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This course contains general EPA's SDWA federal rule requirements. Please be aware that each state implements water / sampling procedures/safety/ environmental / building regulations that may be more stringent than EPA's regulations. Check with your state environmental/health agency for more information. These rules change frequently and are often difficult to interpret and follow. Be careful to be fully in compliance. Do not follow this course for proper compliance instruction.

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

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

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

Stage 2 DBP Rule Federal Register Notice – Rear of Topic 2

1. Which of the following rules is one part of the Microbial and Disinfection Byproducts Rules, which are a set of interrelated regulations that address risks from microbial pathogens and disinfectants/disinfection byproducts?

A. Groundwater Rule (GWR)
B. Compliance
C. The Stage 2 DBP rule
D. Long Term 2 Enhanced Surface Water Treatment Rule (LT2)
E. Interim Enhanced Surface Water Treatment Rule
F. None of the Above

2. _____ focuses on public health protection by limiting exposure to DBPs, specifically total trihalomethanes and five haloacetic acids, which can form in water through disinfectants used to control microbial pathogens.

A. Stage 2 DBPR
B. DBP exposure
C. The Stage 2 DBP rule
D. Long Term 2 Enhanced Surface Water Treatment Rule
E. Traditional disinfection practices
F. None of the Above

3. There are specific microbial pathogens, such as_____, which can cause illness, and are highly resistant to traditional disinfection practices.

A. Enteric virus(es)
B. Oocyst(s)
C. Cryptosporidium
D. C. perfringens
E. E. coli host culture
F. None of the Above

4. The Stage 1 Disinfectants and Disinfection Byproducts Rule and_____, promulgated in December 1998.

A. Major public health advances
B. The Stage 2 DBPR
C. This final rule
D. Amendments to the SDWA in 1996
E. Interim Enhanced Surface Water Treatment Rule
F. None of the Above

5. The Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) builds upon the _____to address higher risk public water systems for protection measures beyond those required for existing regulations.

A. Stage 2 DBPR
B. DBP exposure
C. Stage 1 DBPR
D. Long Term 2 Enhanced Surface Water Treatment Rule
E. Traditional disinfection practices
F. None of the Above

6. Which of the following rules along with the Long Term 2 Enhanced Surface Water Treatment Rule are the second phase of rules required by Congress?

A. Major public health advances
B. The Stage 2 DBPR
C. This final rule
D. Amendments to the SDWA in 1996
E. Primary or residual disinfectant
F. None of the Above

7. _____ will reduce potential cancer and reproductive and developmental health risks from disinfection byproducts (DBPs) in drinking water, which form when disinfectants are used to control microbial pathogens.

A. Stage 3 DBPR
B. DBP exposure
C. Stage 2 Disinfection Byproducts
D. Long Term 2 Enhanced Surface Water
E. Traditional disinfection practices
F. None of the Above

8. Which Rule strengthens public health protection for customers by tightening compliance monitoring requirements for two groups of DBPs, trihalomethanes (TTHM) and haloacetic acids (HAA5)?

A. Major public health advances
B. The Stage 3 DBPR
C. Stage 2 Disinfection Byproducts
D. Amendments to the SDWA in 1996
E. Primary or residual disinfectant
F. None of the Above

9. _____ targets systems with the greatest risk and builds incrementally on existing rules.

A. Stage 2 DBPR
B. The rule
C. The Stage 1 DBP rule
D. Long Term 2 Enhanced Surface Water Treatment Rule
E. Traditional disinfection practices
F. None of the Above

10. Which of the following rules is being promulgated simultaneously with the Long Term 2 Enhanced Surface Water Treatment Rule to address concerns about risk tradeoffs between pathogens and DBPs?

A. Major public health advances
B. The Stage 2 DBPR
C. This final rule
D. Amendments to the SDWA in 1996
E. Primary or residual disinfectant
F. None of the Above

What does the rule require?

11. Under this rule, systems will conduct an evaluation of their distribution systems, known as an Initial Distribution System Evaluation.

A. Stage 2 DBPR
B. DBP exposure
C. The Stage 1 DBP rule
D. Long Term 2 Enhanced Surface Water Treatment Rule
E. Traditional disinfection practices
F. None of the Above

12. Compliance with the maximum contaminant levels for two groups of disinfection byproducts (TTHM and HAA5) will be calculated for each monitoring location in the distribution system. This approach is referred to as the_____.

A. TTHM and HAA5
B. DBP MCLs
C. Locational running annual average (LRAA))
D. Disinfection byproducts (DBPs)
E. Trihalomethanes and haloacetic acids
F. None of the Above

13. Which of the following rules also requires each system to determine if they have exceeded an operational evaluation level, which is identified using their compliance monitoring results?

A. Stage 2 DBPR
B. DBP exposure
C. The Stage 1 DBP rule
D. Long Term 2 Enhanced Surface Water Treatment Rule
E. Traditional disinfection practices
F. None of the Above

Who must comply with the rule?

14. Entities potentially regulated by this missing term are community and nontransient noncommunity water systems that produce and/or deliver water that is treated with a primary or residual disinfectant other than ultraviolet light.

A. DBPs from chlorination
B. Chlorine and chloramine
C. Stage 2 DBPR
D. Classes of DBPs
E. TTHM and HAA5
F. None of the Above

15. _____ is a public water system that serves year-round residents of a community, subdivision, or mobile home park that has at least 15 service connections or an average of at least 25 residents.

A. Trailer park
B. A non-community water system
C. A community water system (CWS)
D. NTNCWS
E. A nontransient water system
F. None of the Above

16. Which of the following terms is a water system that serves at least 25 of the same people more than six months of the year, but not as primary residence, such as schools, businesses, and day care facilities?

A. Trailer park
B. A non-community water system
C. A community water system (CWS)
D. NTNCWS
E. A nontransient water system
F. None of the Above

Microbial Regulations

17. One of the key regulations developed and implemented by the United States Environmental Protection Agency (USEPA) to counter pathogens in drinking water is the Surface Water Treatment Rule which requires that a public water system, using surface water (or ground water under the direct influence of surface water) as its source, have sufficient treatment to reduce the source water concentration of Giardia and viruses by at least 99.9% and 99.99%, respectively.

A. True B. False

18. Which rule specifies treatment criteria to assure that these performance requirements are met; they include turbidity limits, disinfectant residual, and disinfectant contact time conditions?

A. Long Term 1 Rule
B. Maximum Contaminant Level Goal (MCLG)
C. Stage 1 Byproducts Rule
D. Surface Water Treatment Rule
E. Interim Enhanced Surface Water
F. None of the Above

Bromate

19. Fill in the missing information in order. _____ is a chemical that is formed when _____ used to disinfect drinking water reacts with naturally occurring _____ found in source water.

A. Bromate, Ozone, Chlorite
B. Bromide, Bromate, Ozone
C. Bromate, Bromate, Bromate
D. Hydrogen sulfide, Water, Nitrogen
E. Bromate, Ozone, Bromide
F. None of the Above

20. What is the annual average for bromate that was established in the Stage 1 Disinfectants/Disinfection Byproducts Rule?

A. 1 part per billion
B. 10 parts per billion
C. 100 parts per billion
D. 10 parts per million
E. 500 parts per million
F. None of the Above

Waterborne Pathogen Section - Introduction

21. Waterborne pathogens are primarily spread by ?

A. Fecal-oral, or feces-to-mouth, route
B. Dermal to fecal route
C. Oral to fecal route
D. Influenza route
E. Waterborne mishaps
F. None of the Above

22. When infected humans or animals pass the bacteria, viruses, and _____in their stool, pathogens may get into water and spread disease.

A. Fecal Coliform and E coli
B. Protozoa
C. Macroorganisms
D. Cryptosporidiosis
E. Bioslime
F. None of the Above

23. For another person to become infected, he or she must take the pathogen in through the mouth.

A. True B. False

24. Which term means that in nature it is different from other types of pathogens such as the viruses that cause influenza (the flu) or the bacteria that cause tuberculosis?

A. Fecal Coliform and E coli
B. Giardia lamblia
C. Microorganism(s)
D. Waterborne Pathogen(s)
E. Coliform bacteria
F. None of the Above

25. According to the text, _____are spread by secretions that are coughed or sneezed into the air by an infected person.

A. Fecal Coliform and E coli
B. Giardia lamblia
C. Microorganisms
D. Influenza virus and tuberculosis bacteria
E. Coliform bacteria
F. None of the Above

Safe Drinking Water Act (SDWA) Review

26. The states are expected to administer and enforce these regulations for public water systems (systems that either have 25 or more service connections or regularly serve an average of 50 or more people daily for at least 60 days each year).

A. True B. False

27. Public water systems must provide water treatment, ensure proper drinking water quality through monitoring, and provide public notification of contamination problems.

A. True B. False

Microbes - Towards the front of Topic 2

28. Coliform bacteria are common in the environment and are considered harmful.

A. True B. False

29. The presence of these bacteria in drinking water indicates that the water may be contaminated with germs that can cause disease.

A. True B. False

30. Microbes in human wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms and are caused by?

A. Fecal Coliform and E coli
B. Giardia lamblia
C. Microorganisms
D. Cryptosporidiosis
E. Coliform bacteria
F. None of the Above

31. What is the bacteria whose presence indicates that water may be contaminated with human or animal wastes?

A. Fecal Coliform and E coli
B. Protozoa
C. Thermophilic
D. Bac-T
E. Coliforinia bacteria
F. None of the Above

32. What is the parasite that enters lakes and rivers through sewage and animal waste? It causes cryptosporidiosis, a mild gastrointestinal disease.

A. Fecal Coliform and E coli
B. Giardia lamblia
C. Microorganisms
D. Cryptosporidiosis
E. Cryptosporidium
F. None of the Above

33. Giardia lamblia is a parasite that enters lakes and rivers through sewage and animal waste. It causes_____ .

A. Fecal Coliform and E coli
B. Gastrointestinal illness
C. Microorganisms
D. Cryptosporidiosis
E. Coliform bacteria
F. None of the Above

No. of Samples per System Population - Repeat Sampling

34. Repeat sampling replaces the old check sampling with a more comprehensive procedure to try to _____areas in the system.

A. Double check the routine sample
B. Identify problem
C. Originate the sampling location
D. Sample
E. Calculate MCL compliance
F. None of the Above

35. According to the text, whenever a Routine sample is total coliform or fecal coliform present, a set of repeat samples must be collected within _____ hours after being notified by the laboratory.

A. 12
B. 24
C. 48
D. 10
E. 2
F. None of the Above

The follow-up for repeat sampling is:

36. If only one _____ per month or quarter is required, four (4) repeat samples must be collected.

A. Routine sample
B. Surface water sample
C. Original sample
D. Sample
E. MCL sample
F. None of the Above

37. For systems collecting two (2) or more routine samples per month, three (3) _____ must be collected.

A. Routine samples
B. Surface water samples
C. Samplers
D. Repeat samples
E. MCL compliance calculations
F. None of the Above

38. Repeat samples must be collected from:
The original sampling location of the?

A. Routine sample
B. Surface water
C. Coliform present sample
D. Sample
E. MCL area
F. None of the Above

39. Within five (5) service connections upstream from?
A. Routine sample D. Sample
B. Surface water E. MCL location
C. Original sampling location F. None of the Above

40. Within five (5) service connections downstream from?
A. Routine sample site D. Sample area
B. Surface water location E. MCL compliance area
C. Original sampling location F. None of the Above

41. Samples should be taken elsewhere in the _____or at the wellhead, if necessary.
A. Sewage system D. Distribution system
B. Surface system E. MCL compliance calculation
C. Sampling location F. None of the Above

42. In a very small system if the system has only_____, the repeat samples must be collected from the same sampling location over a four-day period or on the same day.
A. Routine water D. One service connection
B. Surface water E. MCL compliance zone
C. One sampling location F. None of the Above

43. If a repeat sample is necessary, all repeat samples are included in the?
A. Routine sample D. Sample
B. Surface water E. MCL compliance calculation
C. Original sampling location F. None of the Above

44. Generally speaking, and depending on your State, if a system which normally collects fewer than five (5) routine samples per month has a coliform present sample; it must collect five (5) routine samples the following _____regardless of whether a MCL violation occurred or if repeat sampling was coliform absent.
A. Week D. Day
B. Hour E. Month or quarter
C. Immediately F. None of the Above

Positive or Coliform Present Results

45. According to the text, if you are notified of a positive test result you need to contact either the Drinking Water Program or your local county health department within 24 hours, or by the next business day after?
A. Results are reported to you D. Sample violation
B. Positive violation E. MCL compliance violation
C. Repeat sampling immediately F. None of the Above

46. Ideally speaking, your Drinking Water Program Agency should contract with health departments to provide _____to water systems.
A. Assistance D. Sample help
B. Harassment E. Compliance calculation
C. Hostility F. None of the Above

47. Hopefully after you have contacted an agency for assistance, you will be instructed as to the proper repeat sampling procedures and possible corrective measures for solving the problem. It is very important to initiate the _____as the corrective measures will be based on those results.
A. Storage and distribution D. Perform routine procedures
B. Repeat sampling immediately E. Corrective measures
C. Upgrading of the wellhead area F. None of the Above

Maximum Contaminant Levels (MCLs)
48. State and federal laws establish standards for drinking water quality. Under normal circumstances when these guidelines are being met, the water is somewhat safe to drink with little threat to human health.
A. True B. False

49. EPA had developed standards that are known as maximum contaminant levels (MCL). When a particular contaminant exceeds _____ a potential health threat may occur.
A. Coliform bacteria count D. HPC
B. MCL E. CFU
C. Standards F. None of the Above

50. This acronym generally expresses properties of the contaminants, risk assessments and factors, short term (acute) exposure and long term (chronic) exposure.
A. Coliform bacteria D. HPC
B. MCLs E. CFU
C. Standards F. None of the Above

51. When you as the operator take samples to ensure your water is in compliance with the MCL, there are two types of _____for coliform bacteria.
A. Coliform bacteria D. MCL violations
B. MCLs E. CFU
C. Standards F. None of the Above

52. The first type of_____ is for total coliform; the second is an acute risk to health violation characterized by the confirmed presence of fecal coliform or E. coli.
A. Coliform bacteria D. MCL violations
B. MCLs E. CFU
C. Standards F. None of the Above

Heterotrophic Plate Count HPC
53. Heterotrophic Plate Count (HPC) --- formerly known as the Standard Plate Count, is a procedure for estimating the number of live heterotrophic bacteria and measuring changes during water treatment and distribution in water or in swimming pools.
A. True B. False

54. Colonies may arise from pairs, chains, clusters, all of which are included in the _____.
A. Coliform bacteria units D. HPC units
B. MCLs units E. Colony-forming units
C. Standards F. None of the Above

Spread Plate Method

55. During this method, colonies are on the _____where they can be distinguished readily from particles and bubbles.

A. Agar surface
B. Surface growth area
C. Top
D. Bottom
E. Material
F. None of the Above

56. During the Spread Plate Method, colonies can be transferred quickly, and _____easily can be discerned and compared to published descriptions.

