Registration form

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Water Treatment ___ Water Distribution ___ Other _____

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DISCLAIMER NOTICE
I understand that it is my responsibility to ensure that this CEU course is either approved or accepted in my State for CEU credit. I understand State laws and rules change on a frequent basis and I believe this course is currently accepted in my State for CEU or contact hour credit, if it is not, I will not hold Technical Learning College responsible. I also understand that this type of study program deals with dangerous conditions and that I will not hold Technical Learning College, Technical Learning Consultants, Inc. (TLC) liable for any errors or omissions or advice contained in this CEU education training course or for any violation or injury caused by this CEU education training course material. I will call or contact TLC if I need help or assistance and double-check to ensure my registration page and assignment has been received and graded.

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

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

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

Rush Grading Service
If you need this assignment graded and the results mailed to you within a 48-hour period, prepare to pay an additional rush service handling fee of $50.00. This fee may not cover postage costs. If you need this service, simply write RUSH on the top of your Registration Form. We will place you in the front of the grading and processing line.

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

Distribution 303 Answer Key

Name_____

Phone _____

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

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Please fax the answer key to TLC Western Campus Fax (928) 272-0747
Backup Fax (928) 468-0675 Always call us after faxing the paperwork to ensure that we've received it.

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

WATER DISTRIBUTION 303 CEU COURSE
CUSTOMER SERVICE RESPONSE CARD

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1. Please rate the difficulty of your course.
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Water Distribution 303 CEU Training Course Assignment

The Water Distribution 303 CEU course assignment is 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 receipt of this manual to complete it in order to receive your Professional Development Hours (**PDHs**) or Continuing Education Unit (**CEU**). A score of 70 % or better is necessary to pass this course. If you should need any assistance, please email or fax all concerns and the completed **ANSWER KEY** to info@tlch2o.com.

Select one answer per question. Please utilize the answer key. (s) on the answer will indicate either plural and singular tenses. The answer will come exactly from the text.

Waterborne Pathogens and Disease Section

1. Bacteria, viruses, and protozoan that cause disease are known as pathogens. Most pathogens are generally associated with diseases that cause _____ and affect people in a relatively short amount of time, generally a few days to two weeks.

A. Stomach flu
B. Tuberculosis
C. Microscopic particles
D. Spread of disease
E. Intestinal illness
F. None of the Above

2. They can cause _____through exposure to small quantities of contaminated water or food, or from direct contact with infected people or animals.

A. Foodborne route
B. Pathogens
C. Illness
D. Fecal-oral route
E. Contaminating water
F. None of the Above

How Diseases are Transmitted

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

A. Stomach flu
B. Tuberculosis
C. Microscopic particles
D. Spread of disease
E. Waterborne outbreaks
F. None of the Above

4. _____are spread by secretions that are coughed or sneezed into the air by an infected person.

A. Stomach flu
B. Tuberculosis
C. Microscopic particles
D. Spread of disease
E. Influenza virus and tuberculosis bacteria
F. None of the Above

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

A. Foodborne route
B. Pathogens
C. Waterborne illness(es)
D. Fecal-oral route
E. Contaminating water
F. None of the Above

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

A. Stomach flu
B. Tuberculosis
C. Microscopic particles
D. Spread of disease
E. Waterborne pathogens
F. None of the Above

7. These particles, containing _____, may remain in the water and be passed to humans or animals unless adequately treated.
A. Foodborne route
B. Pathogens
C. Waterborne illness(es)
D. Fecal-oral route
E. Contaminating water
F. None of the Above

8. _____ may get into water and spread when infected humans or animals pass the bacteria, viruses, and protozoa in their stool. For another person to become infected, he or she must take that pathogen in through the mouth.
A. Foodborne route
B. Pathogens
C. Waterborne illness(es)
D. Fecal-oral route
E. Contaminating water
F. None of the Above

9. _____ are different from other types of pathogens such as the viruses that cause influenza (the flu) or the bacteria that cause tuberculosis.
A. Stomach flu
B. Tuberculosis
C. Microscopic particles
D. Spread of disease
E. Waterborne pathogens
F. None of the Above

10. Only proper treatment will ensure eliminating the _____. In addition to water, other methods exist for spreading pathogens by the fecal-oral route.
A. Stomach flu
B. Tuberculosis
C. Microscopic particles
D. Spread of disease
E. Waterborne pathogens
F. None of the Above

11. The general public and some of the medical community usually refer to diarrhea symptoms as _____.
A. Stomach flu
B. Tuberculosis
C. Microscopic particles
D. Spread of disease
E. Waterborne pathogens
F. None of the Above

12. Technically, influenza is an upper respiratory illness and rarely has diarrhea associated with it; therefore, stomach flu is a misleading description for foodborne or _____, yet is accepted by the general public.
A. Foodborne route
B. Pathogens
C. Waterborne illness(es)
D. Fecal-oral route
E. Contaminating water
F. None of the Above

13. So the next time you get the _____, you may want to think twice about what you've digested within the past few days.
A. Stomach flu
B. Tuberculosis
C. Microscopic particles
D. Spread of disease
E. Waterborne pathogens
F. None of the Above

14. The _____ is one of the more common methods. A frequent source is a food handler who does not wash his hands after a bowel movement and then handles food with unclean hands.
A. Foodborne route
B. Pathogens
C. Waterborne illness(es)
D. Fecal-oral route
E. Contaminating water
F. None of the Above

15. The individual who eats feces-contaminated food may become infected and ill. It is interesting to note the majority of _____occur in the home, not restaurants.
A. Stomach flu
B. Foodborne diseases
D. Spread of disease
E. Waterborne pathogens

C. Microscopic particles F. None of the Above

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

A. Foodborne route D. Fecal-oral route
B. Pathogens E. Contaminating water
C. Waterborne illness(es) F. None of the Above

Water Sampling Terms and Definitions-
Microbes

17. _____are common in the environment and are generally not harmful. However, the presence of these bacteria in drinking water is usually a result of a problem with the treatment system or the pipes which distribute water, and indicates that the water may be contaminated with germs that can cause disease.

A. Fecal Coliform D. Cryptosporidium
B. E. coli E. Microbes
C. Coliform bacteria F. None of the Above

18. _____ and E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes.

A. Fecal Coliform D. Cryptosporidium
B. E. coli E. Microbes
C. Turbidity F. None of the Above

19. Cryptosporidium is a parasite that enters lakes and rivers through sewage and animal waste. It causes_____, a mild gastrointestinal disease. However, the disease can be severe or fatal for people with severely weakened immune systems.

A. Fecal Coliform D. Cryptosporidium
B. E. coli E. Cryptosporidiosis
C. Turbidity F. None of the Above

20. _____is a parasite that enters lakes and rivers through sewage and animal waste. It causes gastrointestinal illness (e.g. diarrhea, vomiting, cramps).

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

21. _____ in these wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms.

A. Fecal Coliform D. Cryptosporidium
B. E. coli E. Microbes
C. Turbidity F. None of the Above

22. _____ has no health effects. However, turbidity can interfere with disinfection and provide a medium for microbial growth.

A. Fecal Coliform D. Cryptosporidium
B. E. coli E. Microbes
C. Turbidity F. None of the Above

23. _____ may indicate the presence of disease causing organisms. These organisms include bacteria, viruses, and parasites that can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.

A. Fecal Coliform D. Cryptosporidium
B. E. coli E. Microbes
C. Turbidity F. None of the Above

Radionuclides

24. The EPA has set an enforceable drinking water standard for _____ of 4 mg/L (some people who drink water containing fluoride in excess of this level over many years could get bone disease, including pain and tenderness of the bones).

A. Lead
B. Fluoride
C. Intestinal illness
D. Waterborne outbreaks
E. Arsenic
F. None of the Above

25. The EPA has also set a secondary _____ standard of 2 mg/L to protect against dental fluorosis. Dental fluorosis, in its moderate or severe forms, may result in a brown staining and/or pitting of the permanent teeth.

A. Lead
B. Fluoride
C. Intestinal illness
D. Waterborne outbreaks
E. Arsenic
F. None of the Above

26. This problem occurs only in developing teeth, before they erupt from the gums. Children under nine should not drink water that has more than 2 mg/L of _____.

A. Lead
B. Fluoride
C. Intestinal illness
D. Waterborne outbreaks
E. Arsenic
F. None of the Above

27. _____typically leaches into water from plumbing in older buildings. Lead pipes and plumbing fittings have been banned since August 1998. Children and pregnant women are most susceptible to lead health risks.

A. Lead
B. Fluoride
C. Intestinal illness
D. Waterborne outbreaks
E. Arsenic
F. None of the Above

28. _____ Certain minerals are radioactive and may emit a form of radiation known as alpha radiation. Some people who drink water containing alpha emitters in excess of the EPA standard over many years may have an increased risk of getting cancer.

A. Radon gas
B. Beta/photon emitters
C. Radioactive
D. Alpha emitters
E. Combined Radium 226/228
F. None of the Above

29. _____ Certain minerals are radioactive and may emit forms of radiation known as photons and beta radiation. Some people who drink water containing beta and photon emitters in excess of the EPA standard over many years may have an increased risk of getting cancer.

A. Radon gas
B. Beta/photon emitters
C. Radioactive
D. Alpha emitters
E. Combined Radium 226/228
F. None of the Above

30. _____ Some people who drink water containing radium 226 or 228 in excess of EPA standard over many years may have an increased risk of getting cancer.

A. Radon gas
B. Beta/photon emitters
C. Radioactive
D. Alpha emitters
E. Combined Radium 226/228
F. None of the Above

31. _____ can dissolve and accumulate in underground water sources, such as wells, and in the air in your home. Breathing radon can cause lung cancer.

