valve _____ compression is too tight: Verify the packing bolt torque and adjust if necessary.

- A. Stem
- B. Valves
- C. Packing
- D. Skirts
- E. None of the Above

158. Foreign debris is trapped on threads and/or in the packing area: This is a common problem when _____ are installed outdoors in sandy areas and areas not cleaned before operating.

- A. Stem
- B. Valves
- C. Packings
- D. Mechanisms
- E. None of the Above

159. Always inspect threads and _____ area for particle obstructions, even seemingly small amounts of sand trapped on the drive can completely stop large valves from cycling.

- A. Stem
- B. Valves
- C. Packing
- D. Needles
- E. None of the Above

160. The valve may stop abruptly when a cycle is attempted. With the line pressure removed from the valve, disconnect the actuator, gear operator, or handwheel and inspect the drive nut, _____, bearings and yoke bushing.

- A. Stem
- B. Valves
- C. Packings
- D. Mechanism
- E. None of the Above

161. _____ should be cleaned with a lint-free cloth using alcohol, varsol or equivalent. All parts should be re-lubricated before re-assemble.

- A. Backflow assemblies
- B. Contaminated parts
- C. Valve components
- D. Handwheel
- E. None of the Above

162. If the valves are installed outdoors in a sandy area, it may be desirable to cover the _____ with jackets.

- A. Backflow assemblies
- B. Swing check
- C. Valves
- D. Mechanism
- E. None of the Above

163. 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. Backflow assemblies
- B. Swing check
- C. Valve components
- D. Mechanism
- E. None of the Above

164. If the valve's _____ is too small: Increasing the size of the handwheel will reduce the amount of torque required to operate the valve.

- A. Mechanism
- B. Swing check
- C. Valve components
- D. Handwheel
- E. None of the Above

165. If a larger _____ is installed, the person operating the valve must be careful not to over-torque the valve when closing it.

- A. Mechanism
- B. Swing check
- C. Valve components
- D. Handwheel
- E. None of the Above

Ball or Corporation Stop

166. Most commonly found on customer or water meters. All small _____ will have two Ball valves. It is the valve that is either fully on or fully off.

- A. Backflow assemblies
- B. Swing checks
- C. Valve components
- D. Vacuum breakers
- E. None of the Above

167. Most ball valves are the quick-acting type. They require only a 90-degree turn to either completely open or close the valve. However, many are operated by _____.

- A. Planetary gears
- B. Swing check
- C. Mechanisms
- D. Handwheel
- E. None of the Above

168. This type of gearing allows the use of a relatively small _____ and operating force to operate a fairly large valve. Always follow standard safety procedures when working on a valve.

- A. Operating time
- B. Swing check
- C. Valve components
- D. Handwheel
- E. None of the Above

169. The gearing does, increase the _____ for the valve.

- A. Operating time
- B. Swing check
- C. Valve components
- D. Handwheel
- E. None of the Above

170. Some ball valves also contain a swing check located within the ball to give the valve a _____ valve feature.

- A. Backflow assemblies
- B. Check
- C. Valve components
- D. Handwheel
- E. None of the Above

171. The _____ is often used for house appliance and industry appliance, the size range is 1/4"-4".

- A. Backflow assemblies
- B. Swing check
- C. Valve components
- D. Handwheel
- E. None of the Above

172. Brass or zinc is common for body, brass or iron for stem, brass or iron for ball, aluminum, stainless steel, or iron for handle including a _____ in the ball housing.

- A. Backflow assemblies
- B. Swing check
- C. Valve components
- D. Handwheel
- E. None of the Above

173. Flush the pipeline before installing the valve. Debris allowed to remain in the pipeline (such as _____, welding rods, bricks, tools, etc.) can damage the valve. After installation, cycle the valve a minimum of three times and re-torque bolts as required.

- A. Backflow assemblies
- B. Swing check
- C. Valve components
- D. Weld spatters
- E. None of the Above

174. Ensure that the valve is in the open position and the inside of the body bore of the valve body/body end is coated with a suitable _____.

- A. Spatter guard
- B. Swing check
- C. Valve components
- D. Handwheel
- E. None of the Above

Butterfly Valve Problems

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

176. 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

177. 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

178. 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

179. 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

180. 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

181. 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

182. 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

Backflow Prevention and Cross-Connection Principles

Atmospheric Pressure

183. 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

184. 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

185. 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

186. _____ at sea level is approximately 14.7 psi.