A. Colonies grow
B. Surface growth
C. Low counts
D. Heterotrophic organisms will grow
E. Colony morphology
F. None of the Above

Membrane Filter Method

57. This method permits testing large volumes of _____ and is the method of choice for low-count waters.

A. Colonies
B. Surface water
C. Low-turbidity water
D. Heterotrophic organisms
E. MCL
F. None of the Above

Heterotrophic Plate Count (Spread Plate Method)

58. Which of the following terms use inorganic carbon sources, this is in contrast to heterotrophic organisms utilize organic compounds as their carbon source?

A. Colonies
B. Surface growth
C. AGAR
D. Heterotrophic organisms
E. Autotrophic organisms
F. None of the Above

59. _____ provides a technique to quantify the bacteriological activity of a sample.

A. Colonies
B. Heat
C. Agar
D. Heterotrophic Plate Count
E. MCL
F. None of the Above

60. After an incubation period, a bacteriological colony count provides an estimate of the concentration of heterotrophs in the sample of interest. The R2A agar provides a medium that will support a large variety of?

A. Colonies
B. Bugs
C. Germs
D. Heterotrophic bacteria
E. MCL
F. None of the Above

Total Coliforms

61. This MCL is based on the presence of total coliforms, and compliance is on a daily or weekly basis, depending on your water system type and state rule.

A. True B. False

62. For systems that collect fewer than _____ samples per month, no more than one sample per month may be positive. In other words, the second positive result (repeat or routine) in a month or quarter results in a MCL violation.

A. 5
B. 10
C. 100
D. 200
E. 40
F. None of the Above

63. For systems that collect this amount or more samples per month, no more than five (5) percent may be Positive, check with your state drinking water section or health department for further instructions.

A. 5 D. 200
B. 10 E. 40
C. 100 F. None of the Above

Acute Risk to Health (Fecal coliforms and E. coli)

64. Which of the following terms to human health violation occurs if either one of the following happens? (Questions #65-68)

A. Routine analysis D. Human health violation
B. Drinking violation E. Fecal coliform or E. coli is present
C. Acute risk F. None of the Above

65. A routine analysis shows total coliform present and is followed by a repeat analysis which indicates?

A. Routine analysis D. Human health violation
B. Drinking violation E. Fecal coliform or E. coli present
C. Water penalty F. None of the Above

66. A routine analysis shows total and _____ is followed by a repeat analysis which indicates total coliform present.

A. Routine analysis D. Human health violations
B. Drinking water violation E. Fecal coliform or E. coli present
C. MCL violation F. None of the Above

67. Which of the following terms requires the water system to provide public notice via radio and television stations in the area?

A. Routine analysis violation D. Human health violation
B. Drinking water rule violation E. Acute health risk violation
C. MCL violation F. None of the Above

68. According to the text, the type of contamination can pose an immediate threat to human health and notice must be given as soon as possible, but no later than 24 hours after notification from your laboratory of the test results.

A. True B. False

Total Coliforms- Public Notice

69. A public notice is required to be issued by a water system whenever it fails to comply with an applicable MCL or_____, or fails to comply with the requirements of any scheduled variance or permit.

A. Routine analysis D. Human health violation
B. Drinking water rule E. Fecal coliform or E. coli present
C. Treatment technique F. None of the Above

70. Which term best describes what also is required whenever a water system fails to comply with its monitoring and/or reporting requirements or testing procedure?

A. Routine analysis D. Public notice
B. Drinking water rule E. Fecal coliform or E. coli present count
C. MCL violation F. None of the Above

71. There shall be certain information, be issued properly and in a timely manner, and contain certain_____ on the public notice.
A. Legal analysis D. Mandatory language
B. Drinking water rule information E. Fecal language
C. NOVs F. None of the Above

72. If there is a(n) _____ present to users, the timing and place of posting of the public notice may have different priorities.
A. Routine analysis D. Human health violation
B. Drinking water rule E. Fecal coliform or E. coli present
C. Acute risk F. None of the Above

The following are acute violations:
73. Which is violation of nitrate?
A. Presence D. Count(s)
B. MCL E. Acute violation(s)
C. MCLG F. None of the Above

74. Concerning total coliforms - when fecal coliforms or E. coli are present in the distribution system and is a violation of the?
A. Presence D. Count
B. MCL E. Acute violation(s)
C. MCLG F. None of the Above

75. Any outbreak of _____, as defined by the rules.
A. Total coliforms D. Radioactive bacteria
B. MCL E. Acute violations
C. Waterborne disease F. None of the Above

Conclusion of Waterborne Diseases
76. Because of emerging waterborne diseases, a new dimension to the global epidemiology of cholera-an ancient scourge-was provided by the emergence of?
A. Cholera D. Vibrio cholerae O139
B. Legionella pneumophila E. Campylobacter
C. Shigellosis F. None of the Above

77. Water authorities are reassessing the adequacy of current water-quality regulations because of outbreaks of chlorine-resistant?
A. Campylobacter D. Cryptosporidium
B. Pathogen E. Shigella dysenteriae
C. Pontiac fever F. None of the Above

78. All of the following have been associated with waterborne illnesses: hepatitis viruses (including hepatitis E virus), Campylobacter jejuni, microsporidia, cyclospora, _____, calciviruses and environmental bacteria like Mycobacterium spp, aeromonads, Legionella pneumophila and multidrug-resistant Pseudomonas aeruginosa.
A. Yersinia enterocolitica D. Emergence of disinfection resistant variants
B. Legionella pneumophila E. Campylobacter
C. Shigellosis F. None of the Above

79. Many different areas need to be investigated and understood to afford the water quality safeguards are not taken for granted. Areas of concern include life cycles, mechanisms of infection, protective or dormant states, emergence of disinfection resistant variants, _____, regrowth in distribution lines.

A. Optimal pathogen removal techniques
B. Disinfection process
C. Environmental and regulatory impact
D. Primary methods used for the disinfection
E. Extensive waterborne disease research
F. None of the Above

Salmonella Typhi

80. Humans are the reservoir for the Salmonella typhi pathogen, which causes diarrheal illness, and also known as?

A. Campylobacter
B. Pathogen
C. Pontiac fever
D. Typhoid fever
E. Shigella dysenteriae
F. None of the Above

81. Salmonella typhi**.** Prevention strategies for this pathogen include source protection, halogenation of water, and?

A. Adding cchlorine
B. Adding sodium chlorite
C. Adding KNO4
D. Adding NH4
E. Boiling water for one minute
F. None of the Above

82. Shigella species, in the United States two-thirds of the shigellosis in the U.S. is caused by Shigella sonnei, and the remaining one-third is caused by Shigella flexnieri.

A. True B. False

83. Campylobacter, the basics. It's a bacterium. It causes diarrheal illness. Campylobacter is primarily associated with poultry, animals, and humans.

A. True B. False

84. Vibrio cholerae, the basics. It's a virus. It causes diarrheal illness, also known as cholera. It is typically associated with aquatic environments, shell stocks, and human. Vibrio cholerae has also been associated with ship ballast water.

A. True B. False

85. Legionnaire's disease, which causes a severe pneumonia, and the second, _____, which is a nonpneumonia illness; it's typically an influenza-like illness, and it's less severe.

A. Campylobacter
B. Pathogen
C. Pontiac fever
D. Typhoid fever
E. Shigella dysenteriae
F. None of the Above

86. This pathogen is naturally found in water, both natural and artificial water sources.

A. Campylobacter
B. Legionella
C. Pontiac fever
D. Typhoid fever
E. Hydrodysenteriae
F. None of the Above

87. Legionella, prevention. Legionella in water systems. Hot water in tanks should be maintained between _____degrees Centigrade.

A. 81 to 100
B. 110 to 210
C. 75 – 212
D. 71 and 77
E. 75 and 85
F. None of the Above

Pseudomonas

88. Pseudomonas, the basics. It's a protozoon. It is caused by visual contact with water. It can cause dermatitis, which is an inflammation of the skin, or it can cause otitis, which is an infection of the ear.
A. True B. False

89. Which of the following terms is typically associated with soil and water?
A. Hepatitis A virus D. Pseudomonas
B. Diarrheal illness E. Waterborne outbreaks
C. Cryptosporidium F. None of the Above

90. Proper maintenance and disinfection of recreational water systems is important in preventing?
A. Pathogen D. Pseudomonas
B. Cryptosporidium E. Salmonellosis
C. Hepatitis A virus F. None of the Above

91. Hepatitis A, the basics. It's a virus. It causes inflammation of the liver, and the reservoir for _____ is humans.
A. Hepatitis A virus D. Hepatitis B
B. Diarrheal illness E. Waterborne outbreaks
C. Cryptosporidium F. None of the Above

92. Hepatitis A virus is resistant to combined chlorines, so it is important to have an adequate free chlorine residual. Fecal matter can shield _____ from chlorine.
A. Hepatitis A virus D. Hepatitis B
B. Diarrheal illness E. Waterborne outbreaks
C. Cryptosporidium F. None of the Above

Norovirus

93. Humans are the reservoir for the Norovirus. Prevention strategies for this pathogen include?
A. Maintaining water systems D. Containment protection
B. Source protection E. Internal protection
C. Chlorine monoxide F. None of the Above

Cryptosporidium

94. Cryptosporidium causes diarrheal illness known as?
A. Vomiting D. Cryptosporidiosis
B. Hemorrhagic colitis E. Salmonellosis
C. Diarrhea F. None of the Above

95. Cryptosporidium is typically associated with animals and humans, and it can be acquired through consuming fecally contaminated food, contact with fecally contaminated soil and water.
A. True B. False

96. Cryptosporidium, prevention. Prevention strategies for this pathogen include source protection. A CT value of 9,600 is required when dealing with fecally accidents. CT equals a concentration, in parts per million, while time equals a contact time in minutes.
A. True B. False

97. Filtration with an "absolute" pore size of one micron or smaller can eliminate _____. And reverse osmosis is known to be effective as well.
A. Pathogen D. Pseudomonas
B. Cryptosporidium E. Salmonellosis
C. Hepatitis A virus F. None of the Above

Giardia
98. Giardia prevention strategies for this pathogen include _____; filtration, coagulation, and halogenation of drinking water.
A. Maintaining hot water systems D. Primary protection
B. Source protection E. Secondary measurements
C. Sulfur dioxide F. None of the Above

99. Schistosomatidae, the basics. It is a parasite. It is acquired through dermal contact, cercarial dermatitis. It is commonly known as?
A. Swimmer's itch D. Pseudomonas
B. Beaver fever E. Salmonellosis
C. Hemorrhagic colitis F. None of the Above

100. Schistosomatidae prevention strategies for this pathogen include _____ or interrupting the life cycle of the parasite by treating birds with an antihelmetic drug.
A. Maintaining clarifiers D. Eliminating snails with a molluscicide
B. Source protection E. Boiling
C. Placing boric acid on berms F. None of the Above

E-Coli Section
101. Escherichia coli. There are several pathogenic strains of Escherichia coli, which are classified under enterovirulent E. coli. They are enterohemorrhagic, enteroinvasive, enterotoxigenic, enteropathogenic, and enteroaggregative.
A. True B. False

102. Escherichia coli. In its most severe form, it can cause?
A. Hemorrhagic colitis D. Pseudomonas
B. Escherichia coli O157:H7 E. Salmonellosis
C. Beaver fever F. None of the Above

More on Evolving Disinfection Rules – End of Topic 3
103. Chlorine is the most widely used water disinfectant due to its effectiveness and cost. Using chlorine as a drinking water disinfectant has prevented millions of water borne diseases, such as typhoid, cholera, dysentery, and diarrhea. Most states require community water systems to use chlorination.
A. True B. False

104. These compounds are called disinfection by-products (DBPs). All disinfectants form DBPs in one of two reactions: Chorine and chlorine-based compounds (halogens) react with organics in water causing the chlorine atom to substitute other atoms resulting in?
A. Chlorine D. Halogenated by-products
B. Organic sulfide(s) E. HOCl
C. Calcium carbonate F. None of the Above

105. Oxidation reactions, where chlorine oxidizes _____present in water.

A. Carbon
B. Surface water
C. Compounds
D. Chorine and chlorine-based compounds (halogens)
E. Secondary by-products
F. None of the Above

106. Which of the following rules requires systems using public water supplies from either surface water or groundwater under the direct influence of surface water to disinfect?

A. TTHM and HAA5 Rule
B. DBP MCLs Rule
C. A community water system (CWS)
D. Disinfection byproducts (DBPs) Rule
E. Surface Water Treatment Rule (SWTR)
F. None of the Above

107. The maximum contaminant level (MCL) for the SWTR disinfection set by EPA. At this time, an MCL is set for only_____, and proposed for additional disinfection byproducts.

A. TTHM and HAA5 Rule
B. DBP MCLs Rule
C. A community water system (CWS)
D. Disinfection byproducts (DBPs) Rule
E. Total Trihalomethanes
F. None of the Above

108. _____ apply to all community and non-community water systems using a disinfectant such as chlorine, chloramines, ozone and chlorine dioxide.

A. TTHM and HAA5 Rule
B. DBP MCLs Rule
C. A community water system (CWS)
D. Disinfection byproducts (DBPs) Rule
E. Disinfectants and Disinfection Byproducts (DBP)
F. None of the Above

109. The Long Term 2 Enhanced Surface Water Treatment Rule (LT2) rule applies to all water systems using _____under the influence of a surface water, as well as groundwater/surface water blends.

A. Surface water, groundwater
B. DBP MCLs Rule
C. A community water system (CWS)
D. Disinfection byproducts (DBPs) Rule
E. Total Trihalomethanes
F. None of the Above

110. Which of the following rules began in 2006 with the characterization of raw water Cryptosporidium and E. coli levels?

A. DBPs requirements
B. Disinfectants requirements
C. SDWA in 1996
D. Stage 1 Disinfectant and Disinfection Byproduct Rule
E. The LT2 requirements
F. None of the Above

111. _____ applies to all public water systems using groundwater.