A. Radon gas
B. Beta/photon emitters
C. Radioactive
D. Alpha emitters
E. Combined Radium 226/228
F. None of the Above

32. Drinking water containing radon presents a risk of developing cancer. Radon in air is more dangerous than _____.

A. Radon gas
B. Beta/photon emitters
C. Radioactive
D. Alpha emitters
E. Combined Radium 226/228
F. None of the Above

33. _____ Some people who drink water containing arsenic in excess of the EPA standard over many years could experience skin damage or problems with their circulatory system, and may have an increased risk of getting cancer.

A. Lead
B. Fluoride
C. Intestinal illness
D. Waterborne outbreaks
E. Arsenic
F. None of the Above

34. _____ Many communities add fluoride to their drinking water to promote dental health. Each community makes its own decision about whether or not to add fluoride.

A. Lead
B. Fluoride
C. Intestinal illness
D. Waterborne outbreaks
E. Arsenic
F. None of the Above

Chain of Transmission

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

A. Foodborne route
B. Pathogens
C. Waterborne illness(es)
D. Fecal-oral route
E. Contaminating water
F. None of the Above

36. The pathogens must survive in the water. This depends on the temperature of the water and the length of time the _____are in the water.

A. Stomach flu
B. Tuberculosis
C. Microscopic particles
D. Spread of disease
E. Pathogens
F. None of the Above

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

A. Illness
B. Cryptosporidium
C. Bacteria
D. Campylobacteriosis
E. Transmission of disease
F. None of the Above

38. The pathogens in the water must enter the water system's intake and in numbers sufficient to infect people. The water is either not treated or inadequately treated for the _____. A susceptible person must drink the water that contains the pathogen. Illness (disease) will occur.

A. Pathogen
B. Yersiniosis
C. Hepatitis A
D. Campylobacteriosis
E. Incubation period
F. None of the Above

39. This chain lists the events that must occur for the transmission of disease via drinking water. By breaking the chain at any point, the _____ will be prevented.

A. Illness
B. Cryptosporidium
C. Bacteria
D. Campylobacteriosis
E. Transmission of disease
F. None of the Above

Bacterial Diseases

40. _____ is the most common diarrhea illness caused by bacteria. Symptoms include abdominal pain, malaise, fever, nausea and vomiting, and they usually begin three to five days after exposure.

A. Pathogen
B. Yersiniosis
C. Hepatitis A
D. Campylobacteriosis
E. Incubation period
F. None of the Above

41. The _____is frequently over within two to five days and usually lasts no more than 10 days.

A. Illness
B. Cryptosporidium
C. Bacteria
D. Campylobacteriosis
E. Transmission of disease
F. None of the Above

42. _____ outbreaks have most often been associated with food, especially chicken and unpasteurized milk, as well as un-chlorinated water.

A. Pathogen
B. Yersiniosis
C. Hepatitis A
D. Campylobacteriosis
E. Incubation period
F. None of the Above

Types of Bacteria

43. These organisms are also an important cause of travelers' diarrhea. Medical treatment generally is not prescribed for _____ because recovery is usually rapid.

A. Illness
B. Cryptosporidium
C. Bacteria
D. Campylobacteriosis
E. Transmission of disease
F. None of the Above

44. Cholera, Legionellosis, salmonellosis, _____, and yersiniosis are other bacterial diseases that can be transmitted through water.

A. Shigellosis
B. Yersiniosis
C. Hepatitis A
D. Campylobacteriosis
E. Incubation period
F. None of the Above

45. All _____in water are readily killed or inactivated with chlorine or other disinfectants.

A. Illness
B. Cryptosporidium
C. Bacteria
D. Campylobacteriosis
E. Transmission of disease
F. None of the Above

Viral-Caused Diseases

46. _____ is an example of a common viral disease that may be transmitted through water. The onset is usually abrupt with fever, malaise, loss of appetite, nausea and abdominal discomfort, followed within a few days by jaundice.

A. Pathogen
B. Yersiniosis
C. Hepatitis A
D. Campylobacteriosis
E. Incubation period
F. None of the Above

47. The disease varies in severity from a _____lasting one to two weeks, to a severely disabling disease lasting several months (rare).

A. Pathogen
B. Yersiniosis
C. Hepatitis A
D. Mild illness
E. Incubation period
F. None of the Above

48. The _____ is 15-50 days and averages 28-30 days. Hepatitis A outbreaks have been related to fecally contaminated water; food contaminated by infected food handlers, including sandwiches and salads that are not cooked or are handled after cooking and raw or undercooked mollusks harvested from contaminated waters.

A. Pathogen
B. Yersiniosis
C. Hepatitis A
D. Campylobacteriosis
E. Incubation period
F. None of the Above

49. Aseptic meningitis, polio and viral gastroenteritis (Norwalk agent) are other viral diseases that can be transmitted through water. Most _____in drinking water can be inactivated by chlorine or other disinfectants.

A. Giardia lamblia
B. Giardiasis
C. Viruses
D. Cryptosporidiosis
E. Infections
F. None of the Above

Protozoan Caused Diseases

50. _____are larger than bacteria and viruses but still microscopic. They invade and inhabit the gastrointestinal tract.

A. HIV infections
B. Symptoms
C. Giardiasis
D. Hepatitis A
E. Protozoan pathogens
F. None of the Above

51. Some parasites enter the environment in a dormant form, with a protective cell wall, called a _____.

A. Giardia lamblia
B. Giardiasis
C. Malaise
D. Cyst
E. Infections
F. None of the Above

52. The _____ can survive in the environment for long periods of time and is extremely resistant to conventional disinfectants such as chlorine. Effective filtration treatment is therefore critical to removing these organisms from water sources.

A. HIV infections
B. Symptoms
C. Giardiasis
D. Hepatitis A
E. Cyst
F. None of the Above

53. _____ is a commonly reported protozoan-caused disease. It has also been referred to as backpacker's disease and beaver fever because of the many cases reported among hikers and others who consume untreated surface water.

A. Giardia lamblia
B. Giardiasis
C. Malaise
D. Cryptosporidiosis
E. Infections
F. None of the Above

54. _____ include chronic diarrhea, abdominal cramps, bloating, frequent loose and pale greasy stools, fatigue and weight loss.

A. HIV infections
B. Symptoms
C. Giardiasis
D. Hepatitis A
E. Cryptosporidiosis
F. None of the Above

55. The incubation period is 5-25 days or longer, with an average of 7-10 days. Many infections are _____(no symptoms).

A. Giardia lamblia
B. Giardiasis
C. Malaise
D. Asymptomatic
E. Infections
F. None of the Above

56. _____occurs worldwide. Waterborne outbreaks in the United States occur most often in communities receiving their drinking water from streams or rivers without adequate disinfection or a filtration system.

A. HIV infections
B. Symptoms
C. Giardiasis
D. Hepatitis A
E. Cryptosporidiosis
F. None of the Above

Giardia lamblia

57. Giardia lamblia has been responsible for more community-wide outbreaks of disease in the U.S. than_____. Drugs are available for treatment, but these are not 100% effective.

A. Giardia lamblia
B. Giardiasis
C. Malaise
D. Any other pathogen
E. Infections
F. None of the Above

Cryptosporidiosis

58. By understanding the nature of_____, the importance of properly constructed, operated and maintained public water systems becomes obvious.

A. Giardia lamblia
B. Giardiasis
C. Malaise
D. Waterborne diseases
E. Infections
F. None of the Above

59. While water treatment cannot achieve _____(no microorganisms), the goal of treatment must clearly be to produce drinking water that is as pathogen-free as possible at all times.

A. HIV infections
B. Sterile water
C. Giardiasis
D. Hepatitis A
E. Cryptosporidiosis
F. None of the Above

60. _____ is an example of a protozoan disease that is common worldwide, but was only recently recognized as causing human disease. The major symptom in humans is diarrhea, which may be profuse and watery.

A. HIV infections
B. Symptoms
C. Giardiasis
D. Hepatitis A
E. Cryptosporidiosis
F. None of the Above

61. The diarrhea is associated with cramping abdominal pain. General malaise, fever, anorexia, _____occur less often.

A. Giardia lamblia
B. Giardiasis
C. Malaise
D. Nausea and vomiting
E. Infections
F. None of the Above

62. _____ usually come and go, and end in fewer than 30 days in most cases. The incubation period is 1-12 days, with an average of about seven days.

A. HIV infections
B. Symptoms
C. Giardiasis
D. Hepatitis A
E. Cryptosporidiosis
F. None of the Above

63. Cryptosporidium organisms have been identified in human fecal specimens from more than 50 countries on six continents. The mode of transmission is fecal-oral, either by person-to-person or animal-to-person. There is no specific treatment for_____.

A. Giardia lamblia
B. Giardiasis
C. Malaise
D. Cryptosporidium infections
E. Infections
F. None of the Above

64. All of these diseases, with the exception of hepatitis A, have one symptom in common: diarrhea. They also have the same mode of transmission, fecal-oral, whether through person-to-person or animal-to-person contact, and the _____, being either foodborne or waterborne.

A. HIV infections
B. Symptoms
C. Giardiasis
D. Hepatitis A
E. Cryptosporidiosis
F. None of the Above

65. For those who operate water systems with inadequate source protection or treatment facilities, the potential risk of a _____is real.

A. Waterborne disease outbreak
B. Symptoms
C. Giardiasis
D. Hepatitis A
E. Cryptosporidiosis
F. None of the Above

66. For those operating systems that currently provide _____ and treatment, operating, and maintaining the system at a high level on a continuing basis is critical to prevent disease.