- A. Troposphere
- B. Atmospheric pressure
- C. Mercury column barometer
- D. Pressures
- E. None of the Above

187. 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

188. Below sea level, in excavations and depressions, _____ increases.

- A. Troposphere
- B. Atmospheric pressure
- C. Mercury column barometer
- D. Pressures
- E. None of the Above

189. _____ 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

190. 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

191. 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

192. 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

193. 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

194. 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

195. The _____ does not vary uniformly with altitude.

- A. Sea level
- B. Atmospheric pressure
- C. Mercury column barometer
- D. Aneroid barometer
- E. None of the Above

196. _____ 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

197. _____ 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

198. 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 psi.

- A. Absolute
- B. Pressure
- C. Gauge
- D. Vacuum
- E. None of the Above

199. Absolute pressure is the _____.

- A. Absolute
- B. Pressure
- C. Gauge
- D. Vacuum
- E. None of the Above

200. _____ 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

201. 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
- E. None of the Above

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

- A. Absolute
- B. Pressure
- C. Gauge
- D. Vacuum
- E. None of the Above

203. 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

204. 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
- E. None of the Above

205. 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

206. The weight of a cubic foot of water is 62.4 pounds per square foot. The base can be subdivided into 144-square inches with each subdivision being subjected to a _____ of 0.433 psig.

- A. Absolute
- B. Pressure
- C. Gauge
- D. Vacuum
- E. None of the Above

207. 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

208. 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

209. _____ 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

210. _____ 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

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

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

212. 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

213. _____, 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

214. _____ 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

215. 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

216. 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

217. _____ are almost incompressible.

- A. Fluids
- B. Hydraulics
- C. Liquids
- D. Water
- E. None of the Above

218. 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

219. Other _____ behave in about the same manner as water.

- A. Fluids
- B. Hydraulics
- C. Liquids
- D. Water
- E. None of the Above

220. 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

221. 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

222. Pressure is the _____ that pushes water through pipes.

- A. Volume
- B. Pressure
- C. Force
- D. Fluid acts
- E. None of the Above

223. 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

224. 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

225. _____ 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

226. _____ 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/in²) or grams per square centimeter (gm/cm²).

- A. Volume
- B. Pressure
- C. Force
- D. Fluid acts
- E. None of the Above

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

- A. Volume
- B. Pressure
- C. Force
- D. Fluid acts
- E. None of the Above

228. 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

229. 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

230. When the depth is doubled, the indicated _____ is doubled.

- A. Volume
- B. Pressure
- C. Force
- D. Fluid acts
- E. None of the Above

231. The pressure in a liquid is directly _____ to the depth.

- A. Volume
- B. Pressure
- C. Force
- D. Fluid acts
- E. None of the Above

232. 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

233. 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

234. 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

235. 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

236. 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

237. 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

238. 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

239. 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

240. 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

241. _____ of flow is an important consideration in sizing the hydraulic lines.

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

242. Volume and _____ of flow are often considered together.

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

243. 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

244. 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

245. 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

246. _____ 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

247. 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

248. 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

249. There are two types of _____ --backpressure and backsiphonage.

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

250. _____ 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

251. _____ 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

252. _____ 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

253. _____ (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

254. 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

255. 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

256. 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

257. 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

258. _____, 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

259. _____ 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

260. 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

261. 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

262. 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

263. 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
- E. None of the Above

264. 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

265. 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

266. 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

267. 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

268. 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

269. 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

270. 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

271. _____ 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

272. _____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

273. 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

274. 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

275. 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

276. 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

277. 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

Waterborne Pathogens and Disease Section

278. Bacteria, viruses, and protozoan that cause disease are known as _____.

- A. Pathogens
- B. Contaminated water
- C. Tuberculosis bacteria
- D. Cross-connections
- E. None of the Above

279. Most _____ are generally associated with diseases that cause intestinal illness and affect people in a relatively short amount of time, generally a few days to two weeks.

- A. Pathogens
- B. Contaminated water
- C. Tuberculosis bacteria
- D. Cross-connections
- E. None of the Above

280. They can cause illness through exposure to small quantities of _____ or food, or from direct contact with infected people or animals.

- A. Pathogens
- B. Contaminated water
- C. Tuberculosis bacteria
- D. Cross-connections
- E. None of the Above

How Diseases are Transmitted

281. Pathogens that may cause _____ through drinking water have one thing in common: they are spread by the fecal-oral or feces-to-mouth route.

- A. Pathogens
- B. Contaminated water
- C. Waterborne outbreaks
- D. Cross-connections
- E. None of the Above

282. Pathogens may get into water and spread when infected humans or animals pass the _____, viruses, and protozoa in their stool. For another person to become infected, he or she must take that pathogen in through the mouth.