A. Groundwater Rule (GWR)
B. Compliance
C. SDWA in 1996
D. Long Term 2 Enhanced Surface Water Treatment Rule (LT2)
E. Interim Enhanced Surface Water Treatment Rule
F. None of the Above

112. Which of the following rules require EPA to develop rules to balance the risks between microbial pathogens and disinfection byproducts?

A. Amendments to the SDWA in 1996
B. Disinfectants
C. SDWA in 1996
D. Stage 1 Disinfectant and Disinfection Byproduct Rule
E. The LT2 requirements
F. None of the Above

113. The Stage 1 Disinfectants and Disinfection Byproducts Rule and _____, announced in December 1998, are the first of a set of rules under the 1996 SDWA Amendments.

A. Groundwater Rule
B. Compliance
C. SDWA in 1996
D. Long Term 2 Enhanced Surface Water Treatment Rule (LT2)
E. Interim Enhanced Surface Water Treatment Rule
F. None of the Above

Public Health Concerns

114. While disinfectants are effective in controlling many microorganisms, they react with natural organic and inorganic matter in source water and distribution systems to form?

A. DBPs
B. Chlorine and chloramine
C. Stage 2 DBPR
D. Classes of DBPs
E. Ultraviolet light
F. None of the Above

115. Which of the following terms have also been shown to cause adverse reproductive or developmental effects in laboratory animals?

A. DBPs
B. Chlorine and chloramine
C. Stage 2 DBPR
D. Classes of DBPs
E. Ultraviolet light
F. None of the Above

116. More than 200 million people consume water that has been disinfected. Because of the large population exposed, health risks associated with _____, even if small, need to be taken seriously.

A. DBPs
B. Chlorine and chloramine
C. Stage 2 DBPR
D. Classes of DBPs
E. Ultraviolet light
F. None of the Above

117. _____ and Disinfection Byproducts Rule applies to all community and nontransient non-community water systems that treat their water with a chemical disinfectant.

A. Groundwater Rule (GWR)
B. The Stage 1 Disinfectants
C. SDWA in 1996
D. Long Term 2 Enhanced Surface Water Treatment Rule
E. Interim Enhanced Surface Water Treatment Rule
F. None of the Above

118. Which of the following rules and Disinfection Byproduct Rule updates and supersedes the 1979 regulations for total trihalomethanes?

A. DBPs
B. The Stage 1 Disinfectant
C. SDWA in 1996
D. Stage 1 Disinfectant and Disinfection Byproduct Rule
E. The LT2 requirements
F. None of the Above

SOC Section – Towards the rear of Topic 1

119. SOCs are known carcinogens (cancer causing). EPA has set Maximum Contaminant Levels (MCL) for 30 _____under the Safe Drinking Water Act.

A. Volatile Organic Compounds (VOCs)
B. Synthetic Organic Chemicals (SOCs)
C. Polychlorinated Biphenyls (PCBs)
D. Maximum Contaminant Levels (MCL)
E. Organic compounds
F. None of the Above

120. The Safe Drinking Water Act requires that all water sources of all public water systems be periodically monitored for regulated?

A. Volatile Organic Compounds (VOCs)
B. Synthetic Organic Chemicals (SOCs)
C. Polychlorinated Biphenyls (PCBs)
D. Maximum Contaminant Levels (MCL)
E. Organic compounds
F. None of the Above

121. Which of the following terms are very persistent in the environment, whether in soil or water?
A. Volatile Organic Compounds (VOCs) D. Maximum Contaminant Levels (MCL)
B. Synthetic Organic Chemicals (SOCs) E. Organic compounds
C. Polychlorinated Biphenyls (PCBs) F. None of the Above

122. Which of the following terms or "blue baby syndrome" from ingestion of elevated levels of nitrate or nitrite?
A. Methemoglobinemia D. Elevated levels of nitrate or nitrite
B. Most contaminants E. Chemical compounds
C. Three contaminant groups F. None of the Above

123. All public water systems must monitor for?
A. Valuable Organic Compounds (VOCs) D. Maximum Constant Levels (MCL)
B. Synthesis Organic Chemicals (SOCs) E. Nitrate and Nitrite
C. Polychlorinated Biphenyls (PCBs) F. None of the Above

Volatile Organic Compounds (VOCs)
VOCs Explained
124. Which of the following terms are organic chemicals that have a high vapor pressure at ordinary, room-temperature conditions?
A. Volatile Organic Compounds (VOCs) D. Maximum Contaminant Levels (MCL)
B. Synthetic Organic Chemicals (SOCs) E. Organic compounds
C. Polychlorinated Biphenyls (PCBs) F. None of the Above

125. Which of the following terms _____ are of VOCs?.
A. 3 organic chemicals D. Elevated odors
B. Most scents or odors E. Substances
C. Five contaminant groups F. None of the Above

126. Which of the following terms are regulated by law, especially indoors, where concentrations are the highest?
A. Anthropogenic VOCs D. Benzene
B. Aqueous solvents E. Methylene chloride
C. VOCs F. None of the Above

Chlorine Gas Section
127. When chlorine is added into the water stream, chlorine hydrolyzes into?
A. HCL D. Chlorine Acid
B. Sodium hypochlorite E. Hypochlorous acid (HOCl), and hydrochloric acid (HCl)
C. Bromoform F. None of the Above

128. When chlorine hydrolization occurs, it provides an active toxicant, _____, which is pH-dependent. In alkaline cooling systems, it readily dissociates to form the hypochlorite ion (OCl-).
A. HCl D. pH of 7.0 than at pH 8.5
B. HOCl E. the hypochlorite ion (OCl-)
C. High chlorine concentrations F. None of the Above

129. In alkaline conditions, this missing term becomes the predominant species and lacks the biocidal efficacy of the non-dissociated form.
A. Chlorine
B. Sodium hypochlorite
C. OCl-
D. Chlorine gas
E. Hypochlorous acid (HOCl), and hydrochloric acid (HCl)
F. None of the Above

130. Considerably more _____ is present at a pH of 7.0 than at pH 8.5.
A. HCl
B. HOCl
C. High chlorine concentrations
D. Alkanitinity
E. Hypochlorite ion (OCl-)
F. None of the Above

131. Chlorine can be non-selective, making it very sensitive to contamination from either cooling water makeup or from in-plant process leaks._____, organic acids and organic compounds, sulfides, iron and manganese all easily react with HOCl.
A. Chlorine
B. Sodium hypochlorite
C. Ammonia
D. Chlorine gas
E. Hypochlorous acid (HOCl), and hydrochloric acid (HCl)
F. None of the Above

132. What is the term that best describes the amount of chlorine needed to react with contamination species and it must be satisfied before active HOCl is available to provide a free chlorine residual?
A. Chlorine demand
B. HOCl
C. High chlorine concentration
D. Total residual
E. The hypochlorite ion (OCl-)
F. None of the Above

133. The combination of high chlorine demand in process-contaminated systems and the dissociation process in alkaline systems creates the need for greater chlorine feed to obtain the same microbial efficacy. This results in a higher concentration of HCl in the cooling system.
A. True B. False

134. Which of the following terms removes alkalinity, pH depression and system corrosion could occur?
A. HCl
B. HOCl
C. High chlorine concentrations
D. pH of 7.0 than at pH 8.5
E. The hypochlorite ion (OCl-)
F. None of the Above

135. _____ can damage or penetrate the passive oxide layer, leading to localized damage of the metal surface.
A. Chlorine
B. Sodium hypochlorite
C. The chloride ion (Cl^-)
D. Chlorine gas
E. Hypochlorous acid (HOCl), and hydrochloric acid (HCl)
F. None of the Above

136. High chlorine concentrations have also been shown to directly attack traditional organic-based corrosion inhibitors. When these inhibitors are "deactivated," the metal surface would then be susceptible to corrosion. Process Safety Management guidelines dictated by the U.S. Occupational Safety and Health Administration, discharge problems related to Chlorinated organic compounds such as trihalomethane, dezincification of admiralty brass and delignification of cooling tower wood are other significant concerns associated with the use of chlorine.
A. True B. False

Pathophysiology

137. As far as chlorine safety and respiratory protection, the intermediate _____of chlorine accounts for its effect on the upper airway and the lower respiratory tract.

A. Generation of free oxygen radicals
B. Vapor from Chlorine gas
C. Effects of Hydrochloric acid
D. Water solubility
E. The odor threshold for chlorine
F. None of the Above

138. According to the text, respiratory exposure to _____ may be prolonged because its moderate water solubility may not cause upper airway symptoms for several minutes.

A. Hydrochloric acid
B. Chlorine gas
C. The gas
D. The chemical species produced
E. Plasma exudation
F. None of the Above

139. Because chlorine gas is so dangerous, the odor threshold for chlorine is approximately?

A. 1 parts per million (ppm)
B. 3 parts per million (ppm)
C. 10 parts per million (ppm)
D. 3-5 parts per million (ppm)
E. 0.3-0.5 parts per million (ppm)
F. None of the Above

Mechanism of Activity

140. The mechanisms of cellular injury are believed to result from the oxidation of functional groups in cell components, from reactions with tissue water to form_____, and from the generation of free oxygen radicals.

A. Generation of free oxygen radicals
B. Chlorine acid
C. Hydrochloric acid
D. A caustic effect
E. Hypochlorous and hydrochloric acid
F. None of the Above

141. Chlorine gas feeds out of the cylinder through a gas regulator. The cylinders are on a scale that operators use to measure the amount used each day. The chains are used to prevent the tanks from falling over.

A. True B. False

142. Chlorine gas should be stored in vented rooms that have panic bar equipped doors.

A. True B. False

Solubility Effects

143. Which of the following terms is highly soluble in water?

A. Hydrochloric acid
B. H2SO4
C. Hypchloric acid
D. Sodium hypochlorite solution
E. Sulfuric Acid
F. None of the Above

144. Because it is highly water soluble, Hypochlorous acid has an injury pattern similar to?

A. Hydrochloric acid
B. H2SO4
C. Hypchloric acid
D. Sodium hypochlorite solution
E. Sulfuric Acid
F. None of the Above

145. _____ may account for the toxicity of elemental chlorine and hydrochloric acid to the human body.

A. Hydrochloric acid
B. H2SO4
C. Hypchloric acid
D. Hypochlorous acid
E. Sulfuric Acid
F. None of the Above

Early Response to Chlorine Gas

146. If you mix ammonia with chlorine gas, this compound reacts to form?

A. Hypochlorous acid
B. Chlorine gas
C. Hydrochloric acid
D. Sulfuric acid
E. Chloramine gas
F. None of the Above

147. The early response to the odor threshold for chlorine depends on the (1) concentration of chlorine gas, (2) duration of exposure, (3) water content of the tissues exposed, and (4) individual susceptibility.

A. True B. False

Immediate Effects

148. Which of the following answers is the best choice for the immediate effects of this substance's toxicity include acute inflammation of the conjunctivae, nose, pharynx, larynx, trachea, and bronchi?

A. Hydrochloric acid
B. Chlorine gas
C. Hypochlorous gas
D. Sulfuric acid
E. HOCL
F. None of the Above

Pathological Findings

149. Chlorine is a highly reactive gas.

A. True B. False

150. According to the text, treatment plants use _____to reduce water levels of microorganisms that can spread disease to humans.

A. HCl
B. HOCl
C. High chlorine concentrations
D. Chlorine
E. The hypochlorite ion (OCl-)
F. None of the Above

151. Chlorine gas is greenish yellow in color and very toxic. It is heavier than air and will therefore sink to the ground if released from its container. It is the toxic effect of Chlorine gas that makes it a good disinfectant, but it is toxic to more than just waterborne pathogens; it is also toxic to humans. It is a respiratory irritant and it can also irritate skin and mucus membranes.

A. True B. False

152. Chlorine gas is sold as a compressed liquid, which is amber in color. Chlorine, as a solid, is heavier (less dense) than water. If the chlorine liquid is released from its container, it will quickly return back to its liquid state.

A. True B. False

153. Different amounts of chlorine gas are used depending on the quality of water that needs to be treated. If the water quality is good, a higher concentration of chlorine gas will be required to disinfect the water if the contact time cannot be increased.

A. True B. False

Exposure

154. There is no threshold value for to sodium hypochlorite exposure. Various health effects occur after exposure to sodium hypochlorite. People are exposed to sodium hypochlorite by inhalation of aerosols. This causes coughing and a sore throat. After swallowing sodium hypochlorite, the effects are stomachache, a burning sensation, coughing, diarrhea, a sore throat and vomiting. Sodium hypochlorite on skin or eyes causes redness and pain.