A. HIV infections
B. Symptoms
C. Giardiasis
D. Hepatitis A
E. Cryptosporidiosis
F. None of the Above

67. Although most pathogens cause mild, self-limiting disease, on occasion, they can cause serious, even_____.

A. Giardia lamblia
B. Giardiasis
C. Malaise
D. Life threatening illness
E. Infections
F. None of the Above

68. Particularly vulnerable are persons with _____such as those with HIV infections or cancer.

A. HIV infections
B. Symptoms
C. Giardiasis
D. Hepatitis A
E. Weak immune systems
F. None of the Above

Bacteriological Monitoring Section

69. Most waterborne diseases and illnesses have been related to the microbiological quality of drinking water. The routine microbiological analysis of your water is for_____.

A. Indicator bacteria
B. Bacteria tests
C. Contaminate
D. Coliform bacteria
E. Presence of an indicator
F. None of the Above

70. The _____ group is used as an indicator organism to determine the biological quality of your water.

A. Sample container
B. Sterilize
C. Coliform bacteria
D. Escherichia coli (E. coli)
E. Iron bacteria
F. None of the Above

71. The presence of an indicator or _____in your drinking water is an important health concern. Indicator bacteria signal possible fecal contamination, and therefore, the potential presence of pathogens.

A. Indicator bacteria
B. Pathogenic bacteria
C. Contaminate
D. Microbiological analysis
E. Presence of an indicator
F. None of the Above

72. They are used to monitor for pathogens because of the difficulties in determining the presence of _____.
A. Sample container D. Escherichia coli (E. coli)
B. Sterilize E. Specific disease-causing microorganisms
C. Coliform bacteria F. None of the Above

73. _____ are usually harmless, occur in high densities in their natural environment and are easily cultured in relatively simple bacteriological media.
A. Indicator bacteria D. Microbiological analysis
B. Bacteria tests E. Presence of an indicator
C. Contaminate F. None of the Above

74. Indicators in common use today for routine monitoring of drinking water include total coliforms, fecal coliforms, and _____.
A. Sample container D. Escherichia coli (E. coli)
B. Sterilize E. Iron bacteria
C. Coliform bacteria F. None of the Above

Bacteria Sampling
75. Water samples for _____ must always be collected in a sterile container. Take the sample from an inside faucet with the aerator removed.
A. Indicator bacteria D. Microbiological analysis
B. Bacteria tests E. Presence of an indicator
C. Contaminate F. None of the Above

76. Sterilize by spraying a _____ or alcohol solution or flaming the end of the tap with disposable butane lighter.
A. Sample container D. Escherichia coli (E. coli)
B. Sterilize E. Iron bacteria
C. Coliform bacteria F. None of the Above

77. Run the water for five minutes to clear the water lines and bring in fresh water. Do not touch or _____ the inside of the bottle or cap.
A. Indicator bacteria D. Microbiological analysis
B. Bacteria tests E. Presence of an indicator
C. Contaminate F. None of the Above

78. Carefully open the _____ and hold the outside of the cap. Fill the container and replace the top.
A. Sample container D. Escherichia coli (E. coli)
B. Sterilize E. Iron bacteria
C. Coliform bacteria F. None of the Above

79. Refrigerate the sample and transport it to the testing laboratory within six hours (in an ice chest). Many labs will not accept bacteria samples on Friday so check the lab's schedule. Mailing _____is not recommended because laboratory analysis results are not as reliable.
A. Indicator bacteria D. Microbiological analysis
B. Bacteria tests E. Presence of an indicator
C. Bacteria samples F. None of the Above

80. _____ forms an obvious slime on the inside of pipes and fixtures. A water test is not needed for identification. Check for a reddish-brown slime inside a toilet tank or where water stands for several days.
A. Sample container D. Escherichia coli (E. coli)
B. Sterilize E. Iron bacteria
C. Coliform bacteria F. None of the Above

81. Bac-T Sample Bottle, often referred to as a Standard Sample, 100 mls, Notice the white powder inside the bottle. That is_____, a de-chlorination agent. Be careful not to wash-out this chemical while sampling. Notice the custody seal on the bottle.
A. Indicator bacteria D. Microbiological analysis
B. Bacteria tests E. Presence of an indicator
C. Sodium Thiosulfate F. None of the Above

82. _____ are common in the environment and are generally not harmful. However, the presence of these bacteria in drinking water is usually a result of a problem with the treatment system or the pipes which distribute water, and indicates that the water may be contaminated with germs that can cause disease.
A. Sample container D. Escherichia coli (E. coli)
B. Sterilize E. Iron bacteria
C. Coliform bacteria F. None of the Above

Laboratory Procedures
83. The laboratory may perform the _____ in one of four methods approved by the U.S. EPA and your local environmental or health division.
A. Colilert D. Total coliform analysis
B. Coliforms E. Pathogens
C. Sample F. None of the Above

Methods
84. The MMO-MUG test, a product marketed as _____, is the most common. The sample results will be reported by the laboratories as simply coliforms present or absent.
A. Colilert D. Total coliform analysis
B. Coliforms E. Pathogens
C. Sample F. None of the Above

85. If coliforms are present, the laboratory will analyze the sample further to determine if these are fecal coliforms or _____and report their presence or absence.
A. Colilert D. Total coliform analysis
B. Coliforms E. Pathogens
C. E. coli F. None of the Above

Types of Water Samples
86. It is important to properly identify the type of _____ you are collecting. Please indicate in the space provided on the laboratory form the type of sample.
A. Colilert D. Total coliform analysis
B. Coliforms E. Pathogens
C. Sample F. None of the Above

The three (3) types of samples are:
87. Samples collected on a routine basis to monitor for contamination. Collection should be in accordance with an approved sampling plan.
A. Repeat D. Total coliform analysis
B. Special E. Routine
C. Sample F. None of the Above

88. Samples collected following a 'coliform present' routine sample. The number of repeat samples to be collected is based on the number of routine samples you normally collect.
A. Repeat D. Total coliform analysis
B. Special E. Routine
C. Sample F. None of the Above

89. Samples collected for other reasons. Examples would be a sample collected after repairs to the system and before it is placed back into operation or a sample collected at a wellhead prior to a disinfection injection point.
A. Repeat D. Total coliform analysis
B. Special E. Routine
C. Sample F. None of the Above

Noncommunity and nontransient noncommunity public water systems will sample at the same frequency as a like sized community public water system if:
90. It has more than 1,000 daily population and has _____, or
A. Noncommunity D. Coliform present
B. Routine sample(s) E. Original sampling location
C. Repeat sample(s) F. None of the Above

91. It serves 25 or more daily population and utilizes surface water as a source or ground water under the _____as its source.
A. MCL compliance D. Original sampling location
B. Distribution system E. Direct influence of surface water
C. Routine sample F. None of the Above

92. Noncommunity and _____with less than 1,000 daily population and groundwater as a source will sample on a quarterly basis.
A. Noncommunity D. Nontransient, noncommunity water systems
B. Routine sample(s) E. Original sampling location
C. Repeat sample(s) F. None of the Above

Repeat Sampling
93. Repeat sampling replaces the old check sampling with a more comprehensive procedure to try to identify problem areas in the system. Whenever a _____ is total coliform or fecal coliform present, a set of repeat samples must be collected within 24 hours after being notified by the laboratory.
A. MCL compliance D. Original sampling location
B. Distribution system E. Repeat sample(s)
C. Routine sample F. None of the Above

The follow-up for repeat sampling is:
94. If only one _____per month or quarter is required, four (4) repeat samples must be collected.
A. Noncommunity D. Coliform present
B. Routine sample E. Original sampling location
C. Repeat sample(s) F. None of the Above

95. For systems collecting two (2) or more routine samples per month, three (3) _____ must be collected.
A. MCL compliance D. Original sampling location
B. Distribution system E. Repeat sample(s)
C. Routine sample F. None of the Above

Repeat samples must be collected from:
96. If the system has only one service connection, the _____ must be collected from the same sampling location over a four-day period or on the same day.
A. Noncommunity D. Coliform present
B. Routine sample(s) E. Original sampling location
C. Repeat sample(s) F. None of the Above

97. All _____ are included in the MCL compliance calculation.
A. MCL compliance D. Original sampling location
B. Distribution system E. Repeat sample(s)
C. Routine sample F. None of the Above

98. 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 month or quarter regardless of whether an MCL violation occurred or if _____was coliform absent.
A. Noncommunity D. Coliform present
B. Routine sample(s) E. Repeat sampling
C. Repeat sample(s) F. None of the Above

99. The original sampling location of the _____.
A. Noncommunity D. Coliform present
B. Routine sample(s) E. Original sampling location
C. Repeat sample(s) F. None of the Above

100. Within five (5) service connections upstream from the _____.
A. MCL compliance D. Original sampling location
B. Distribution system E. Repeat sample(s)
C. Routine sample F. None of the Above

101. Within five (5) service connections downstream from the _____.
A. Noncommunity D. Coliform present
B. Routine sample(s) E. Original sampling location
C. Repeat sample(s) F. None of the Above

102. Elsewhere in the _____ or at the wellhead, if necessary.
A. MCL compliance D. Original sampling location
B. Distribution system E. Repeat sample(s)
C. Routine sample F. None of the Above

Positive or Coliform Present Results
103. What do you do when your sample is positive or coliform present?
When 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 the results are reported to you. The Drinking Water Program contracts with many of the local health departments to _____to water systems.
A. Noncommunity D. Coliform present
B. Routine sample(s) E. Provide assistance
C. Repeat sample(s) F. None of the Above

104. 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. MCL compliance D. Original sampling location
B. Repeat sampling immediately E. Repeat sample(s)
C. Routine sample F. None of the Above

Some examples of typical corrective measures to coliform problems are:

105. Shock chlorination of a ground water well. The recommended dose of 5% household bleach is 2 cups per 100 gallons of water in the well. This should be done anytime the _____ for repair (pump replacement, etc.). If you plan to shock the entire system, calculate the total gallonage of storage and distribution.