- A. Pathogens
- B. Contaminated water
- C. Bacteria
- D. Cross-connections
- E. None of the Above

283. Waterborne pathogens are different from other types of pathogens such as the viruses that cause influenza (the flu) or the bacteria that cause _____.

- A. Pathogens
- B. Contaminated water
- C. Tuberculosis
- D. Cross-connections
- E. None of the Above

284. Influenza virus and _____ are spread by secretions that are coughed or sneezed into the air by an infected person.

- A. Pathogens
- B. Contaminated water
- C. Tuberculosis bacteria
- D. Cross-connections
- E. None of the Above

285. Human or animal wastes in watersheds, failing septic systems, failing sewage treatment plants or cross-connections of water lines with sewage lines provide the potential for contaminating water with _____.

- A. Pathogens
- B. Contaminated water
- C. Tuberculosis bacteria
- D. Cross-connections
- E. None of the Above

286. The water may not appear to be _____ because the feces has been broken up, dispersed, and diluted into microscopic particles.

- A. Pathogens
- B. Contaminated
- C. Tuberculosis bacteria
- D. Cross-connections
- E. None of the Above

287. These particles, containing _____, may remain in the water and be passed to humans or animals unless adequately treated.

- A. Pathogens
- B. Disease
- C. Tuberculosis bacteria
- D. Cross-connections
- E. None of the Above

288. Only proper treatment will ensure eliminating the spread of _____. In addition to water, other methods exist for spreading pathogens by the fecal-oral route. The foodborne route is one of the more common methods.

- A. Pathogens
- B. Disease
- C. Tuberculosis bacteria
- D. Cross-connections
- E. None of the Above

289. A frequent source is a food handler who does not wash his hands after a _____ and then handles food with "unclean" hands.

- A. Pathogens
- B. Disease
- C. Tuberculosis bacteria
- D. Bowel movement
- E. None of the Above

290. The individual who eats feces-contaminated food may become infected and ill. It is interesting to note the majority of _____ occur in the home, not restaurants.

- A. Pathogens
- B. Disease
- C. Foodborne diseases
- D. Fecal-oral route
- E. None of the Above

291. Day care centers are another common source for spreading pathogens by the _____. Here, infected children in diapers may get feces on their fingers, then put their fingers in a friend's mouth or handle toys that other children put into their mouths.

- A. Pathogens
- B. Disease
- C. Foodborne diseases
- D. Fecal-oral route
- E. None of the Above

292. The general public and some of the medical community usually refer to diarrhea symptoms as "_____."

- A. Pathogens
- B. Stomach flu
- C. Foodborne diseases
- D. Fecal-oral route
- E. None of the Above

293. Technically, influenza is an upper respiratory illness and rarely has diarrhea associated with it; therefore, _____ is a misleading description for foodborne or waterborne illnesses, yet is accepted by the general public.

- A. Pathogens
- B. Stomach flu
- C. Foodborne diseases
- D. Fecal-oral route
- E. None of the Above

Chain of Transmission

294. Water is contaminated with _____. This contamination may be of human or animal origin. The feces must contain pathogens (disease-causing bacteria, viruses or protozoa). If the human or animal source is not infected with a pathogen, no disease will result.

- A. Pathogens
- B. Stomach flu
- C. Foodborne diseases
- D. Contamination
- E. None of the Above

295. The pathogens must survive in the water. This depends on the temperature of the water and the length of time the _____ are in the water.

- A. Pathogens
- B. Stomach flu
- C. Foodborne diseases
- D. Contamination
- E. None of the Above

296. Some pathogens will survive for only a short time in water, others, such as Giardia or _____, may survive for months.

- A. Pathogens
- B. Stomach flu
- C. Foodborne diseases
- D. Contamination
- E. None of the Above

297. The pathogens in the water must enter the water system's intake and in numbers sufficient to infect people. The water is either not treated or inadequately treated for the _____ present.

- A. Pathogens
- B. Stomach flu
- C. Foodborne diseases
- D. Contamination
- E. None of the Above

298. A _____ must drink the water that contains the pathogen. Illness (disease) will occur. This chain lists the events that must occur for the transmission of disease via drinking water.

- A. Pathogens
- B. Stomach flu
- C. Susceptible person
- D. Contamination
- E. None of the Above

299. By breaking the chain at any point, the transmission of _____ will be prevented.

- A. Pathogens
- B. Stomach flu
- C. Disease
- D. Fecal-oral route
- E. None of the Above

Water Main Installation Procedures

300. 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

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