A. True B. False

155. Sodium hypochlorite is poisonous for water organisms. It is mutagenic and very toxic when it comes in contact with Ammonium salts.
A. True B. False

Chemistry of Chlorination
156. The hypochlorite ion is a much weaker disinfecting agent than Hypochlorous acid, about 100 times less effective.
A. True B. False

157. According to the text, pH and temperature affect the ratio of hypochlorous acid to hypochlorite ions. As the temperature is decreased, the _____increases.
A. Reduction Ratio D. "CT" disinfection concept
B. CT actual E. Ratio of hypochlorous acid
C. Free chlorine residual F. None of the Above

158. Under normal water conditions, hypochlorous acid will also chemically react and break down into the hypochlorite ion.
A. True B. False

159. Temperature plays a small part in the acid ratio. Although the ratio of _____is greater at lower temperatures, pathogenic organisms are actually harder to kill.
A. Hypochlorous acid D. Total chlorine
B. The amount of chlorine E. pH value and temperature
C. Chlorine Demand F. None of the Above

160. If all other things were equal, _____ and a lower pH are more conducive to chlorine disinfection.
A. Lower pH D. Lower water temperature
B. Hypochlorous acid E. The hypochlorite ion
C. Higher water temperatures F. None of the Above

161. The disassociation of chlorine gas
(OCl -): HOCl H^+ + OCl^- Also expressed HOCl → H^+ + OCl^-
(hypochlorous acid) (hydrogen) (hypochlorite ion)
A. True B. False

162. All three forms of chlorine produce sodium hypochlorite when added to water.
A. True B. False

163. Hypochlorous acid is a strong acid but a weak disinfecting agent. The amount of hypochlorous acid depends on the pH and temperature of the water.
A. True B. False

Types of Residual
164. Which term is all the chlorine that is available for disinfection?
A. Chlorine residual D. Break-point chlorination
B. Chlorine demand E. Total chlorine
C. Free chlorine F. None of the Above

165. Total chlorine residual = free +_____.
A. Chlorine residual D. Combined chlorine residual
B. Chlorine demand E. Total chlorine residual
C. Free chlorine F. None of the Above

166. In water, there are always other substances (interfering agents) such as iron, manganese, turbidity, etc., which will combine chemically with the chlorine, these substances are called the?
A. Chlorine residual D. Break-point chlorination
B. Chlorine demand E. Total chlorine residual
C. Pathogen reduction F. None of the Above

167. According to the text, once chlorine molecules are combined with these interfering agents, they are not capable of disinfection._____ is much more effective as a disinfecting agent.
A. Chlorine residual D. Break-point chlorination
B. Chlorine demand E. Total chlorine residual
C. Free chlorine F. None of the Above

168. Either a total or a _____can be read when a chlorine residual test is taken,
A. Chlorine residual D. Break-point chlorination
B. Chlorine demand E. Total chlorine residual
C. Free chlorine residual F. None of the Above

169. _____ is a much stronger disinfecting agent, therefore, most water regulating agencies will require that your daily chlorine residual readings be of free chlorine residual.
A. Free chlorine D. "CT" disinfection concept
B. Total residual E. T10 of the process unit
C. Free chlorine residual F. None of the Above

170. Which of the following terms is where the chlorine demand has been satisfied, and any additional chlorine will be considered free chlorine?
A. Chlorine residual D. Break-point chlorination
B. Chlorine demand E. Total chlorine residual
C. Free chlorine F. None of the Above

Residual Concentration/Contact Time (CT) Requirements

171. Since monitoring for very low levels of pathogens in treated water is analytically very difficult, utilizing the _____ is recommended to demonstrate satisfactory treatment.
A. Free chlorine D. "CT" disinfection concept
B. Total residual E. T10 of the process unit
C. Free chlorine residual F. None of the Above

172. _____ = Concentration (mg/L) x Time (minutes)
A. CT D. Total chlorine
B. The amount of chlorine E. pH value and temperature
C. Chlorine Demand F. None of the Above

173. The effective reduction in pathogens can be calculated by reference to standard tables of required?
A. Free chlorine D. "CT" s
B. Total residual E. T10 of the process unit
C. Free chlorine residual F. None of the Above

174. The CT concept as developed by the United States Environmental Protection Agency (uses the combination of disinfectant residual concentration (mg/L) and the effective disinfection contact time (in minutes) to measure effective pathogen reduction.
A. True B. False

Calculation and Reporting of CT Data
175. Reduction Ratio should be reported, along with the appropriate pH, temperature, and?
A. Reduction Ratio D. Disinfectant residual
B. CT actual E. T10 of the process unit
C. Free chlorine residual F. None of the Above

176. Which of the following terms must be greater than 1.0 to be acceptable?
A. Reduction Ratio D. "CT" disinfection concept
B. CT actual E. T10 of the process unit
C. Free chlorine residual F. None of the Above

177. You can also calculate and record actual log reductions. Reduction Ratio = CT actual divide by?
A. Reduction Ratio D. "CT" disinfection concept
B. CT E. CT required
C. Free chlorine residual F. None of the Above

178. _____ shall be calculated daily, using either the maximum hourly flow and the disinfectant residual at the same time, or by using the lowest CT value if it is calculated more frequently.
A. Free chlorine D. "CT" disinfection concept
B. Total residual E. Disinfection CT values
C. Free chlorine residual F. None of the Above

Chlorine (DDBP)
179. These term means that chlorine is present as Cl, HOCl, and OCl^- is called _____, and that which is bound but still effective is _____.
A. Free available chlorine and Total D. Free available chlorine and Combined Chlorine
B. Free and Residual E. Combined chlorine and readily available
C. Break point and Free F. None of the Above

180. Chloramines are formed by reactions with?
A. Acid and Cl2 D. Folic Acid and Cl2
B. Ammonia and Cl2 E. THMs and Haploidic acid
C. THMS and Cl2 F. None of the Above

181. While testing chlorine disinfection process, you will need to understand one especially important feature is the ease of overdosing to create a "_____" concentration.
A. Free available chlorine and Total D. Free available chlorine and Combined Chlorine
B. Residual E. Combined chlorine and readily available
C. Break point and Free F. None of the Above

182. According to the text, this type of chlorine residual concentration residuals from 0.1 to 0.5 ppm.
A. Free available chlorine and Total D. Free available
B. Residual E. Combined chlorine and readily available
C. Break point and Free F. None of the Above

183. A typical chlorine residual is 2 ppm for this type of chlorine residual?
A. Free available chlorine and Total
B. Residual
C. Break point and Free
D. Combined Chlorine
E. Combined chlorine and Readily available
F. None of the Above

Chlorine By-Products

184. The most common chlorination by-products found in U.S. drinking water supplies are?
A. Chlorate and Chlorite
B. CO2 and H2SO4
C. Trihalomethanes (THMs)
D. Ammonia and THMS
E. Chloramines
F. None of the Above

The Principal Trihalomethanes are:

185. Chloroform, bromodichloromethane, chlorodibromomethane, and bromoform. Other less common chlorination by-products include the haloacetic acids and haloacetonitriles. The amount of THMs formed in drinking water can be influenced by a number of factors, including the season and the source of the water.
A. True B. False

186. THM concentrations are generally higher in winter than in summer, because concentrations of natural organic matter are greater and more chlorine is required to disinfect at colder temperatures.
A. True B. False

187. THM levels are also low when wells or large lakes are used as the drinking water source, because organic matter concentrations are generally low in these sources. The opposite — high organic matter concentrations and high THM levels — is true when rivers or other surface waters are used as the source of the drinking water.
A. True B. False

Health Effects

188. The available studies on health effects do not provide conclusive proof of a relationship between exposure to THMs and cancer or reproductive effects, but indicate the need for further research to confirm their results and to assess the potential health effects of chlorination by-products other than THMs.
A. True B. False

Risks and Benefits of Chlorine

189. Many cities utilize the use of ozone to disinfect their source water and to reduce formation of this parameter?
A. Chlorate and Chlorite
B. CO2 and H2SO4
C. Trihalomethanes (THMs)
D. Ammonia and THMS
E. Chloramines
F. None of the Above

190. _____ is a highly effective disinfectant; it breaks down quickly, so that small amounts of _____ or other disinfectants must be added to the water to ensure continued disinfection as the water is piped to the consumer's tap.
A. Ozone, Chlorine
B. UV, Chlorine
C. Chlorite, Chlorine
D. Chlorine Dioxide, Chlorine
E. Chloramines, Chlorine
F. None of the Above

191. Modifying water treatment facilities to use _____ can be expensive, and _____ treatment can create other undesirable by-products that may be harmful to health if they are not controlled (e.g., bromate).
A. Ozone D. Chlorine Dioxide
B. UV E. Chloramines
C. Chlorite F. None of the Above

192. Which term is a weaker disinfectant than chlorine, especially against viruses and protozoa; however, they are very persistent and, as such, can be useful for preventing re-growth of microbial pathogens in drinking water distribution systems?
A. Ozone D. Chlorine Dioxide
B. UV E. Chloramines
C. Chlorite F. None of the Above

193. Chlorine dioxide can be an effective disinfectant, but it forms?
A. Chlorate and Chlorite D. Ammonia and THMS
B. CO2 and H2SO4 E. Chloramines
C. THMS F. None of the Above

194. It is extremely important that water treatment plants ensure that methods used to control chlorination by-products do not compromise the effectiveness of water disinfection.
A. True B. False

Disinfection Byproduct Regulations Summary
195. Regulators and the general public have focused greater attention on potential health risks from chemical contaminants in drinking water. One such concern relates to disinfection byproducts (DBPs), chemical compounds formed unintentionally when chlorine and other disinfectants react with certain inorganic matter in water.
A. True B. False

196. Water system managers may also consider switching from chlorine to alternative disinfectants to reduce formation of THMs and HAAs.
A. True B. False

197. All chemical disinfectants form some DBPs. Much less is known about the byproducts of these alternatives than is known about chlorination byproducts. Furthermore, each disinfection method has other distinct advantages and disadvantages.
A. True B. False

Ozone
198. Which compound is obtained by passing a flow of air or oxygen between two electrodes that are subjected to an alternating current in the order of 10,000 to 20,000 volts?
A. Chloriamine D. Oxygen and nascent oxygen
B. Liquid Ozone E. O2
C. Ozone F. None of the Above

199. This compound is a light blue gas at room temperature.
A. Chloriamine D. Oxygen and nascent oxygen
B. Liquid Ozone E. O2
C. Ozone F. None of the Above

200. Ozone has a _____similar to that sometimes noticed during and after heavy electrical storms. In use, ozone breaks down into oxygen and nascent oxygen.
A. Self-policing pungent odor
B. THMs
C. Light blue gas
D. Oxygen and nascent oxygen
E. Strongest oxidizing agent
F. None of the Above

201. Ozone does not form chloramines or _____, and while it may destroy some THMs, it may produce others when followed by chlorination.
A. Carcinogens
B. THMs
C. Complete disinfectant
D. Oxygen and nascent oxygen
E. Flocculation and coagulation
F. None of the Above

202. Ozone falls into the same category as other disinfectants in that it can produce_____.
A. Carcinogens
B. THMs
C. DBPs
D. Oxygen and nascent oxygen
E. Strongest oxidizing agent
F. None of the Above

203. This compound is very unstable and can readily explode. As a result, it is not shipped and must be manufactured on-site.
A. Chloriamine
B. Liquid Ozone
C. Ozone
D. Oxygen and nascent oxygen
E. O2
F. None of the Above

204. Each water has its own_____, in the order of 0.5 ppm to 5.0 ppm. Contact time, temperature, and pH of the water are factors to be determined.
A. Carcinogens
B. THMs
C. Ozone demand
D. Oxygen and nascent oxygen
E. Strongest oxidizing agent
F. None of the Above

Alternate Disinfectants Section Summary
Chloramines
205. This compound is a very weak disinfectant for Giardia and virus reduction. It is recommended that it be used in conjunction with a stronger disinfectant. It is best utilized as a stable distribution system disinfectant.
A. Chlorine
B. Chloramine
C. Ozone
D. Oxygen and nascent oxygen
E. Strongest oxidizing agent
F. None of the Above

206. In the production of chloramines, the ammonia residuals in the finished water, when fed in excess of stoichiometric amount needed, should be limited to inhibit growth of?
A. Cryptosporidium
B. Chlorine-based disinfectants
C. Giardia lamblia
D. An emerging parasitic protozoan pathogen
E. Nitrifying bacteria
F. None of the Above

Chlorine Dioxide
207. Chlorine dioxide may be used for either taste and odor control or as?
A. Post disinfectant
B. ClO_2/chlorite/chlorate
C. An oxidant
D. Total residual oxidants
E. A pre-disinfectant
F. None of the Above

Barometric Loop – Front of Topic 7

208. According to the text, the barometric loop, will provide protection against backsiphonage, is based upon the principle that a water column, at sea level pressure, will not rise above 33.9 feet. In general, barometric loops are locally fabricated, and are 35 feet high.

A. True B. False

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

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

210. Gauge pressure is simply the pressure read on the gauge. If there is no pressure on the gauge other than atmospheric, the gauge will read zero.

A. True B. False

Pump Definitions

211. Which of the following definitions is a barrier that separates stages of a multi-stage pump?

A. Gasket
B. Keyway
C. Bearing
D. Inter-stage diaphragm
E. Seal
F. None of the Above

212. Which of the following definitions is a rectangular piece of metal that prevents the impeller from rotating on the shaft?

A. Gasket
B. Key
C. Energy
D. Bearing
E. Seal
F. None of the Above

213. Which of the following definitions is the area on the shaft that accepts the key?

A. Gasket
B. Keyway
C. Energy
D. Inter-stage diaphragm
E. Kinetic energy
F. None of the Above

Pumps

214. Pumps are excellent examples of?

A. Hydrostatics
B. Quasi-static
C. Oscillating diaphragm
D. Multi-stage pumps
E. Complicated part
F. None of the Above

215. Pumps are of two general types, _____ or positive displacement pumps, and pumps depending on dynamic forces, such as centrifugal pumps.

A. Hydrostatic
B. Quasi-static
C. Oscillating diaphragm
D. Hydrostatic considerations
E. Complicated part
F. None of the Above

216. Positive displacement pumps have a piston (or equivalent) moving in a closely-fitting cylinder and forces are exerted on the fluid by motion of the piston.

A. True B. False

Pump Categories

217. The key to understanding a pumps operation is that a pump is to move water and generate the _____ we call pressure.

A. Centrifugal pump(s)
B. Impeller blade(s)
C. Delivery force
D. Diaphragm pump(s)
E. Cylindrical pump housing
F. None of the Above

218. Pump operation like with a centrifugal pump — pressure is not referred to in pounds per square inch but rather as the equivalent in elevation, called?

A. Inward force
B. Head
C. Viscous drag pump
D. Center of the impeller
E. Incompressible fluid
F. None of the Above

Basic Water Pump

219. According to the text, the centrifugal pumps work by spinning water around in a circle inside a?

A. Vortex
B. Cylinder
C. Viscous drag pump
D. Center of the impeller
E. Cylindrical pump housing
F. None of the Above

220. In a centrifugal pump, as water drifts outward between the _____ of the pump, it must move faster and faster because its circular path is getting larger and larger.

A. Centrifugal pump(s)
B. Impeller blade(s)
C. Bernoulli's equation
D. Diaphragm pump(s)
E. Cylindrical pump housing
F. None of the Above

Venturi (Bernoulli's law):

221. Which of the following terms best describes a pump whose impeller has no vanes but relies on fluid contact with a flat rotating plate turning at high speed to move the liquid.