A. MCL compliance D. Original sampling location
B. Distribution system E. Repeat sample(s)
C. Routine sample F. None of the Above

106. Conduct routine distribution line _____. Install blowoffs on all dead end lines.

A. Flushing D. Eliminate
B. Standards E. Detectable residual
C. MCL(s) F. None of the Above

107. Conduct a cross connection program to identify all connections with _____.

A. MCL D. Non-potable water sources
B. Routine cleaning E. Back flow prevention devices
C. Construction standards F. None of the Above

108. _____ all of these connections or provide approved back flow prevention devices.

A. Flushing D. Eliminate
B. Standards E. Detectable residual
C. MCL(s) F. None of the Above

109. _____to meet current construction standards as set your state environmental or health agency.

A. MCL D. Upgrade the wellhead area
B. Routine cleaning E. Back flow prevention devices
C. Construction standards F. None of the Above

110. If you continuously chlorinate, review your operation and be sure to maintain a _____ (0.2 mg/l free chlorine) at all times in the distribution system.

A. Flushing D. Eliminate
B. Standards E. Detectable residual
C. MCL(s) F. None of the Above

111. Perform _____ of the storage system.

A. MCL D. Non-potable water sources
B. Routine cleaning E. Back flow prevention devices
C. Construction standards F. None of the Above

Maximum Contaminant Levels (MCLs)

112. State and federal laws establish standards for drinking water quality. Under normal circumstances when these _____ are being met, the water is safe to drink with no threat to human health.

A. Flushing D. Eliminate
B. Standards E. Detectable residual
C. MCL(s) F. None of the Above

113. These standards are known as maximum contaminant levels (MCL). When a particular contaminant exceeds its _____ a potential health threat may occur.

A. MCL D. Non-potable water sources
B. Routine cleaning E. Back flow prevention devices
C. Construction standards F. None of the Above

114. The _____ are based on extensive research on toxicological properties of the contaminants, risk assessments and factors, short term (acute) exposure and long term (chronic) exposure. You conduct the monitoring to make sure your water is in compliance with the MCL.
A. Flushing D. Eliminate
B. Standards E. Detectable residual
C. MCL(s) F. None of the Above

115. There are two types of MCL violations for coliform bacteria. The first is for total coliform; the second is an acute risk to health violation characterized by the confirmed presence of fecal coliform or_____.
A. Heterotrophic bacteria D. Heterotrophic Plate Count
B. E. coli E. Quebec colony counter
C. Low-turbidity water F. None of the Above

Heterotrophic Plate Count HPC
116. Heterotrophic Plate Count (HPC) --- formerly known as the standard plate count, is a procedure for estimating the number of _____and measuring changes during water treatment and distribution in water or in swimming pools.
A. Total coliforms D. Live heterotrophic bacteria
B. No colonies E. Colonies
C. Incubation period F. None of the Above

117. Colonies may arise from pairs, chains, clusters, or single cells, all of which are included in the term "_____" (CFU).
A. Heterotrophic bacteria D. Heterotrophic Plate Count
B. Submerged colonies E. Quebec colony counter
C. Colony-forming units F. None of the Above

Method: There are three methods for standard plate count:
Pour Plate Method
118. The _____produced are relatively small and compact, showing fewer tendencies to encroach on each other than those produced by surface growth. On the other hand, submerged colonies often are slower growing and are difficult to transfer.
A. Heterotrophic bacteria D. Heterotrophic Plate Count
B. Colonies E. Quebec colony counter
C. Low-turbidity water F. None of the Above

Spread Plate Method
119. All colonies are on the agar surface where they can be distinguished readily from particles and bubbles. _____ can be transferred quickly, and colony morphology easily can be discerned and compared to published descriptions.
A. Total coliforms D. Organic compounds
B. No colonies E. Colonies
C. Incubation period F. None of the Above

Membrane Filter Method
120. This method permits testing large volumes of _____ and is the method of choice for low-count waters.
A. Heterotrophic bacteria D. Heterotrophic Plate Count
B. Submerged colonies E. Quebec colony counter
C. Low-turbidity water F. None of the Above

Heterotrophic Plate Count
(Spread Plate Method)

121. Heterotrophic organisms utilize organic compounds as their carbon source (food or substrate). In contrast, autotrophic organisms use_____.

A. Total coliforms
B. No colonies
C. Incubation period
D. Organic compounds
E. Inorganic carbon sources
F. None of the Above

122. The _____ provides a technique to quantify the bacteriological activity of a sample. The R2A agar provides a medium that will support a large variety of heterotrophic bacteria.

A. Heterotrophic bacteria
B. Submerged colonies
C. Low-turbidity water
D. Heterotrophic Plate Count
E. Quebec colony counter
F. None of the Above

123. After an incubation period, a bacteriological colony count provides an estimate of the concentration of _____in the sample of interest.

A. Total coliforms
B. Heterotrophs
C. Incubation period
D. Organic compounds
E. Colonies
F. None of the Above

Counting and Recording:

124. After incubation period, promptly count all colonies on the plates. To count, uncover plate and place on _____. Use hand tally counter to maintain count. Count all colonies on the plate, regardless of size.

A. Heterotrophic bacteria
B. Submerged colonies
C. Low-turbidity water
D. Heterotrophic Plate Count
E. Quebec colony counter
F. None of the Above

125. To report counts on a plate with _____, report the count as less than one (<1) divided by the sample volume put on that plate (remember to account for any dilution of that sample).

A. Total coliforms
B. No colonies
C. Incubation period
D. Organic compounds
E. Colonies
F. None of the Above

126. If plates of all dilutions for a sample have_____, report the count as less than one (<1) divided by the largest sample volume used.

A. Heterotrophic bacteria
B. Submerged colonies
C. No colonies
D. Heterotrophic Plate Count
E. Quebec colony counter
F. None of the Above

Total Coliforms

127. This MCL is based on the presence of _____, and compliance is on a monthly or quarterly basis, depending on your water system type and state rule.

A. Total coliforms
B. No colonies
C. Incubation period
D. Organic compounds
E. Colonies
F. None of the Above

128. For systems which collect fewer than 40 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 an _____.

A. Heterotrophic bacteria
B. Submerged colonies
C. Low-turbidity water
D. Heterotrophic Plate Count
E. MCL violation
F. None of the Above

129. For systems which collect 40 or more samples per month, no more than five (5) percent may be _____, check with your state drinking water section or health department for further instructions.
A. Total coliforms D. Organic compounds
B. No colonies E. Colonies
C. Incubation period F. None of the Above

Acute Risk to Health (Fecal coliforms and E.coli)
130. _____requires the water system to provide public notice via radio and television stations in the area.
A. E. coli D. An acute health risk violation
B. Violations E. Certain mandatory language
C. MCL F. None of the Above

131. This type of contamination can pose an immediate threat to human health and notice must be given as soon as possible, but no later than 72 hours after _____ from your laboratory of the test results.
A. Total coliform present D. Violation
B. MCL E. Contamination
C. Each public notice F. None of the Above

132. _____may be mandatory for both these violations and is included in your state drinking water rule.
A. E. coli D. Certain language
B. Violations E. Certain mandatory language
C. MCL F. None of the Above

133. An acute risk to human health violation occurs if either one of the following happens: A routine analysis shows total coliform present and is followed by a repeat analysis which indicates fecal coliform or _____ present.
A. E. coli D. An acute health risk violation
B. Violations E. Certain mandatory language
C. MCL F. None of the Above

134. A routine analysis shows total and _____or E. coli present and is followed by a repeat analysis which indicates total coliform present.
A. Total coliform present D. Violation
B. Fecal coliform E. Contamination
C. Each public notice F. None of the Above

Public Notice
135. A public notice is required to be issued by a water system whenever it fails to comply with an applicable _____ or treatment technique, or fails to comply with the requirements of any scheduled variance or permit.
A. Total coliform present D. Violation
B. MCL E. Contamination
C. Each public notice F. None of the Above

136. This will inform users when there is a problem with the system and give them information. A public notice is also required whenever a water system fails to comply with its monitoring and/or reporting requirements or_____.
A. E. coli D. An acute health risk violation
B. Testing procedure E. Certain mandatory language
C. MCL F. None of the Above

137. _____ must contain certain information, be issued properly and in a timely manner, and contain certain mandatory language.
A. Total coliform present D. Violation
B. MCL E. Contamination
C. Each public notice F. None of the Above

138. The timing and place of posting of the public notice depends on whether _____ is present to users. Check with your state drinking water section or health department for further instructions.
A. E. coli D. An acute risk
B. Violations E. Certain mandatory language
C. MCL F. None of the Above

Chlorine (DDBP)
139. Today, most of our drinking water supplies are free of the micro-organisms — viruses, bacteria, and protozoa — that cause serious and_____, such as cholera and typhoid fever. This is largely due to the introduction of water treatment, particularly chlorination, at the turn of the century.
A. Micro-organisms D. Life-threatening diseases
B. Chloramines E. Organic matter
C. Disinfection F. None of the Above

140. Living cells react with _____and reduce its concentration while they die. Their organic matter and other substances that are present convert to chlorinated derivatives, some of which are effective killing agents.
A. Combined chlorine D. Chlorination by-products
B. Chlorine E. Chlorinated derivatives
C. Organic matter F. All of the Above

141. Chlorine present as Cl, HOCl, and OCl^- is called free available chlorine and that which is bound but still effective is_____.
A. Micro-organisms D. Residual
B. Chloramines E. Combined chlorine
C. Disinfection F. None of the Above

142. A particularly important group of compounds with combined chlorine is the chloramines formed by _____.
A. Combined chlorine D. Chlorination by-products
B. Reactions with ammonia E. Chlorinated derivatives
C. Organic matter F. All of the Above

143. One especially important feature of disinfection using chlorine is the ease of overdosing to create a _____.
A. Residual concentration D. Residual
B. Chloramines E. Organic matter
C. Disinfection F. None of the Above