A. Submersible
B. Blower
C. Viscous drag pump
D. Rotary pump
E. Bicycle pump
F. None of the Above

Types of Water Pumps

222. The water production well industry almost exclusively uses Turbine pumps, which are a type of centrifugal pump.

A. True
B. False

223. The most common type of water pumps used for municipal and domestic water supplies are?

A. Axial flow
B. Submersible
C. Rotary pump
D. Turbine pump(s)
E. Variable displacement pumps
F. None of the Above

There are three main types of diaphragm pumps:

224. In the first type, the _____with one side in the fluid to be pumped, and the other in air or hydraulic fluid.

A. Vapor bubbles
B. Chamber pressure
C. Drive shaft
D. Volumetric positive displacement
E. Diaphragm is sealed
F. None of the Above

225. _____ pressure later increases from decreased volume (the diaphragm moving down), the fluid previously drawn in is forced out.
A. Vapor bubbles
B. Chamber
C. Drive shaft
D. Volumetric positive displacement
E. Diaphragm
F. None of the Above

Common Hydraulic Terms
226. Which of the following definitions is the engineering science pertaining to liquid pressure and flow?
A. Pressure, Absolute
B. Pressure
C. Hydraulics
D. Hydrokinetics
E. Pascal's Law
F. None of the Above

227. _____ is the engineering science pertaining to the energy of liquid flow and pressure.
A. Pressure, Absolute
B. Pressure
C. Hydraulics
D. Hydrokinetics
E. Pascal's Law
F. None of the Above

228. Which of the following definitions is the pressure applied to a confined fluid at rest is transmitted with equal intensity throughout the fluid?
A. Pressure, Absolute
B. Pressure
C. Hydraulics
D. Hydrokinetics
E. Pascal's Law
F. None of the Above

Types of Pumps
229. The family of pumps comprises a large number of types based on application and capabilities. The two major groups of pumps are?
A. Plunger and bicycle pump
B. Mixed flow and single
C. Dynamic and radical
D. Discharge and radical displacement
E. Dynamic and positive displacement
F. None of the Above

Centrifugal pumps are classified into three general categories:
230. Which of the following terms is a centrifugal pump in which the pressure is developed wholly by centrifugal force?
A. Cylinder
B. Chamber
C. Radial flow
D. Cavity
E. Positive Displacement Pump(s)
F. None of the Above

231. Which of the following terms is a centrifugal pump in which the pressure is developed partly by centrifugal force and partly by the lift of the vanes of the impeller on the liquid?
A. Plunger pump
B. Mixed flow
C. Dynamic
D. Discharge tube
E. Roots blower
F. None of the Above

232. _____ is a centrifugal pump in which the pressure is developed by the propelling or lifting action of the vanes of the impeller on the liquid.
A. Axial flow
B. Chamber
C. Radial flow
D. Cavity
E. Positive Displacement Pump(s)
F. None of the Above

Impeller

233. Which of the following terms is a rotating component of a centrifugal pump, which transfers energy from the motor that drives the pump to the fluid being pumped by accelerating the fluid outwards from the center of rotation?

A. Volute
B. Driver
C. Driveshaft
D. Propellers and pumps
E. Impeller
F. None of the Above

234. The velocity achieved by the impeller transfers into pressure when the outward movement of the fluid is confined by the pump casing.

A. True B. False

235. Impellers are usually short cylinders, vanes to push the fluid radically, and a splined center to accept a?

A. Cavitation
B. Turbulence
C. Driveshaft
D. Propellers and pumps
E. Center of rotation
F. None of the Above

Key Pump Words

236. Which of the following key terms is a measure of a liquid's resistance to flow. i.e.: how thick it is?

A. NPSH
B. Specific Speed
C. Viscosity
D. S.G.: Specific gravity
E. Vapor Pressure
F. None of the Above

237. _____ is the weight of liquid in comparison to water at approx. 20 degrees C.

A. NPSH
B. Specific Speed
C. Viscosity
D. S.G.: Specific gravity
E. Vapor Pressure
F. None of the Above

238. Which of the following key terms is a number which is the function of pump flow, head, efficiency?

A. NPSH
B. Specific Speed
C. Viscosity
D. S.G.: Specific gravity
E. Vapor Pressure
F. None of the Above

Submersible Pumps

239. Submersible pumps are in essence very similar to?

A. Cased wells
B. Turbine pumps
C. Pump's intake
D. Pump bowl assembly
E. VHS or VSS motors
F. None of the Above

240. The pump shaft has a keyway in which the splined motor end shaft inserts, the motor is often bolted to the?

A. Motor
B. Pump shrouds
C. Canned configurations
D. Pump housing
E. Number of stages
F. None of the Above

241. The pump's intake is located between the motor and the pump and is normally screened to prevent sediment from entering the pump and damaging the?
A. Impellers D. Pump bowl assembly
B. Shroud E. VHS or VSS motors
C. Pump's intake F. None of the Above

Understanding the Operation of a Vertical Turbine Pump
242. Deep well turbine pumps are adapted for use in cased wells or where the water surface is below the practical limits of a?
A. Cased wells D. Pump bowl assembly
B. Shroud E. Centrifugal pump
C. Pump's intake F. None of the Above

243. Which of the following terms are also used in surface water systems?
A. Turbine pumps D. Pump housing
B. Pump shrouds E. Number of stages
C. Canned configurations F. None of the Above

244. According to the text, the turbine pump has three main parts: (1) the_____, (2) the shaft and column assembly and (3) the pump bowl assembly.
A. Head assembly D. Pump bowl assembly
B. Shroud E. VHS or VSS motors
C. Pump's intake F. None of the Above

Stuffing Box Adjustment
245. On the initial starting, it is very important that the packing gland not be tightened too much.
A. True B. False

246. To prevent damage to the shaft and shortening of the packing life, new packing must be "_____" properly
A. Packing gland D. Lineshaft bearings
B. Run in E. Variances
C. Impending trouble F. None of the Above

247. The stuffing box must be allowed to leak for?
A. Periodic inspection D. Any deviation in performance
B. Proper operation E. Air to be released
C. Correct alignment F. None of the Above

Centrifugal Pump
248. A Centrifugal pump is a machine, that imparts energy to a fluid. This energy infusion can cause a liquid to flow, rise to a higher level, or both.
A. True B. False

249. The centrifugal pump is an extremely simple machine. It is a member of a family known as rotary machines and consists of two basic parts: 1) the rotary element or impeller and 2) the stationary element or?
A. Staging D. Lantern ring spacer
B. Eye E. Casing (volute)
C. Pressure F. None of the Above

250. In operation, a centrifugal pump "_____" liquid out of the impeller via centrifugal force.
A. Web of the ring D. Vapor bound
B. Slings E. Single-stage pump
C. Pump shaft F. None of the Above

Centrifugal Pump
251. As the impeller rotates, it sucks the liquid into the center of the pump and throws it out under pressure through the?
A. Web of the ring D. Vapor bound
B. Outlet E. Single-stage pump
C. Pump shaft F. None of the Above

252. The casing that houses the impeller is referred to as the_____, the impeller fits on the shaft inside.
A. Staging D. Lantern ring spacer
B. Eye E. Recirculation lines
C. Volute F. None of the Above

NPSH - Net Positive Suction Head
253. NPSH (a) must exceed NPSH(r) to allow pump operation without cavitation.
A. True B. False

254. The vapor pressure of water at 95 degrees C is 84.53 kPa, there was enough suction to contain the vapor, but once the atmospheric pressure dropped at the higher elevation, the vapor was able to escape.
A. True B. False

255. NPSH(r) is the Net Positive Suction Head Required by the pump, which is read from the?
A. Pump suction D. Pump performance curve
B. Speed E. Hydraulic efficiency
C. Suction conditions F. None of the Above

Affinity Laws
256. The centrifugal pump is a very capable and?
A. Centrifugal Pump D. Atmospheric pressure
B. Transmit tension E. Flexible machine
C. Most economical F. None of the Above

257. The performance of a centrifugal pump can be varied by changing the _____ or its rotational speed.
A. Pump suction D. Rotational speed
B. Speed E. Impeller diameter
C. Suction conditions F. None of the Above

258. Reducing the impeller diameter is probably the most common change and is usually the?
A. Most economical D. Atmospheric pressure
B. Transmit tension E. Laws of Affinity
C. Most economical F. None of the Above

259. The speed can be altered by changing _____or by changing the speed of the driver.
A. Pump suction D. Rotational speed
B. Pulley diameters E. Hydraulic efficiency
C. Suction conditions F. None of the Above

260. Which of the following terms or change in impeller diameter, the Laws of Affinity give results that are approximate?
A. Centrifugal Pump D. Speed change
B. Transmit tension E. Laws of Affinity
C. Most economical F. None of the Above

261. According to the text, the discrepancy between the _____and the actual values obtained in test are due to hydraulic efficiency changes that result from the modification.
A. Calculated values D. Rotational speed
B. Speed E. Hydraulic efficiency
C. Suction conditions F. None of the Above

Suction Lift
262. According to the text, atmospheric pressure at sea level is called absolute pressure (PSIA) because it is a measurement using absolute zero (a perfect vacuum) as a base.
A. True B. False

263. A pump cannot push or "force" a liquid up its suction pipe because liquids do not exhibit tensile strength.
A. True B. False

264. The vapor pressure of a liquid is the pressure necessary to keep the liquid from vaporizing at a given temperature.
A. True B. False

Cavitation - Two Main Causes:
265. Due to low pressure the _____and higher pressure implodes into the vapor bubbles as they pass through the pump, causing reduced performance and potentially major damage.
A. Pump suction D. Water vaporizes (boils)
B. Speed E. Hydraulic efficiency
C. Suction conditions F. None of the Above

Affinity laws
266. The power changes by the cube of the difference.
A. i.e.: double the speed / multiply the pressure by 4
B. i.e.: double the speed / double the flow
C. i.e.: double the speed / multiply the power by 8
D. None of the Above

Pump Casing
267. The most common type of centrifugal pump is an end suction pump.
A. True B. False

Impeller

268. In most centrifugal pumps, the impeller looks like a number of cupped vanes on blades mounted on?

A. Radial flow impellers
B. Axial flow impellers
C. Parallel to the shaft
D. Cupped vanes on blades
E. Disc or shaft
F. None of the Above

Motor and Pump Calculations

269. Which of the following terms is caused by friction in the pipes, fittings, and system components?

A. Static head
B. Pump discharge head
C. Friction Loss
D. System or dynamic head
E. Negative suction head
F. None of the Above

Suction Head is Measured the Same Way.

270. If the liquid level is above the pump centerline, that level is a positive suction head.

A. True B. False

Motor, Coupling and Bearing Section

271. The purpose of the bearing house is to hold the shaft firmly in place, yet allow it to rotate.

A. True B. False

272. The pump assembly can only be a vertical set-up.

A. True B. False

A-C Motors

273. The synchronous type of A-C motor is used in smaller horsepower sizes, usually above 100 HP.

A. True B. False

274. The squirrel cage motor provides a relatively constant speed.

A. True B. False

Motor Starters

275. All electric motors, except very large ones are equipped with starters, either full voltage or reduced voltage.

A. True B. False

276. The purpose of the _____is to prevent the load from coming on until the amperage is low enough.

A. Bubbler pipe
B. Manual pump controls
C. Reduced voltage starter
D. Totally enclosed motors
E. Reduced voltage starter
F. None of the Above

Common Pump and Troubleshooting Questions

277. When cavitation occurs, immediate action must be taken to prevent the impeller, pump and motor bearings, and piping from being damaged.

A. True B. False

278. Cavitation is defined as the phenomenon of formation of _____of a flowing liquid in a region where the pressure of the liquid falls below its vapor pressure.
A. Vapor bubbles D. Turbulent flows
B. Vibration monitoring E. Low-pressure area
C. Suction nozzle F. None of the Above

279. Cavitation can be identified by a noise that sounds like marbles or rocks are being pumped.
A. True B. False

Backflow/Cross-Connection Section – Topic 5
What is backflow? Reverse flow condition
280. Backflow is the undesirable reversal of flow of nonpotable water or other substances through a _____and into the piping of a public water system or consumer's potable water system.
A. Backflow D. Cross-connection
B. Backpressure E. Indirect connection
C. Backsiphonage F. None of the Above

281. Which of the following terms can result from an increase in downstream pressure, a reduction in the potable water supply pressure, or a combination of both?
A. Backflow D. Cross-connection
B. Backpressure E. Indirect connection
C. Backsiphonage F. None of the Above

282. Which of the following terms can have two forms-backpressure and backsiphonage?
A. Backflow D. Cross-connection
B. Backpressure E. Indirect connection
C. Backsiphonage F. None of the Above

283. The basic mechanism for preventing backflow is a mechanical _____, which provides a physical barrier to backflow.
A. High hazard installations D. Backflow
B. Air gap E. Device or method
C. Backflow preventer F. None of the Above

284. The principal types of mechanical backflow preventers are the reduced-pressure principle assembly, the _____, and the double check valve assembly.
A. High hazard installations D. Backflow
B. Air gap E. Device or method
C. Vacuum breaker F. None of the Above

285. Which of the following terms can occur when there is a stoppage of water supply due to nearby firefighting, a break in a water main?
A. Backflow D. Cross-connection
B. Backpressure E. Indirect connection
C. Backsiphonage F. None of the Above

286. _____ is a form of backflow caused by a downstream pressure that is greater than the upstream or supply pressure in a public water system or consumer's potable water system.
A. Backflow D. Cross-connection
B. Backpressure E. Indirect connection
C. Backsiphonage F. None of the Above

287. Which of the following terms is the means or mechanism to prevent backflow?
A. High hazard installations D. Backflow
B. Air gap E. Device or method
C. Backflow preventer F. None of the Above

288. According to the text, basic means of preventing backflow is an _____, which either eliminates a cross-connection or provides a barrier to backflow.
A. High hazard installations D. Backflow
B. Air gap E. Device or method
C. Backflow preventer F. None of the Above

Water Distribution System Design and Valves System Elements- Topic 4
289. Distribution mains function is to carry water from the water source or treatment works to users, these are the pipelines that make up the?
A. Increase water pressure D. Distribution system
B. Distribution tree E. Arterial system
C. Complete gridiron system F. None of the Above

290. Arterial mains are interconnected with smaller distribution mains to form a complete gridiron system and are for?
A. Increasing water pressure D. Distribution mains of large size
B. Tree system E. Fire protection
C. Complete gridiron system F. None of the Above

291. Storage reservoirs are structures used to store water and _____ the supply or pressure in the distribution system.
A. Increase water pressure D. Main line isolation
B. Equalize E. Provide a reserve pressure
C. Complete gridiron system F. None of the Above

Butterfly Valve
292. Butterfly valves are rotary type of valves usually found on large transmission lines, and may also have an additional valve beside it known as a_____ to prevent water hammer.
A. Regulator D. Main line isolation
B. Bypass E. PRV
C. Complete gridiron system F. None of the Above

Water Distribution Valves
293. One purpose of installing shutoff valves in water mains at various locations within the distribution system is to allow sections of the system to be _____ or provide maintenance without significantly curtailing service over large areas.
A. Feeders as practical D. Curtail the service
B. Adjust the pressure E. Taken out of service for repairs
C. Open or close the valve F. None of the Above

294. According to the text, at intersections of distribution mains, the number of valves required is normally one less than the number of?
A. Ties D. Throttling purposes
B. Depends E. Standardizes
C. Radiating mains F. None of the Above

Gate Valves
295. In the distribution system, gate valves are used when a straight-line flow of fluid and?
A. Principally D. Minimum flow restriction
B. Dependability E. Stops or allows
C. Repair or replacement F. None of the Above

296. The control of flow is easy because of the gate valve's design, and the flow of fluid
A. True B. False

Ball Valves
297. Most ball valves require only a 180-degree turn to either completely open or close the valve.
A. True B. False

Friction Loss
298. The damaged section can be isolated and the remainder of the system will still carry pressure, water will not be distributed if a single section fails.
A. True B. False

299. During periods of peak fire flow demand, there will be less impact from _____ in water mains as the velocity within any given section of main.
A. Carrying capacity D. Static pressure
B. Friction loss E. Total pressure
C. Pressure F. None of the Above

Aquifer – Topic 6
300. 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. Unconfined aquifer(s) D. Well(s)
B. Groundwater E. Aquifer
C. Water table F. None of the Above

301. Limestones are often fractured aquifers, but here the cracks and fractures may be enlarged by solution, forming large channels or even caverns. Limestone terrain where solution has been very active is termed *karst*.
A. True B. False

302. Which of the following terms such as sandstone may become so highly cemented or recrystalized that all of the original space is filled. In this case, the rock is no longer a porous medium?
A. Unconfined aquifer(s) D. Fractured aquifer(s)
B. Groundwater E. Aquifer
C. Porous media F. None of the Above

303. A well in such as the above, an aquifer is called an artesian well.
A. True B. False

Cone of Depression

304. When pumping begins, water begins to flow towards the well in contrast to the natural direction of groundwater movement.