144. There is a constant danger that safe water leaving the treatment plant may become contaminated later. There may be breaks in water mains, _____that permits an inward leak, or plumbing errors.
A. Combined chlorine D. Chlorination by-products
B. Plumbing errors E. Loss of pressure
C. Organic matter F. All of the Above

145. This residual concentration of chlorine provides some degree of protection right to the water faucet. With_____, a typical residual is from 0.1 to 0.5 ppm.
A. Micro-organisms D. Residual
B. Chloramines E. Free available chlorine
C. Disinfection F. None of the Above

146. Because chlorinated organic compounds are less effective, a typical residual is 2 ppm for _____.
A. Combined chlorine D. Chlorination by-products
B. Plumbing errors E. Chlorinated derivatives
C. Organic matter F. All of the Above

147. There will be no chlorine residual unless there is an excess over the amount that reacts with the organic matter present. However, reaction kinetics complicates interpretation of chlorination data. The correct excess is obtained in a method called _____.
A. Micro-organisms D. Residual
B. Chloramines E. Break Point Chlorination
C. Disinfection F. None of the Above

Chlorine by-products
148. Chlorination by-products are the chemicals formed when the chlorine used to kill disease-causing micro-organisms reacts with naturally occurring _____ (i.e., decay products of vegetation) in the water.
A. Combined chlorine D. Chlorination by-products
B. Plumbing errors E. Chlorinated derivatives
C. Organic matter F. All of the Above

149. The most common _____found in U.S. drinking water supplies are the trihalomethanes (THMs).
A. Chlorination by-products D. Residual
B. Chloramines E. Organic matter
C. Disinfection F. None of the Above

The principal trihalomethanes are:
150. Chloroform, bromodichloromethane, chlorodibromomethane, and bromoform. Other less common _____ includes the haloacetic acids and haloacetonitriles.
A. Combined chlorine D. Chlorination by-products
B. Plumbing errors E. Chlorinated derivatives
C. Organic matter F. All of the Above

151. The amount of _____formed in drinking water can be influenced by a number of factors, including the season and the source of the water.
A. Micro-organisms D. THMs
B. Chloramines E. Organic matter
C. Disinfection F. None of the Above

152. THM concentrations are generally lower in winter than in summer, because concentrations of natural _____ are lower and less chlorine is required to disinfect at colder temperatures.
A. Combined chlorine D. Chlorination by-products
B. Plumbing errors E. Chlorinated derivatives
C. Organic matter F. All of the Above

153. THM levels are also low when wells or large lakes are used as the drinking water source, because _____ are generally low in these sources.
A. THM(s) D. Chlorinated surface water
B. Chlorine E. Organic matter concentrations
C. Disinfect F. None of the Above

154. The opposite —_____and high THM levels — is true when rivers or other surface waters are used as the source of the drinking water.
A. THM(s) D. High organic matter concentrations
B. Chlorine E. Disinfectants
C. Disinfect F. None of the Above

Health Effects
155. Laboratory animals exposed to very high levels of THMs have shown increased incidences of cancer. Also, several studies of cancer incidence in human populations have reported associations between long-term exposure to high levels of _____and an increased risk of certain types of cancer.
A. THM(s) D. Chlorinated surface water
B. Chlorine E. Chlorination by-products
C. Disinfect F. None of the Above

156. For instance, a recent study conducted in the Great Lakes basin reported an increased risk of bladder and possibly colon cancer in people who drank _____ for 35 years or more.
A. THM(s) D. Chlorinated surface water
B. Chlorine E. Disinfectants
C. Disinfect F. None of the Above

157. Possible relationships between exposure to high levels of _____ and adverse reproductive effects in humans have also been examined recently.
A. THMs D. Water-borne diseases
B. Ozone E. Filtration practices
C. Disinfectants F. A and E

158. The available studies on health effects do not provide conclusive proof of a relationship between exposure to _____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. THM(s) D. Chlorinated surface water
B. Chlorine E. Disinfectants
C. Disinfect F. None of the Above

159. Current evidence indicates the benefits of chlorinating our drinking water — reduced incidence of water-borne diseases — are much greater than the risks of health effects from _____.
A. THMs D. Water-borne diseases
B. Ozone E. Filtration practices
C. Disinfectants F. A and B

160. Although other _____ are available, chlorine continues to be the choice of water treatment experts.
A. THM(s) D. Chlorinated surface water
B. Chlorine E. Disinfectants
C. Disinfect F. None of the Above

161. When used with modern water filtration practices, chlorine is effective against virtually all _____— bacteria, viruses, and protozoa.
A. THMs D. Water-borne diseases
B. Ozone E. Filtration practices
C. Infectious agents F. A and C

162. It is easy to apply, and most importantly, small amounts of _____ remain in the water and continue to disinfect throughout the distribution system. This ensures the water remains free of microbial contamination on its journey from the treatment plant to the consumer's tap.
A. THM(s) D. Chlorinated surface water
B. Chlorine E. Disinfectants
C. Disinfect F. None of the Above

163. A number of cities use _____ to disinfect their source water and to reduce THM formation.
A. THMs D. Water-borne diseases
B. Ozone E. Filtration practices
C. Disinfectants F. B and D

164. Although ozone is a highly effective _____, it breaks down quickly, so that small amounts of chlorine or other disinfectants must be added to the water to ensure continued disinfection as the water is piped to the consumer's tap.
A. THM(s) D. Chlorinated surface water
B. Chlorine E. Disinfectant
C. Disinfect F. None of the Above

165. Modifying water treatment facilities to use ozone can be expensive, and ozone treatment can create other _____ that may be harmful to health if they are not controlled (i.e., bromate).
A. THMs D. Water-borne diseases
B. Ozone E. Undesirable by-products
C. Disinfectants F. A and D

166. Examples of other _____ include chloramines and chlorine dioxide.
A. THM(s) D. Chlorinated surface water
B. Chlorine E. Disinfectants
C. Disinfect F. None of the Above

167. Chloramines are weaker disinfectants than chlorine, especially against viruses and protozoa; however, they are very persistent and, as such, can be useful for preventing re-growth of _____ in drinking water distribution systems.
A. THMs D. Microbial pathogens
B. Ozone E. Chloramines
C. Disinfectants F. A and D

168. Chlorine dioxide can be an effective disinfectant, but it forms_____, compounds whose toxicity has not yet been fully determined.
A. THM(s) D. Chlorinated surface water
B. Chlorine E. Chlorate and chlorite
C. Disinfect F. None of the Above

169. Assessments of the health risks from these and other chlorine-based disinfectants and _____ are currently under way.
A. THM(s) D. chlorination by-products
B. Chlorine E. Disinfectants
C. Disinfect F. None of the Above

170. In general, the preferred method of controlling chlorination by-products is removal of the naturally occurring organic matter from the source water so it cannot react with the _____ to form by-products.
A. THM(s) D. Chlorinated surface water
B. Chlorine E. Disinfectants
C. Disinfect F. None of the Above

171. _____levels may also be reduced through the replacement of chlorine with alternative disinfectants.
A. THM(s) D. Chlorinated surface water
B. Chlorine E. Disinfectants
C. Disinfect F. None of the Above

172. A third option is removal of the _____on activated carbon beds. It is extremely important that water treatment plants ensure the methods used to control chlorination by-products do not compromise the effectiveness of water disinfection.
A. THM(s) D. Chlorinated surface water
B. Chlorine E. By-products by adsorption
C. Disinfect F. None of the Above

Chlorination Equipment Requirements
173. For all water treatment facilities, _____shall not be permitted outside the chlorine room.
A. Point of solution D. Chlorine gas under pressure
B. Positive shutdown E. Automatic residual controlled
C. Constant flow rate F. None of the Above

174. The chlorine room is the room where chlorine gas cylinders and/or ton containers are stored. _____shall also be located inside the chlorine room.
A. Positive displacement D. Automatic residual controlled system
B. Injectors E. Automatic proportional controlled
C. Vacuum regulators F. None of the Above

175. The chlorinator, which is the _____equipment, may or may not be located inside the chlorine room.
A. Point of solution D. Mechanical gas proportioning
B. Positive shutdown E. Automatic residual controlled
C. Constant flow rate F. None of the Above

176. For new and upgraded facilities, from the chlorine room, chlorine gas vacuum lines should be run as close to the point of solution application as possible. _____ should be located to minimize the length of pressurized chlorine solution lines.
A. Positive displacement D. Automatic residual controlled system
B. Injectors E. Automatic proportional controlled
C. Gas pressure relief system F. None of the Above

177. A _____shall be included in the gas vacuum line between the vacuum regulator(s) and the chlorinator(s) to ensure that pressurized chlorine gas does not enter the gas vacuum lines leaving the chlorine room.
A. Point of solution D. Gas pressure relief system
B. Positive shutdown E. Automatic residual controlled
C. Constant flow rate F. None of the Above

178. The _____ shall vent pressurized gas to the atmosphere at a location that is not hazardous to plant personnel; the vent line should be run in such a manner that moisture collecting traps are avoided.
A. Positive displacement D. Automatic residual controlled system
B. Injectors E. Automatic proportional controlled
C. Gas pressure relief system F. None of the Above

179. The vacuum regulating valve(s) shall have _____ in the event of a break in the downstream vacuum lines.
A. Point of solution D. Mechanical gas proportioning
B. Positive shutdown E. Automatic residual controlled
C. Constant flow rate F. None of the Above

180. As an alternative to chlorine gas, it is permissible to use hypochlorite with _____ pumping. Anti-siphon valves shall be incorporated in the pump heads or in the discharge piping.
A. Positive displacement D. Automatic residual controlled system
B. Injectors E. Automatic proportional controlled
C. Gas pressure relief system F. None of the Above