A. True B. False

305. The water level in the well falls below the water table in the?

A. Water table
B. Groundwater
C. Surrounding aquifer
D. Cone of depression
E. Well
F. None of the Above

Water Well Reports and Hydrogeology

Hydrogeologic Data

306. For hydrogeologists to make reliable assessments about the current and future status of ground water, they need to know where ground water occurs in the subsurface, what the properties are of the various geologic units below the surface, and how fast and in what direction ground water is moving.

A. True B. False

Depth to the Aquifer

307. It is important to know the type of geologic materials that occur from the surface down to the top of the?

A. Aquifer
B. Hydraulic head
C. Geologic materials
D. Amount of recharge to the aquifer
E. Ground water
F. None of the Above

Nature of the Aquifer

308. An unconfined aquifer has which missing term as its upper surface; there are no significant low-permeability layers between the water table and the surface?

A. Hydraulic head
B. Water table
C. A confined aquifer
D. Hydraulic conductivity
E. Permeability, or hydraulic conductivity
F. None of the Above

How Wells Are Drilled

309. A few examples of today's more common well drilling methods include rotary, auger, and cable tool with?

A. Many variations of each
B. Typical drilling fluid(s)
C. Advanced methods
D. A highly trained and skilled driller
E. Today's more common well drilling methods
F. None of the Above

Basic Rotary Drilling Methods

310. Rotary drilling utilizes two methods that include: direct and reverse mud rotary, direct air rotary, and?

A. Rotary drilling
B. Typical drilling fluid(s)
C. Advanced methods
D. Drill through casing driver methods
E. Today's more common well drilling methods
F. None of the Above

The Rotary Drill String

311. Rotary drilling methods use a drill string, which typically consists of a bit, collar, drill pipe and?

A. The drill collar
B. Drag bit(s)
C. Roller bit(s)
D. Shock absorber (floating sub)
E. A kelly
F. None of the Above

312. Drill pipe can be used in various lengths but are typically 20-foot sections and may be connected to the drive unit with?

A. Drilling method
B. The Kelly
C. The table drive
D. A sub
E. Rotary bit
F. None of the Above

313. A sub is a length of pipe used to connect pipes and/or act as shock absorber (between the drill pipes and drive unit, at the end of the drill pipe is_____ .

A. The drill collar
B. Drag bit(s)
C. Roller bit(s)
D. Shock absorber
E. The kelly
F. None of the Above

314. Which of the following terms or stabilizer is typically very heavy and is often gauged close to the diameter of the bit being used?

A. Drilling method
B. The Kelly
C. The table drive
D. The drill collar
E. Rotary bit
F. None of the Above

315. Which of the following terms aids in maintaining a consistent borehole diameter and primarily helps to prevent borehole deviation?

A. The drill collar
B. Drag bit(s)
C. Roller bit(s)
D. Shock absorber (floating sub)
E. The kelly
F. None of the Above

316. Several types of bits may be used; such as drag bits or_____.

A. The flighting
B. The plug
C. Roller bits
D. A telescoping kelly
E. The cutting head
F. None of the Above

317. Which of the following terms are typically used in unconsolidated to semi-consolidated sand, silt, and clay-rich formations?

A. The drill collar
B. Drag bit(s)
C. Roller bit(s)
D. Shock absorber (floating sub)
E. The kelly
F. None of the Above

318. Drag bits come in many shapes and sizes and cut with a shearing action aided by the jetting of drilling fluids from_____.

A. The drill collar
B. Drag bit(s)
C. Nozzles or jets in the bit
D. Shock absorber (floating sub)
E. The kelly
F. None of the Above

319. Roller bits, such as _____, typically utilize interlocking teeth or buttons on individual rotating cones to cut, crush, or chip through the formation.

A. The flighting
B. The plug
C. The bucket
D. The common tri-cone bit
E. The cutting head
F. None of the Above

320. Roller bits can be used in consolidated formations and even hard rock applications if equipped with carbide buttons. These types of bits are often referred to as?
A. The drill collar D. Shock absorber (floating sub)
B. Drag bit(s) E. Roller button bits
C. Roller bit(s) F. None of the Above

321. Which of the following terms are bits that can be used to enlarge, straighten, or clean an existing borehole?
A. Drilling method D. Reamers
B. The Kelly E. Rotary bit
C. The table drive F. None of the Above

322. Which of the following terms are used to enlarge deeper sections of an existing borehole without requiring the enlargement of the entire upper well bore?
A. The drill collar D. Shock absorber (floating sub)
B. Drag bit(s) E. Under reamers
C. Roller bit(s) F. None of the Above

323. Under reaming involves the projection of which term beneath permanently installed casing in loosely consolidated sediments.
A. Cutting blades D. A sub
B. The Kelly E. Rotary bit
C. The table drive F. None of the Above

Direct Rotary Method
324. Direct rotary drilling methods utilize a rotating bit at the end of a drilling string with drilling fluid that is circulated from the rig through the drill pipe and jets in the bit.
A. True B. False

325. Down-force exerted by the drilling rig and/or the weight of _____ is used along with rotating action to force the bit downwards, cutting through the sediment or rock.
A. Direct Mud rotary drilling rig(s) D. Drill string
B. Bit E. Loss of mud drilling fluids
C. Large drill rig(s) F. None of the Above

326. The drilling fluid that is pumped by which term and/or air compressor is jetted out of ports in the bit?
A. The flighting D. A telescoping kelly
B. The rig's mud pump E. The cutting head
C. The bucket F. None of the Above

327. The drilling fluid carries cuttings up the annular space between the drill pipe and formation and into mud pits or containment recirculating systems on the surface.
A. True B. False

328. Which of the following terms pressurizes the borehole and helps to keep the hole open while removing cuttings?
A. Rotary drilling D. A highly trained and skilled driller
B. Typical drilling fluid(s) E. The drilling fluid
C. Advanced methods F. None of the Above

329. Large drill rigs may utilize _____ that separate the cuttings from the drilling fluid before a pickup pump recirculates the drilling fluid back down the borehole, where the process is then repeated.

A. The reverse method
B. Zone(s)
C. The mud drilling fluid
D. The cutting's containment systems
E. Direct Mud rotary drilling rig(s)
F. None of the Above

330. Mud pits may be dug into the ground adjacent to the rig in order to contain and settle out cuttings from this missing term before recirculating.

A. The flighting
B. The plug
C. The bucket
D. The drilling fluid
E. The cutting head
F. None of the Above

Direct Mud Rotary Method

331. Mud is circulated down the drill string and through the bit at the bottom of the borehole and the mud then carries the cuttings generated by the bit up to the surface and into the mud recirculating system.

A. True B. False

332. The process of building up a film of mud on the borehole walls is not important to mud rotary drilling and is called mud balling.

A. True B. False

333. Which of the following terms use various types of mud or drilling fluid to drill into the ground?

A. The reverse method
B. Zone(s)
C. The mud drilling fluid
D. The mud
E. Direct Mud rotary drilling rig(s)
F. None of the Above

334. Which of the following terms or set of screens called a shaker may be used in part of the recirculating system on larger rigs; it separates out cuttings from drilling fluid and provides an ideal sampling location?

A. Direct Mud rotary drilling rig(s)
B. A vibrating screen
C. Large drill rig(s)
D. A drilling string with drilling fluid
E. The loss of mud drilling fluids
F. None of the Above

335. Which of the following terms not only removes cuttings but also adheres to and pushes against the borehole walls, minimizes fluid loss, and cools the bit?

A. The reverse method
B. Zone(s)
C. The mud drilling fluid
D. The mud
E. Direct Mud rotary drilling rig(s)
F. None of the Above

336. Sometimes specially trained personnel are needed to manage the physical properties of the mud to ensure that a proper mud cake thickness is maintained and that a proper density or _____ is used to efficiently drill the well.

A. The reverse method
B. Weight of mud
C. The mud drilling fluid
D. The mud
E. Direct Mud rotary drilling rig(s)
F. None of the Above

337. The mud engineer will often use bentonite clay and water to make the mud drilling fluid. Sometimes chemical additives such as _____ may be used.
A. The reverse method D. The mud
B. Drilling polymers or gels E. Direct Mud rotary drilling rig(s)
C. The mud drilling fluid F. None of the Above

338. Sometimes the loss of _____ to cavities in the earth cannot be stopped with a mud cake alone.
A. The reverse method D. The mud
B. Weight of mud E. Direct Mud rotary drilling rig(s)
C. Mud drilling fluids F. None of the Above

Reverse Mud Rotary Method
339. Reverse rotary methods pump the drilling fluid down the borehole to the bit where the cuttings are forced up the rotary bit and into the mud pit.
A. True B. False

340. Reverse mud rotary drilling rigs utilize the same process as which term with the exception that the mud drilling fluid injection process is reversed?
A. Direct mud rotary D. A drilling string with drilling fluid
B. The bit E. The loss of mud drilling fluids
C. Large drill rig(s) F. None of the Above

341. Which of the following terms is utilized in situations where borehole stability problems are particularly difficult and would otherwise prevent conventional drilling?
A. Roller bit(s) D. The mud rotary method
B. Drilling E. The reverse method
C. The borehole F. None of the Above

342. Reverse mud rotary drilling is particularly applicable to hard rock aquifers in zones where highly fractured or weathered rock may prevent the efficient flow of drilling fluids up the borehole walls to the surface.
A. True B. False

Air Rotary Method
343. Air rotary methods utilize compressed air and derived drill cuttings and groundwater as the drilling fluid.
A. True B. False

344. Which of the following terms is forced through the drill string and out the bit where it then mixes with and lifts cuttings and any derived groundwater to the surface?
A. The air rotary method D. Biodegradable foam or surfactant (soap)
B. Soil or formation sample(s) E. Mud
C. Air F. None of the Above

345. The cuttings and groundwater are typically contained in subsurface pits, much like?
A. Roller bit(s) D. The mud rotary method
B. Drilling E. The reverse method
C. The borehole F. None of the Above

346. Soil or formation samples may be collected in a bucket or shovel placed beneath the table of the rig as drilling proceeds, resulting in?
A. The air rotary method
B. Soil or formation sample(s)
C. Representative samples
D. Biodegradable foam or surfactant (soap)
E. The total target depth
F. None of the Above

347. Which of the following terms is kept in a pressured condition while drilling, in order to maintain the circulation of drilling fluid to the surface?
A. The flighting
B. The plug
C. The bucket
D. The borehole
E. The cutting head
F. None of the Above

348. Which of the following terms is often added while drilling with air in order to maintain sufficient hole pressurization so that cuttings may be lifted to the surface efficiently while maintaining hole stability.
A. The air rotary method
B. Soil or formation sample(s)
C. Air
D. Biodegradable foam or surfactant (soap)
E. Mud
F. None of the Above

349. According to the text, the air rotary method is particularly suitable to soft dirt drilling with a down hole air hammer.
A. True B. False

350. The air hammer utilizes compressed air to drive a piston up and down which makes which term move up and down while the drill string rotates?
A. The air rotary method
B. Soil or formation sample(s)
C. Air
D. The hammer bit
E. The total target depth
F. None of the Above

351. According to the text, conventional air rotary drilling methods utilize roller bits in the same way as those used for mud rotary drilling
A. True B. False

352. Which of the following terms action generates great rock breaking force and is very valuable for drilling through solid rock or consolidated formations?
A. Roller bit(s)
B. Drilling
C. The borehole
D. The mud rotary method
E. The combined rotating and hammering
F. None of the Above

353. Which of the following terms in hard rock or consolidated formations, may be used when drilling pressures are too high or borehole sizes are too large for the efficient operation of an air hammer?
A. The flighting
B. A roller button bit
C. The bucket
D. A telescoping kelly
E. The cutting head
F. None of the Above

Drill through Casing Driver Method
354. The drill through casing driver method drives casing into the borehole as the telescoping kelly advances.
A. True B. False

355. Which of the following terms is a pneumatic device designed to push or pull casing that is typically attached to a top head drive air rotary rig?

A. A hammer or roller bit
B. The drill string
C. The bucket auger method
D. The rig
E. A casing driver
F. None of the Above

356. Which of the following terms is a specially designed hardened steel ring that is installed on the casing end?

A. Auger boring method(s)
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The cutting shoe
F. None of the Above

357. Which of the following terms is inserted into the casing and the casing is attached to the casing driver?

A. A hammer or roller bit
B. The drill string
C. A casing driver
D. The rig
E. The addition of casing and drill string
F. None of the Above

358. Which of the following terms penetrates into the overburden or formation, the casing driver hammers the casing down, following the drill string?

A. The drill string
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

359. Which of the following terms may employ a hammer or roller bit?

A. The flighting
B. The plug
C. The bucket
D. The drill string
E. The cutting head
F. None of the Above

360. According to the text, cuttings rise to the surface with _____ through the casing and exit through the casing driver.

A. The injected air
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

361. According to the text, as the borehole is drilled, the cuttings are then collected near?

A. A hammer or roller bit
B. The drill string
C. A casing driver
D. The rig
E. The addition of casing and drill string
F. None of the Above

362. Which of the following terms can continue until competent formation is encountered?

A. A hammer or roller bit
B. The drill string
C. A casing driver
D. The rig
E. The addition of casing and drill string
F. None of the Above

363. Which of the following terms is often used to install temporary casing in order to permit the installation of a well in unstable aquifers?

A. Auger boring method(s)
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

364. Which of the following terms may be used as a puller to remove the temporary casing following well construction?

A. The flighting
B. The plug
C. The bucket
D. The casing driver
E. The cutting head
F. None of the Above

Auger Boring Methods

365. Auger boring methods make use of this missing term, which may be attached to a pilot bit and cutter head.

A. Auger boring method(s)
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. A rotating blade or spiral flange
E. The bucket auger method
F. None of the Above

366. Which of the following terms along with the rotating action of the blade and cutting action of the pilot and/or cutter bits facilitates the boring process?

A. The flighting
B. The plug
C. The bucket
D. A telescoping kelly
E. Down-force applied by the rig
F. None of the Above

367. Soil samples may be collected as cuttings rise or are brought to the surface, or they may be collected with?

A. Auger boring method(s)
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

368. Which of the following terms are capable of boring large diameter holes in excess of four feet in diameter?

A. Auger boring method(s)
B. Augers
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

369. According to the text, there are three primary types of _____: solid stem, bucket, and hollow stem.

A. Auger boring method(s)
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

Solid Stem Auger Method

370. Which of the following terms method uses a spiral flanged drill pipe driven by either a kelly or rotary drive head, like those used on rotary rigs?

A. Auger boring method(s)
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

371. The drill pipe may be continuously flanged or just the initial section is flanged.

A. True B. False

372. Flanged sections of drill pipe are referred to as?

A. Flighting
B. The plug
C. The bucket
D. A telescoping kelly
E. The cutting head
F. None of the Above

373. Which of the following terms typically employ a single flight and can be used in stable formations to depths of approximately 60 feet?
A. The flighting
B. The plug
C. The bucket
D. Larger diameter augers
E. The cutting head
F. None of the Above

374. _____ is removed from the borehole so that cuttings, which accumulate at the bottom of the borehole, may be removed and/or sampled.
A. The flighting
B. The lower flight
C. The bucket
D. A telescoping kelly
E. The cutting head
F. None of the Above

375. Samples may be collected from these cuttings or the flighting may be brought to the surface and samples collected from?
A. The flighting
B. The plug
C. The bucket
D. A telescoping kelly
E. The cutting head
F. None of the Above

Bucket Auger Method

376. The bucket auger method employs a single, typically large in diameter, bucket auger to drill or bore into the ground.
A. True B. False

377. Which of the following terms essentially combines the rotary and auger techniques?
A. Auger boring method(s)
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

378. Which of the following terms is rotated via a kelly and table drive much like those of rotary rigs?
A. Auger boring method(s)
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger
F. None of the Above

379. Which of the following terms consists of two or more sections of square piping that telescope into each other?
A. The flighting
B. The plug
C. The bucket
D. A telescoping kelly
E. The cutting head
F. None of the Above

380. Which of the following terms is filled with cuttings it is closed and brought to the surface where it is swung out to the side of the rig by a specially designed swing arm?
A. The flighting
B. The plug
C. The bucket
D. A telescoping kelly
E. The cutting head
F. None of the Above

381. Which of the following terms cannot be used in material containing cobbles and boulders, but is used most often in more stable semi consolidated silty or clay rich deposits?
A. Bucket auger methods
B. The plug
C. The bucket
D. A telescoping kelly
E. The cutting head
F. None of the Above

Hollow Stem Auger Method

382. Which of the following terms has been used in the geotechnical field for many years for its usefulness in obtaining soil samples?

A. The hollow stem auger
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

383. Which of the following terms contains a plug that is connected to drill pipe that passes through the center of the flights and is ultimately connected to a top drive?

A. The lowermost flight
B. Split spoon type sampler(s)
C. The solid stem auger boring method
D. The casing driver method
E. The bucket auger method
F. None of the Above

384. When the plug is removed, accurate soil samples may be obtained while the flighting remains to keep this open.

A. The flighting
B. The plug
C. The bucket
D. The borehole
E. The cutting head
F. None of the Above

385. Samples are typically collected with _____ driven into the soil a few feet ahead of the flighting.

A. The flighting
B. The plug
C. The bucket
D. A telescoping kelly
E. A split spoon sampler or core barrel sampler
F. None of the Above

386. Which of the following terms can also permit the installation of well screen and filter media in otherwise relatively unstable formations by its acting as temporary casing?

A. The flighting
B. The plug
C. The bucket
D. The use of larger diameter continuous flights
E. The cutting head
F. None of the Above

What is a Significant Deficiency?

387. Significant deficiencies cause, or have the potential to cause, the introduction of contamination into water delivered to customers include defects in design, operation, or maintenance of?

A. Well screen
B. The aquifer
C. A pumping test
D. The amount of water production
E. The source, treatment or distribution systems
F. None of the Above

388. The rule requires each state to define and describe at least one type of specific significant deficiency for each of_____ .

A. The eight sanitary survey elements
B. The aquifer
C. A pumping test
D. The amount of water production
E. The optimum pumping rate
F. None of the Above

389. EPA will develop guidance to help states carry out sanitary surveys and identify significant deficiencies that could affect the quality of drinking water.

A. True B. False

Selecting an Appropriate Well Site

390. Before a well can be drilled a permit is normally required. The permit helps to ensure that an appropriate location of the well is selected which reduces the possibility of contamination.

A. True B. False

391. The ideal well location has good drainage and is higher than?

A. The quality of drinking water
B. The possibility of contamination
C. Surface drainage(s)
D. The surrounding ground surface
E. Preliminary aquifer parameters
F. None of the Above

392. Which of the following terms should be at a lower elevation than the well, and the distances to those contamination sources must be in accordance with the State or Local Water Well Construction Codes?

A. The quality of drinking water
B. The possibility of contamination
C. Surface drainage(s)
D. All possible sources of contamination
E. Preliminary aquifer parameters
F. None of the Above

Common Well Construction Specifications

393. Which of the following terms should always be located and constructed in such a manner that they yield safe water at all times and under all conditions?

A. Water wells
B. The aquifer
C. A pumping test
D. The amount of water production
E. The optimum pumping rate
F. None of the Above

394. Contamination of a water supply typically occurs when leachate from sewage systems or surface waters enter a well. Surface water may enter the well through an opening in the top or by seeping through _____.

A. The quality of drinking water
B. The possibility of contamination
C. Surface drainage(s)
D. Contamination of a water
E. The shallow borehole walls
F. None of the Above

395. Tests have shown that bacterial contamination is usually eliminated after filtering through 1000 feet of normal soil.

A. True B. False

396. Construction of this missing term must ensure that the top and uppermost 20 feet of the well bore are sealed and watertight.

A. The well
B. The inflatable packer
C. The louver(s)
D. The casing and screen specifications
E. Well screen(s)
F. None of the Above

397. All wells must be constructed with a surface seal to prevent the infiltration of surface water and/or surface contaminants into?

A. The anticipated flow rate
B. The well
C. Annulus and surface casing
D. The well bore and aquifer
E. The upper borehole from the surface
F. None of the Above

398. The seal is constructed by pouring or pumping neat cement grout and/or bentonite between the Annulus and surface casing.

A. True B. False

399. Which of the following terms is installed in the upper portions of the well bore between the annulus and surface casing and will normally extend to the ground surface around the well?
A. This seal
B. The inflatable packer
C. The louver(s)
D. The casing and screen specifications
E. Well screen(s)
F. None of the Above

400. The installation of the cement or grout between the annulus and surface casing effectively seals off the upper borehole from_____ .
A. The anticipated flow rate
B. The well
C. Annulus and surface casing
D. The surface
E. The upper borehole from the surface
F. None of the Above

401. Which of the following terms uses is a solid piece of permanently installed casing, usually steel, that should be of sufficient size to allow the completion of the well within it?
A. The surface casing
B. The inflatable packer
C. The louver(s)
D. The casing and screen specifications
E. Well screen(s)
F. None of the Above

402. _____ in addition to the surface seal is always installed with the pumping equipment to ensure no surface water or debris enters the well.
A. A well seal or cap
B. The well
C. Annulus and surface casing
D. Unstable or non-productive areas
E. The upper borehole from the surface
F. None of the Above

403. Specialized borehole geophysical logging equipment may be used to isolate the areas of optimum production capability and aid in determining the ultimate well design.
A. True
B. False

404. Preliminary pumping tests are normally conducted to ensure the well is as productive as originally estimated and to obtain?
A. The quality of drinking water
B. The possibility of contamination
C. Surface drainage(s)
D. Contamination of a water
E. Preliminary aquifer parameters
F. None of the Above

405. Which of the following terms following the installation, the well is then reamed to accept additional blank casing, well screen, and filter or gravel pack?
A. The quality of drinking water
B. The possibility of contamination
C. Surface drainage(s)
D. The well's surface seal
E. Preliminary aquifer parameters
F. None of the Above

406. According to the text, once the well has been reamed large enough in diameter for the anticipated flow rate, the appropriate casing can be installed.
A. True
B. False

407. According to the text, blank casing is normally installed to the depth of?
A. The quality of drinking water
B. The possibility of contamination
C. Surface drainage(s)
D. The main producing zone
E. Preliminary aquifer parameters
F. None of the Above

408. Which of the following terms may extend to the total depth of the well or may be used intermittently to total depth with blank casing used through unstable or non-productive areas?
A. The anticipated flow rate
B. The well
C. Well screen
D. Unstable or non-productive areas
E. The upper borehole from the surface
F. None of the Above

Choice of Casing
409. According to the text, stainless steel casing and screen may be required for one situation, while PVC or low carbon steel may be acceptable in another.
A. True B. False

410. Which of the following terms needed is related to the type of aquifer, well depth, water quality, well use, and regulatory requirements?
A. The type of well casing
B. The inflatable packer
C. The louver(s)
D. The casing and screen specifications
E. Well screen(s)
F. None of the Above

411. According to the text, as with casing, the choice of well screen is as important as its placement, the size of the openings in the casing are dependent on the grain size of the filter or?
A. The anticipated flow rate
B. The well
C. Gravel pack
D. Unstable or non-productive areas
E. The upper borehole from the surface
F. None of the Above

412. A few of the more common types of well screen are: wire wrapped, continuous screen, slotted, louvered, and?
A. The centralizer(s)
B. The inflatable packer
C. The louver(s)
D. Perforated screens
E. Well screen(s)
F. None of the Above

413. According to the text, louvered screen is used in low yield production wells but particularly in rock packed wells and may help where cascading water is a problem.
A. True B. False

414. _____ are stronger and less expensive than wire wrapped screens and are best suited to deep applications, where borehole stability is a concern.
A. The anticipated flow rate
B. Slotted and perforated screens
C. Annulus and surface casing
D. Unstable or non-productive areas
E. The upper borehole from the surface
F. None of the Above

Selecting an Optimum Pumping Rate
415. Specific capacities for each of the pumping steps are compared. The highest Sc observed is normally associated with?
A. The anticipated flow rate
B. The well
C. The optimum pumping rate
D. Unstable or non-productive areas
E. The upper borehole from the surface
F. None of the Above

Pump Selection Section
Three Basic Types of Wells
416. Which of the following terms are usually bored into an unconfined water source, generally found at depths of 100 feet or less?
A. Unconsolidated or sand well(s) D. Total dynamic or discharge head
B. Bored or shallow well(s) E. The most important components
C. The proper selection F. None of the Above

417. _____ are drilled into a formation consisting entirely of a natural rock formation that contains no soil and does not collapse.
A. Consolidated or rock wells D. Total equivalent feet of lift
B. Screen filter(s) E. The total friction head
C. Power requirement(s) F. None of the Above

418. Which of the following terms are drilled into a formation consisting of soil, sand, gravel, or clay material that collapses upon itself?
A. Unconsolidated or sand well(s) D. Total dynamic or discharge head
B. Bored or shallow well(s) E. The most important components
C. The proper selection F. None of the Above

Selection of Pumping Equipment
419. The proper selection of pumping equipment for a well is of great importance.
A. True B. False

420. The primary factors that must be considered before selecting the well pump are: flow rate, line pressure, pumping lift, and _____ and size of piping.
A. Power requirements (and limitations) D. Total equivalent feet of lift
B. Screen filter(s) E. The total friction head
C. Power requirement(s) F. None of the Above

Pumping Lift and Total Dynamic or Discharge Head
421. The most important components in selecting the correct pump for your application are: total pumping lift and_____.
A. Cavitation D. Total dynamic or discharge head
B. Suction head E. Pressure head
C. Velocity head F. None of the Above

422. Which of the following terms refers to the total equivalent feet of lift that the pump must overcome in order to deliver water to its destination, including frictional losses in the delivery system?
A. Total dynamic head D. Total equivalent feet of lift
B. Screen filter(s) E. The total friction head
C. Power requirement(s) F. None of the Above

Basic Pump Operating Characteristics
423. Pressure and head are interchangeable concepts in irrigation, because a column of water .433 feet high is equivalent to 2.31 pound per square inch of pressure.
A. True B. False

424. Which of the following terms refers to the height of a vertical column of water?
A. Head D. Loss of head
B. Suction head E. Pressure head
C. Velocity head F. None of the Above

425. Which of the following terms of a pump is composed of several types of head that help define the pump's operating characteristics?
A. Cavitation D. Total head
B. Suction head E. Pressure head
C. Velocity head F. None of the Above

Total Dynamic Head
426. The total dynamic head of a pump is the sum of _____, the pressure head, the friction head, and the velocity head.
A. The total static head D. Total equivalent feet of lift
B. Screen filter(s) E. The total friction head
C. Power requirement(s) F. None of the Above

427. The Total Dynamic Head is the sum of the total static head, the missing term and the pressure head.
A. Cavitation D. Loss of head
B. Suction head E. Total friction head
C. Velocity head F. None of the Above

Total Static Head
428. The total static head is the total vertical distance the pump must lift the water.
A. True B. False