Capacity
181. The chlorinator shall have the capacity to dose enough chlorine to overcome the demand and maintain the required_____.
A. Point of solution D. Mechanical gas proportioning
B. Positive shutdown E. Concentration of the free or combined chlorine
C. Constant flow rate F. None of the Above

Methods of Control
182. The chlorine feed system shall be _____, automatic residual controlled, or compound loop controlled.
A. Positive displacement D. Automatic residual controlled system
B. Injectors E. Automatic proportional controlled
C. Gas pressure relief system F. None of the Above

183. In the_____, the equipment adjusts the chlorine feed rate automatically in accordance with the flow changes to provide a constant pre-established dosage for all rates of flow.
A. Point of solution D. Mechanical gas proportioning
B. Positive shutdown E. Automatic proportional controlled system
C. Constant flow rate F. None of the Above

184. In the _____, the chlorine feeder is used in conjunction with a chlorine residual analyzer which controls the feed rate of the chlorine feeders to maintain a particular residual in the treated water.
A. Positive displacement D. Automatic residual controlled system
B. Injectors E. Automatic proportional controlled
C. Gas pressure relief system F. None of the Above

185. In the compound loop control system, the _____of the chlorinator is controlled by a flow proportional signal and a residual analyzer signal to maintain particular chlorine residual in the water.
A. Point of solution D. Mechanical gas proportioning
B. Positive shutdown E. Automatic residual controlled
C. Constant flow rate F. None of the Above

186. _____ may be installed for groundwater systems with constant flow rate.
A. Positive displacement D. Automatic residual controlled system
B. Manual chlorine feed systems E. Automatic proportional controlled
C. Gas pressure relief system F. None of the Above

Standby Provision
187. As a safeguard against malfunction and/or shut-down, standby chlorination equipment having the capacity to replace the _____ shall be provided.
A. Point of solution D. Mechanical gas proportioning
B. Positive shutdown E. Automatic residual controlled
C. Constant flow rate F. None of the Above

188. For uninterrupted chlorination, gas chlorinators shall be equipped with an _____. In addition, spare parts shall be available for all chlorinators.
A. Positive displacement D. Automatic changeover system
B. Injectors E. Automatic proportional controlled
C. Gas pressure relief system F. None of the Above

Weigh Scales
189. Scales for weighing cylinders shall be provided at all plants using chlorine gas to permit an accurate reading of _____of chlorine used.
A. Ton containers D. Discharge chlorine gas
B. Cylinders E. Cylinder and/or ton repair kits
C. Total daily weight F. None of the Above

190. At large plants, scales of the recording and indicating type are recommended. As a minimum, a _____shall be provided. Scales shall be of corrosion-resistant material.
A. Platform scale D. Gas chlorination
B. Chlorine leak detection E. Corrosion-resistant material
C. Chlorine gas leakage F. None of the Above

Securing Cylinders
191. _____shall be securely positioned to safeguard against movement. Tag the cylinder empty and store upright and chained. Ton containers may not be stacked.
A. Ton containers D. All chlorine cylinders
B. Cylinders E. Cylinder and/or ton repair kits
C. Exhaust ventilation systems F. None of the Above

Chlorine Leak Detection
192. Automatic _____and related alarm equipment shall be installed at all water treatment plants using chlorine gas.
A. Ammonia D. Gas chlorination
B. Chlorine leak detection E. Corrosion-resistant material
C. Chlorine gas leakage F. None of the Above

193. Leak detection shall be provided for the chlorine rooms. _____ equipment should be connected to a remote audible and visual alarm system and checked on a regular basis to verify proper operation.
A. Ammonia
B. Chlorine leak detection
C. Chlorine gas leakage
D. Gas chlorination
E. Corrosion-resistant material
F. None of the Above

194. _____ shall not automatically activate the chlorine room ventilation system in such a manner as to discharge chlorine gas.
A. Ton containers
B. Leak detection equipment
C. Exhaust ventilation systems
D. Discharge chlorine gas
E. Cylinder and/or ton repair kits
F. None of the Above

195. During an emergency, if the chlorine room is unoccupied, the chlorine gas leakage shall be contained within the chlorine room itself in order to facilitate a_____.
A. Ammonia
B. Chlorine leak detection
C. Chlorine gas leakage
D. Gas chlorination
E. Proper method of clean-up
F. None of the Above

196. Consideration should also be given to the provision of caustic soda solution reaction tanks for absorbing the contents of leaking _____where such cylinders are in use.
A. One-ton cylinders
B. Cylinders
C. Exhaust ventilation systems
D. Discharge chlorine gas
E. Cylinder and/or ton repair kits
F. None of the Above

197. You can use a spray solution of _____ or a rag soaked with Ammonia to detect a small Cl2 leak. If there is a leak, the ammonia will create a white colored smoke.
A. Ammonia
B. Chlorine leak detection
C. Chlorine gas leakage
D. Gas chlorination
E. Corrosion-resistant material
F. None of the Above

Safety Equipment
The facility shall be provided with personnel safety equipment to include the following:
198. _____, safety shower, eyewash, gloves, eye protection, protective clothing, cylinder and/or ton repair kits.
A. Ton containers
B. Cylinders
C. Exhaust ventilation systems
D. Discharge chlorine gas
E. Cylinder and/or ton repair kits
F. None of the Above

199. Respiratory equipment shall be provided which has been approved under the Occupational Health and Safety Act, General Safety Regulation - Selection of Respiratory Protective Equipment. Equipment shall be in _____ to the access door(s) of the chlorine room.
A. Ton containers
B. Close proximity
C. Exhaust ventilation systems
D. Discharge chlorine gas
E. Cylinder and/or ton repair kits
F. None of the Above

Chlorine Room Design Requirements
200. Where gas chlorination is practiced, the gas cylinders and/or the ton containers up to the vacuum regulators shall be housed in a gas-tight, well illuminated, _____ and mechanically ventilated enclosure.
A. Ammonia
B. Chlorine leak detection
C. Chlorine gas leakage
D. Gas chlorination
E. Corrosion resistant
F. None of the Above

201. The _____may or may not be located inside the chlorine room. The chlorine room shall be located at the ground floor level.

A. Ton containers
B. Cylinders
C. Chlorinator
D. Discharge chlorine gas
E. Cylinder and/or ton repair kits
F. None of the Above

Ventilation

202. Gas chlorine rooms shall have entirely separate exhaust ventilation systems capable of delivering one complete air change per minute during periods of chlorine room occupancy only - there shall be no_____.

A. Continuous ventilation
B. Chlorine leak detection
C. Chlorine gas leakage
D. Gas chlorination
E. Corrosion-resistant material
F. None of the Above

203. The air outlet from the room shall be 150 mm above the floor and the point of discharge located to _____of air inlets to buildings or areas used by people. The vents to the outside shall have insect screens.

A. Ton containers
B. Preclude contamination
C. Exhaust ventilation systems
D. Discharge chlorine gas
E. Cylinder and/or ton repair kits
F. None of the Above

204. Air inlets should be louvered near the ceiling, the air being of such _____as to not adversely affect the chlorination equipment.

A. Heating
B. Spilled gas
C. Panic bar
D. Temperature
E. Protected to ensure
F. None of the Above

205. _____for fans and lights shall be outside the room at all entrance or viewing points, and a clear wire-reinforced glass window shall be installed in such a manner as to allow the operator to inspect from the outside of the room.

A. Panic button
B. Scrubbers
C. Panic bar
D. Wire reinforced
E. Separate switches
F. None of the Above

Heating

206. Chlorine rooms shall have_____, if a forced air system is used to heat the building.

A. Heating
B. Spilled gas
C. Panic bar
D. Temperature
E. Separate heating systems
F. None of the Above

207. _____ for the building will negate the need for a separate heating system for the chlorine room. The heat should be controlled at approximately 15^{o}C.

A. Panic button
B. Scrubbers
C. Panic bar
D. Wire reinforced
E. Hot water heating system
F. None of the Above

208. Cylinders or containers shall be protected to ensure that the chlorine maintains its gaseous state when entering the_____.

A. Heating
B. Spilled gas
C. Panic bar
D. Chlorinator
E. Protected to ensure
F. None of the Above

Access

209. All access to the chlorine room shall only be from the exterior of the building. Visual inspection of the chlorination equipment from inside may be provided by the installation of glass window(s) in the walls of the chlorine room. Windows should be at least 0.20 m^2 in area, and be made of clear _____ glass.

A. Panic button D. Wire reinforced
B. Scrubbers E. Hot water heating system
C. Panic bar F. None of the Above

210. There should also be a _____ on the inside of the chlorine room door for emergency exit.

A. Heating D. Temperature
B. Spilled gas E. Protected to ensure
C. Panic bar F. None of the Above

Storage of Chlorine Cylinders

211. If necessary, a separate storage room may be provided to simply store the chlorine gas cylinders, with_____.

A. Panic button D. Wire reinforced
B. Scrubbers E. No connection to the line
C. Panic bar F. None of the Above

212. The chlorine cylinder storage room shall have access either to the chlorine room or from the plant exterior, and be arranged to prevent the_____.

A. Heating D. Uncontrolled release of spilled gas
B. Spilled gas E. Protected to ensure
C. Panic bar F. None of the Above

213. Chlorine gas storage room shall have provision for ventilation at thirty air changes per hour. Viewing glass windows and _____on the inside of door should also be provided.

A. Panic button D. Wire reinforced
B. Scrubbers E. Hot water heating system
C. Panic bar F. None of the Above

214. In very large facilities, entry into the chlorine rooms may be through a_____.

A. Heating D. Vestibule from outside
B. Spilled gas E. Protected to ensure
C. Panic bar F. None of the Above

Scrubbers

215. For facilities located within residential or densely populated areas, consideration shall be given to provide _____ for the chlorine room.