Pressure Head
429. Which of the following terms at any point where a pressure gauge is located can be converted from pounds per square inch to feet of head by multiplying by 2.31?
A. Cavitation D. Loss of head
B. Suction head E. Pressure head
C. Velocity head F. None of the Above

430. 20 PSI is equal to 20 times 2.31 or 46.2 feet of head.
A. True B. False

Friction Head
431. Friction head is the energy increase or pressure increase when water flows through pipe networks.
A. True B. False

432. The velocity of the water has a significant effect on_____ .
A. Friction head D. Total dynamic or discharge head
B. Friction loss E. Loss of head
C. Pressure head F. None of the Above

433. Which of the following terms occurs when water flows through straight pipe sections, fittings, valves, around corners, and where pipes increase or decrease in size?
A. Cavitation D. Loss of head
B. Suction head E. Loss of head due to friction
C. Velocity head F. None of the Above

434. Values for these losses can be calculated or obtained from friction loss tables. The friction head for a piping system is the sum of all the?
A. Friction head D. Total dynamic or discharge head
B. Friction losses E. Loss of head
C. Pressure head F. None of the Above

Velocity Head
435. Velocity head is the energy of the water due to?
A. Cavitation D. Loss of head
B. Suction head E. Its velocity
C. Velocity head F. None of the Above

Suction Head
436. According to the text, the suction head includes not only the vertical suction lift, but also the friction losses through the pipe, elbows, foot valves, and other fittings on the suction side of the pump.
A. True B. False

437. According to the text, a pump operating above a water surface is working with?
A. Friction head D. Total dynamic or discharge head
B. A suction head E. Loss of head
C. Pressure head F. None of the Above

438. There is an allowable limit to _____ on a pump and the net positive suction head of a pump sets that limit.
A. Cavitation D. Loss of head
B. Suction head E. Pressure head
C. Velocity head F. None of the Above

439. The theoretical maximum height that water can be lifted using suction is 21 feet.
A. True B. False

440. The NPSH curve will increase with increasing flow rate through the pump.
A. True B. False

441. At a certain flow rate, the NPSH is subtracted from 23 feet to determine the maximum suction head at which that pump will operate.
A. True B. False

442. Operating a pump with this missing term than it was designed for, or under conditions with excessive vacuum at some point in the impeller, may cause cavitation.
A. Suction lift greater D. Loss of head
B. Suction head E. Pressure head
C. Velocity head F. None of the Above

443. Which of the following terms is the implosion of bubbles of air and water vapor and makes a very distinct noise like gravel in the pump?
A. Friction head D. Cavitation
B. Total static head E. Loss of head
C. Pressure head F. None of the Above

444. Which of the following terms must also protect water quality between the source and the customer's tap?
A. Distribution system D. Hydropneumatic tanks and surge tanks
B. Water pressure E. Cavitation
C. Fire protection F. None of the Above

445. Care must be taken that no foreign material is introduced into the system during pipe laying operations. Pipe ends should be covered at the end of the workday or during interruptions of construction.
A. True B. False

Water Use or Demand
446. Water system demand comes from a number of sources including residential, commercial, industrial and public consumers as well as waste and some_____.
A. Pressure D. Unavoidable loss and waste
B. System integrity E. Maximum daily use
C. Unavoidable loss F. None of the Above

447. The combination of storage reservoirs and distribution lines must be capable of meeting consumers' needs for pressure at all times.
A. True B. False

448. The quantity of water used in any community varies from 100 to 200 gallons per person per day.
A. True B. False

449. Which of the following terms is desired, that could also represent a rather significant demand upon the system?
A. Distribution system D. Hydropneumatic tanks and surge tanks
B. Water pressure E. Cavitation
C. Fire protection F. None of the Above

450. A common design assumption is to use from 100 to 150 gallons per person per day for average domestic use.
A. True B. False

451. The maximum daily use is approximately 3 to 5 times the average daily use.
A. True B. False

452. _____ is usually encountered during the summer months and can vary widely depending on irrigation practices.
A. Pressure D. Unavoidable loss and waste
B. System integrity E. Maximum daily use
C. Maximum daily use F. None of the Above

Water Pressure

453. 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. True B. False

454. For ordinary domestic use, water pressure should be between 25 and 45 psi.

A. True B. False

455. 20 psi is considered to be the minimum required at any point in the water system, so that this _____ is prevented.

A. Distribution system
B. Water pressure
C. Backflow and infiltration
D. Hydropneumatic tanks and surge tanks
E. Cavitation
F. None of the Above

456. Which of the following terms is provided by the direct force of the water, or by the height of the water?

A. Pressure
B. System integrity
C. Gravity
D. Unavoidable loss and waste
E. Maximum daily use
F. None of the Above

Storage and Distribution – Topic 4

Water Storage Facilities

457. According to the text, there are different types of tants or storage that are used in the water distribution systems, such as stand pipes, elevated tanks and reservoirs, hydropneumatic tanks and?

A. Distribution system
B. Water pressure
C. Fire protection
D. Surge tanks
E. Cavitation
F. None of the Above

Storage Reservoirs

458. According to the text, it is also recommended that storage reservoirs be located at a high enough elevation to allow the water to flow by _____ to the distribution system.

A. Pressure
B. System integrity
C. Gravity
D. Cross-connection
E. Maximum daily use
F. None of the Above

459. According to the text, some storage for _____ should be provided.

A. Fire protection
B. Reservoir(s)
C. Steel tank(s)
D. Cross-connection
E. Stored water
F. None of the Above

460. Which of the following terms are also used as detention basins to provide the required chlorine contact time necessary to ensure the adequacy of disinfection?

A. Baffle(s)
B. Reservoir(s)
C. Steel tank(s)
D. Cross-connection
E. Stored water
F. None of the Above

461. Which of the following terms inside the reservoir increase the contact time by preventing the water from leaving the reservoir too quickly?

A. Baffle(s)
B. Reservoir(s)
C. Steel tank(s)
D. Cross-connection
E. Stored water
F. None of the Above

Water Storage Introduction

462. According to the text, treated or pumped water is placed in _____in order for disinfection to take place.

A. Storage reservoirs
B. Water distribution systems
C. Steel reservoirs
D. A closed tank or reservoir
E. Repairing and replacing these facilities
F. None of the Above

463. Which of the following terms prevents contamination of water as it travels to the customer, finished water storage facilities are an important component of the protective distribution system?

A. Cathodic protection
B. Corrosion
C. System integrity
D. Barrier
E. Clearwells
F. None of the Above

Storage and Distribution

464. The cost of supplying water to the users of any water system includes are on-going maintenance costs associated with cleaning, repairing and replacing these?

A. Storage reservoirs
B. Facilities
C. Steel reservoirs
D. Adequate pressure
E. Clearwells
F. None of the Above

465. Proper construction is important in maintaining system integrity and the distribution system must also protect_____ .

A. Cathodic protection
B. Corrosion
C. Water quality
D. Protective distribution system “barrier”
E. Clearwells
F. None of the Above

Water Storage Facilities

466. Water storage facilities and tanks vary in different types that are used in the water distribution systems, such as stand pipes, elevated tanks and reservoirs, hydropneumatic tanks and?

A. Storage reservoirs
B. Water distribution systems
C. Steel reservoirs
D. Adequate pressure
E. Surge tanks
F. None of the Above

467. According to the text, which of the following terms can be converted to pressure potential energy or kinetic energy for delivery to homes?

A. Hydrostatic
B. Static pressure
C. Pressure
D. Hydraulic power
E. Stored energy
F. None of the Above

Storage Reservoirs

468. It is recommended that _____ be located at a high enough elevation to allow the water to flow by gravity to the distribution system.

A. Storage reservoirs
B. Levelers
C. Tree systems
D. Adequate pressure
E. Pumps
F. None of the Above

Steel Reservoirs

469. Steel reservoirs or tanks generally have higher construction and installation costs than concrete, and require less maintenance.
A. True B. False

470. Steel tanks should be inspected once a year and repainted every 5-7 years.
A. True B. False

471. The maintenance program for reservoir tanks should call for annual draining for a complete inspection of the interior.
A. True B. False

472. Many storage facilities have hydraulic considerations that has resulted in many storage facilities operating today with _____than is needed for non-emergency usage.
A. Storage reservoirs
B. Larger water storage capacity
C. Steel reservoirs
D. Adequate pressure
E. Repairing and replacing these facilities
F. None of the Above

Categories of Finished Water Storage Facilities

473. According to the text, which of the following terms does not include facilities such as clearwells that are part of treatment or contact time requirements per the Surface Water Treatment Rules?
A. Long detention times
B. Clear wells
C. Storage
D. Finished water storage
E. Ground storage reservoirs
F. None of the Above

474. Ground storage tanks or reservoirs can be below ground, and may be accompanied by pump stations if not built at elevations providing the required system pressure by?
A. Storage volume of a standpipe
B. Gravity
C. Distribution system
D. Water quality problems in storage facilities
E. A filtration and treatment plant
F. None of the Above

475. Which of the following terms are supported by a single pedestal have been constructed where aesthetic considerations are an important part of the design process?
A. Elevated tanks
B. Reservoirs
C. Storage
D. Clear wells on the outboard side of water treatment plants
E. Ground storage reservoirs
F. None of the Above

476. Which of the following terms functions somewhat as a combination of ground and elevated storage?
A. Storage volume of a standpipe
B. Standpipe
C. Distribution system
D. Surge tank
E. A pump station
F. None of the Above

477. According to the text, many standpipes were built with?
A. A common inlet and outlet
B. Air tanks
C. Pressure reliefs
D. Clear wells
E. Ground storage reservoirs
F. None of the Above

478. Water color in many storage facilities is the most important factor related to water quality deterioration.
A. True B. False

479. According to the text, long detention times, resulting in excessive water age, can be conducive to microbial growth and chemical changes.
A. True B. False

Municipal Water Supply Systems
480. Water supplies that are used to feed water to a filtration and _____ for purification for domestic purposes including drinking water is classified as raw water.
A. Storage volume of a standpipe
B. Storage
C. Distribution system
D. Water quality problems in storage facilities
E. Treatment plant
F. None of the Above

481. Raw water sources are not suitable for any domestic purposes including water for cooking, bathing, and especially drinking.
A. True B. False

482. There is an exception to the rule above, the exception is _____that has been chlorinated and disinfected for individual household use in accordance with individual State Public Health regulations.
A. Sample
B. Individual well water
C. Distribution system
D. Water quality tests have been done prior
E. A filtration and treatment plant
F. None of the Above

483. Which of the following answers is the most common type of water storage on a municipal water system is the use of clear wells?
A. Water storage
B. Reservoir
C. Storage
D. Finished water storage
E. Ground storage reservoir
F. None of the Above

Distribution Storage Functions
484. Storage within a _____enables the system to process water at times when treatment facilities otherwise would be idle.
A. System demand
B. Variations in demand
C. Holding tank
D. Most useful form of storage
E. Distribution system
F. None of the Above

Advantages.
485. The principal advantages of _____ include the fact that storage equalizes demands on supply sources, production works, and transmission and distribution mains.
A. Pumping equipment
B. Dedicated fire storage
C. System demands
D. Water supply distribution system
E. Distribution storage
F. None of the Above

Meeting system demands and required fire flow.
486. The variations in demand that occur throughout the day in different parts of the _____ along with the location, capacity, and elevation of distribution storage are closely associated with system demands.
A. System demand
B. Variation in demand
C. Distribution system
D. Most useful form of storage
E. Capacity of the system's high-service pumps
F. None of the Above

487. Which of the following terms can be determined only after a careful analysis of an entire distribution system?
A. Pumping equipment D. Water supply distribution system
B. Dedicated fire storage E. Distribution storage water quality
C. System demands F. None of the Above

Elevated and Ground-Level Storage
488. Distribution system storage normally is provided in one of two ways, elevated storage or ground storage with?
A. System demand D. High-service pumping
B. Variations in demand E. Capacity of the system's high-service pumps
C. Holding tank F. None of the Above

Elevated Storage
489. Properly sized elevated water tanks provide dedicated fire storage and are used to maintain constant pressure on the _____ .
A. Pumping equipment D. Water supply distribution system
B. Dedicated fire storage E. Distribution storage
C. System demands F. None of the Above

490. Domestic water supplies are regularly fed to the system from the top 10 to 15 feet of water in the elevated tanks.
A. True B. False

491. The high-service pumps are constant-speed units, which can operate at their highest efficiency point, the remaining water in the tanks normally is held in reserve as?
A. Pumping equipment D. Water supply backup
B. Dedicated fire storage E. Distribution storage
C. System demand F. None of the Above

492. The fire storage reserve will feed into the system automatically as the fire-flow demand and the domestic use at a specific time exceed the capacity of the?
A. System demand D. Most useful form of storage
B. Variations in demand E. System's high-service pumps
C. Holding tank F. None of the Above

Ground Storage
493. Since water kept in ground storage is not under any significant pressure, it must be delivered to the point of use by_____ .
A. Pumping equipment D. Water supply distribution system height
B. Dedicated fire storage E. Distribution storage in stand pipes
C. System demands F. None of the Above

494. Which of the following terms is needed for normal uses as well as any fire demand, which requires a generally unused investment in pumping capacity?
A. System demand D. Most useful form of storage
B. Variations in demand E. Peak demand
C. Holding tank F. None of the Above

495. Water supply sources and ground-level storage must be maintained at all times because the system cannot function without the pumps.
A. True B. False

496. The distribution lines to all points in the water distribution system must be significantly oversized to handle fire flow, no matter where the fire might occur near one or more fire hydrants on the?
A. Storage D. Piping system
B. Water supply E. Standby pumping systems
C. Trees F. None of the Above

497. In hilly areas, it is frequently possible to install ground reservoirs at sufficient elevation so that the water would “float” on the distribution system.
A. True B. False

498. The energy that would be needed to deliver the water when ground-level storage is used in areas of high fire risks, is lost on the initial delivery of water to?
A. The tank D. Pump station
B. Water supply E. Standby pumping systems
C. An elevated tank F. None of the Above

499. Which of the following terms must be either variable speed or controlled by discharge valves to maintain constant system pressures?
A. Ground-level storage D. System’s high-service pumps
B. Water supply system E. Standby pumping systems
C. An elevated tank F. None of the Above

500. Capital costs for pumps, generators, and backup systems, and the long-term energy costs, significantly increase the costs of a?
A. Ground-level storage D. Ground-storage system
B. Water supply E. Standby pumping systems
C. An elevated tank F. None of the Above