A. Panic button D. Wire reinforced
B. Scrubbers E. Hot water heating system
C. Panic bar F. None of the Above

Alternate Disinfectants

Chloramine

216. Chloramine 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 _____.

A. Chloramine D. Stable distribution system disinfectant
B. T10 value E. Sodium chlorite (NaClO2)
C. Free chlorine F. None of the Above

217. In the production of_____, the ammonia residuals in the finished water, when fed in excess of stoichiometric amount needed, should be limited to inhibit growth of nitrifying bacteria.
A. Dry sodium chlorite D. Ammonia residual(s)
B. Chloramines E. Free and/or combined chlorine
C. Chlorinated byproducts F. None of the Above

Chlorine Dioxide
218. _____ provides good Giardia and virus protection but its use is limited by the restriction on the maximum residual of 0.5 mg/L ClO2/chlorite/chlorate allowed in finished water. This limits usable residuals of chlorine dioxide at the end of a process unit to less than 0.5 mg/L.
A. Dry sodium chlorite D. Ammonia residual(s)
B. Chlorine dioxide E. Free and/or combined chlorine
C. Chlorinated byproducts F. None of the Above

219. Where chlorine dioxide is approved for use as an oxidant, the preferred method of generation is to entrain _____into a packed reaction chamber with a 25% aqueous solution of sodium chlorite (NaClO2).
A. Chloramine D. Chlorine dioxide
B. Chlorine gas E. Sodium chlorite (NaClO2)
C. Free chlorine F. None of the Above

220. Warning: _____ is explosive and can cause fires in feed equipment if leaking solutions or spills are allowed to dry out.
A. Dry sodium chlorite D. Ammonia residual(s)
B. Chlorine dioxide E. Free and/or combined chlorine
C. Chlorinated byproducts F. None of the Above

221. Chlorine dioxide may be used for either taste or odor control or as a_____.
A. Chloramine D. Chlorine dioxide
B. T10 value E. Pre-disinfectant
C. Free chlorine F. None of the Above

222. Total residual oxidants (including chlorine dioxide and chlorite, but excluding_____) shall not exceed 0.30 mg/L during normal operation or 0.50 mg/L (including chlorine dioxide, chlorite and chlorate) during periods of extreme variations in the raw water supply.
A. Chloramine D. Chlorine dioxide
B. Chlorate E. Sodium chlorite (NaClO2)
C. Free chlorine F. None of the Above

Ozone
223. Ozone is a very effective disinfectant for both Giardia and viruses. Ozone CT (contact time) values must be determined for the ozone basin alone; an accurate _____ must be obtained for the contact chamber, residual levels measured through the chamber and an average ozone residual calculated.
A. Chloramine D. Chlorine dioxide
B. T10 value E. Sodium chlorite (NaClO2)
C. Free chlorine F. None of the Above

224. Ozone does not provide a system residual and should be used as a primary disinfectant only in conjunction with _____.
A. Dry sodium chlorite D. Ammonia residual(s)
B. Chlorine dioxide E. Free and/or combined chlorine
C. Chlorinated byproducts F. None of the Above

225. Ozone does not produce chlorinated byproducts (such as trihalomethanes) but it may cause an increase in such byproduct formation if it is fed ahead of free chlorine; ozone may also produce its own oxygenated byproducts such as_____.
A. Chloramine D. Chlorine dioxide
B. T10 value E. Aldehydes, ketones or carboxylic acids
C. Free chlorine F. None of the Above

226. Any installed _____must include adequate ozone leak detection alarm systems, and an ozone off-gas destruction system.
A. Dry sodium chlorite D. Ammonia residual(s)
B. Chlorine dioxide E. Ozonation system
C. Chlorinated byproducts F. None of the Above

227. _____ may also be used as an oxidant for removal of taste and odor or may be applied as a pre-disinfectant.
A. Chloramine D. Chlorine dioxide
B. T10 value E. Sodium chlorite (NaClO2)
C. Free chlorine F. None of the Above

Chlorine Exposure Limits
228. OSHA PEL _____
A. 10 PPM D. 1,000 PPM
B. 1 PPM E. 100 PPM
C. 00.1 PPM F. None of the Above

229. IDLH _____
A. 10 PPM D. 1,000 PPM
B. 1 PPM E. 100 PPM
C. 00.1 PPM F. None of the Above

230. Can be readily compressed into a clear, amber-colored liquid, a _____, and a strong oxidizer.
A. Cl2 D. Combined Available Chlorine
B. Cl E. Noncombustible gas
C. HOCl and OCl- F. None of the Above

231. Fatal Exposure Limit _____
A. 10 PPM D. 1,000 PPM
B. 1 PPM E. 100 PPM
C. 00.1 PPM F. None of the Above

232. Physical and chemical properties of _____: A yellowish green, nonflammable and liquefied gas with an unpleasant and irritating smell.
A. Cl3 D. Combined Available Chlorine
B. Chlorine E. Monochloramine
C. HOCl and OCl- F. None of the Above

233. The current Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) for chlorine is _____ (3 milligrams per cubic meter (mg/m(3))) as a ceiling limit. A worker's exposure to chlorine shall at no time exceed this ceiling level.
A. 10 PPM D. 1,000 PPM
B. 1 PPM E. 100 PPM
C. 00.1 PPM F. None of the Above

234. Solid chlorine is about _____ times heavier than water and gaseous chlorine is about 2.5 times heavier than air.
A. 1.5 D. 2.5
B. 1.0 E. 3.0
C. 0.5 F. None of the Above

235. Atomic number of chlorine is _____.
A. 17 7 D. 17 PPM
B. 17 E. 23
C. 0.17 F. None of the Above

236. Cl is the elemental symbol and _____ is the chemical formula.
A. Cl2 D. Combined Available Chlorine
B. Cl E. Monochloramine
C. HOCl and OCl- F. None of the Above

237. Monochloramine, _____, and trichloramine are also known as Combined Available Chlorine. Cl2 + NH4.
A. Cl2 D. Combined Available Chlorine
B. Dichloramine E. Monochloramine
C. HOCl and OCl- F. None of the Above

238. HOCl and OCl-: The OCL- is the hypochlorite ion and both of these species are known as free available chlorine, they are the two main chemical species formed by chlorine in water and they are known collectively as hypochlorous acid and the_____.
A. Cl2 D. Combined Available Chlorine
B. Hypochlorite ion E. Monochloramine
C. HOCl and OCl- F. None of the Above

239. When _____is added to water, it rapidly hydrolyzes. The chemical equations best describes this reaction is Cl2 + H2O --> H+ + Cl- + HOCl.
A. Chlorine gas D. Combined Available Chlorine
B. Cl E. Monochloramine
C. HOCl and OCl- F. None of the Above

240. _____is the most germicidal of the chlorine compounds with the possible exception of chlorine dioxide.
A. Cl2 D. Combined Available Chlorine
B. Cl E. Monochloramine
C. Hypochlorous acid F. None of the Above

241. Yoke-type connectors should be used on a _____assuming that the threads on the valve may be worn.
A. Chlorine exposure D. Protective bonnet
B. Connection E. Chlorine cylinder's valve
C. Leak area F. None of the Above

242. The connection from a _____to a chlorinator should be replaced by using a new, approved gasket on the connector. Always follow your manufacturer's instructions.
A. Chlorine exposure D. Protective bonnet
B. Connection E. Several safety precautions
C. Chlorine cylinder F. None of the Above

243. On a 1 ton Cl2 gas container, the chlorine pressure reducing valve should be located downstream of the evaporator when using an evaporator. This is the _____and it is going to be made into chlorine gas.
A. Chlorine exposure D. Liquid chlorine supply line
B. Connection E. Several safety precautions
C. Leak area F. None of the Above

244. Here are several safety precautions when using chlorine gas: In addition to protective clothing and goggles, chlorine gas should be used only in a well-ventilated area so that _____ cannot concentrate.
A. Chlorine exposure D. Any leaking gas
B. Connection E. Several safety precautions
C. Leak area F. None of the Above

245. Emergency procedures in the case of a large uncontrolled chlorine leak are to: notify local emergency response team, warn and evacuate people in adjacent areas, and be sure that no one enters the leak area without_____.
A. Chlorine exposure D. Adequate self-contained breathing equipment
B. Connection E. Several safety precautions
C. Leak area F. None of the Above

246. Here are several symptoms of _____: burning of eyes, nose, and mouth; coughing, sneezing, choking; nausea and vomiting; headaches and dizziness; fatal pulmonary edema, pneumonia and skin blisters. A little Cl2 will corrode the teeth and then progress to throat cancer.
A. Chlorine exposure D. Protective bonnet
B. Connection E. Several safety precautions
C. Leak area F. None of the Above

247. Approved method for storing a 150 - 200 pound chlorine cylinder: secure each cylinder in an upright position, attach the _____ over the valve and firmly secure each cylinder. Never store near heat.
A. Chlorine exposure D. Protective bonnet
B. Connection E. Several safety precautions
C. Leak area F. None of the Above

248. Always store the empty in an upright, secure position with_____.
A. Chlorine exposure D. Protective bonnet
B. Proper signage E. Several safety precautions
C. Leak area F. None of the Above

The following are acute violations:
249. Violation of the _____ for nitrate.
A. Total coliform present D. Violation
B. MCL E. Contamination
C. Each public notice F. None of the Above

250. Any violation of the _____for total coliforms, when fecal coliforms or E. coli are present in the distribution system.
A. Total coliform present D. Violation
B. MCL E. Contamination
C. Each public notice F. None of the Above

251. Any outbreak of_____, as defined by the rules.
A. Total coliform present D. Violation
B. MCL E. Contamination
C. Waterborne disease F. None of the Above

Contaminants that may be present in sources of drinking water include:

252. Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, _____.

A. Viruses and bacteria
B. Pesticides and herbicides
C. Radioactive contaminants
D. Agricultural livestock operations and wildlife
E. Organic chemical contaminants
F. None of the Above

253. _____, such as salts and metals, which can be naturally occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

A. Viruses and bacteria
B. Pesticides and herbicides
C. Radioactive contaminants
D. Inorganic contaminants
E. Organic chemical contaminants
F. None of the Above

254. _____, which may come from a variety of sources such as agriculture, urban stormwater run-off and residential uses.

A. Viruses and bacteria
B. Pesticides and herbicides
C. Radioactive contaminants
D. Inorganic contaminants
E. Organic chemical contaminants
F. None of the Above

255. _____, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater run-off and septic systems.

A. Viruses and bacteria
B. Pesticides and herbicides
C. Radioactive contaminants
D. Inorganic contaminants
E. Organic chemical contaminants
F. None of the Above

256. _____, which can be naturally occurring or be the result of oil and gas production and mining activities.

A. Viruses and bacteria
B. Pesticides and herbicides
C. Radioactive contaminants
D. Inorganic contaminants
E. Organic chemical contaminants
F. None of the Above

Background

257. Coliform bacteria and chlorine residual are the only routine sampling and monitoring requirements for small ground water systems with chlorination. The coliform bacteriological sampling is governed by the _____of the SDWA.

A. Multiple sources
B. Sample siting plan
C. Total coliform
D. TCB
E. Total Coliform Rule (TCR)
F. None of the Above

258. Although there is presently no requirement for chlorination of groundwater systems under the SDWA, State regulations require _____of those systems that do chlorinate the water.

A. Seal individual samples
B. Chain of custody
C. Chlorine residual monitoring
D. Sample siting plan
E. Positive for total coliform
F. None of the Above

TCR

259. The _____ requires all Public Water Systems (PWS) to monitor their distribution system for coliform bacteria according to the written sample siting plan for that system. The sample sitting plan identifies sampling frequency and locations throughout the distribution system that are selected to be representative of conditions in the entire system.

A. Multiple sources
B. Sample siting plan
C. Total coliform
D. TCR
E. Sampling containers
F. None of the Above

260. _____can occur anywhere in the system, possibly due to problems such as; low pressure conditions, line breaks, or well contamination, and therefore routine monitoring is required.
A. Seal individual samples D. Sample siting plan
B. Chain of custody E. Positive for total coliform
C. Coliform contamination F. None of the Above

261. A copy of the _____ for the system should be kept on file and accessible to all who are involved in the sampling for the water system.
A. Multiple sources D. TCR
B. Sample siting plan E. Sampling containers
C. Total coliform F. None of the Above

Number of Monthly Samples
262. The number of samples to be collected monthly depends on the size of the system. The TCR specifies the minimum number of _____collected but it may be necessary to take more than the minimum number in order to provide adequate monitoring.
A. Seal individual samples D. Coliform samples
B. Chain of custody E. Positive for total coliform
C. Distribution system F. None of the Above

263. This is especially true if the system consists of multiple sources, pressure zones, booster pumps, long transmission lines, or _____.
A. Multiple sources D. TCR
B. Sample siting plan E. Sampling containers
C. Total coliform F. None of the Above

264. Since timely detection of _____is the purpose of the sample siting plan, sample sites should be selected to represent the varying conditions that exist in the distribution system.
A. Seal individual samples D. Sample siting plan
B. Chain of custody E. Positive for total coliform
C. Coliform contamination F. None of the Above

265. The _____ should be updated as changes are made in the water system, especially the distribution system.
A. Multiple sources D. TCR
B. Sample siting plan E. Sampling containers
C. Total coliform F. None of the Above

Sampling Procedures
266. The _____ must be followed and all operating staff must be clear on how to follow the sampling plan.
A. Seal individual samples D. Sample siting plan
B. Chain of custody E. Positive for total coliform
C. Distribution system F. None of the Above

267. In order to properly implement the sample siting plan, staff must be aware of how often sampling must be done, the _____to be used for collecting the samples, and the proper procedures for identification, storage and transport of the samples to an approved laboratory.
A. Multiple sources D. Proper procedures and sampling containers
B. Sample siting plan E. Sampling containers
C. Total coliform F. None of the Above

268. In addition, proper procedures must be followed for repeat sampling whenever a routine sample result is_____.
A. Seal individual samples D. Sample siting plan
B. Chain of custody E. Positive for total coliform
C. Distribution system F. None of the Above

Chain of Custody Procedures
269. Because a sample is physical evidence, chain of custody procedures are used to maintain and document sample possession from the time the sample is collected until it is introduced as evidence. _____requirements will vary from agency to agency.
A. Multiple sources D. TCR
B. Sample siting plan E. Chain of custody
C. Total coliform F. None of the Above

270. However, these procedures are similar and the _____ outlined in this manual is only a guideline. Consult your project manager for specific requirements.
A. Seal individual samples D. Sample siting plan
B. Chain of custody E. Positive for total coliform
C. Distribution system F. None of the Above

271. If you have physical possession of a sample, have it in view, or have physically secured it to prevent tampering then it is defined as being in “custody." A_____, therefore, begins when the sample containers are obtained from the laboratory. From this point on, a chain of custody record will accompany the sample containers.
A. Multiple sources D. Chain of custody record
B. Sample siting plan E. Sampling containers
C. Total coliform F. None of the Above

272. Handle the samples as little as possible in the field. Each custody sample requires a _____record and may require a seal. If you do not seal individual samples, then seal the containers in which the samples are shipped.
A. Seal individual samples D. Sample siting plan
B. Chain of custody E. Positive for total coliform
C. Distribution system F. None of the Above

273. When the_____, both parties involved in the transfer must sign, date and note the time on the chain of custody record. If a shipper refuses to sign the chain-of-custody you must seal the samples and chain of custody documents inside a box or cooler with bottle seals or evidence tape.
A. Multiple sources D. Samples transfer possession
B. Sample siting plan E. Sampling containers
C. Total coliform F. None of the Above

274. The recipient will then attach the _____showing the transfer dates and times to the custody sheets. If the samples are split and sent to more than one laboratory, prepare a separate chain of custody record for each sample.
A. Seal individual samples D. Sample siting plan
B. Chain of custody E. Positive for total coliform
C. Shipping invoices F. None of the Above

275. If the samples are delivered to after-hours night drop-off boxes, the custody record should note such _____and be locked with the sealed samples inside sealed boxes.
A. Multiple sources D. TCR
B. Sample siting plan E. A transfer
C. Total coliform F. None of the Above

New EPA Rules

Arsenic

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

A. Arsenic
B. Trihalomethanes
C. Disinfection byproducts
D. Information Collection Rule (ICR)
E. Disinfection byproducts (DBPs)
F. None of the Above

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

A. Arsenic
B. Trihalomethanes
C. Disinfection byproducts
D. Information Collection Rule (ICR)
E. Disinfection byproducts (DBPs)
F. None of the Above

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

A. Arsenic
B. Trihalomethanes
C. Disinfection
D. Information Collection Rule (ICR)
E. Disinfection byproducts (DBPs)
F. None of the Above

279. To protect human health, an EPA standard limits the amount of _____in drinking water. In January 2001, the EPA revised the standard from 50 parts per billion (ppb), ordered that it fall to 10 ppb by 2006.

A. Arsenic
B. Trihalomethanes
C. Disinfection
D. Information Collection Rule (ICR)
E. Disinfection byproducts (DBPs)
F. None of the Above

280. After adopting 10ppb as the new standard for _____ in drinking water, the EPA decided to review the decision to ensure that the final standard was based on sound science and accurate estimates of costs and benefits.

A. Arsenic
B. Trihalomethanes
C. Disinfection
D. Information Collection Rule (ICR)
E. Disinfection byproducts (DBPs)
F. None of the Above

281. In October 2001, the EPA decided to move forward with implementing the 10 ppb standard for _____ in drinking water.

A. Arsenic
B. Trihalomethanes
C. Disinfection
D. Information Collection Rule (ICR)
E. Disinfection byproducts (DBPs)
F. None of the Above

ICR

282. The EPA has collected data required by the Information Collection Rule (ICR) to support future regulation of_____, disinfectants, and disinfection byproducts.

A. Microbial contaminants
B. Trihalomethanes
C. Disinfection
D. Information Collection Rule (ICR)
E. Disinfection byproducts (DBPs)
F. None of the Above

283. The rule is intended to provide EPA with information on chemical byproducts that form when disinfectants used for microbial control react with chemicals already present in source water (disinfection byproducts (DBPs));_____, including Cryptosporidium; and engineering data to control these contaminants.

A. Cryptosporidium
B. Trihalomethanes
C. Disinfection byproduct Rule
D. Disease-causing microorganisms (pathogens)
E. Disinfection byproducts (DBPs)
F. None of the Above

Disinfection Byproduct Regulations

284. In December 1998, EPA established the Stage 1 Disinfectants/Disinfection Byproducts Rule that requires public water systems to use treatment measures to reduce the formation of _____.

A. Cryptosporidium
B. Trihalomethanes
C. Disinfection byproduct Rule
D. Total Trihalomethane Rule
E. Disinfection byproducts (DBPs)
F. None of the Above

285. Currently trihalomethanes are regulated at a maximum allowable annual average level of 100 ppb for water systems serving more than 10,000 people under the _____ finalized by EPA in 1979.

A. Cryptosporidium
B. Trihalomethanes
C. Disinfection byproduct Rule
D. Total Trihalomethane Rule
E. Disinfection byproducts (DBPs)
F. None of the Above

286. The _____standards became effective for trihalomethanes and other disinfection byproducts listed above back in December 2001 for large surface water public water systems.

A. Cryptosporidium
B. Trihalomethanes
C. Disinfection byproduct Rule
D. Total Trihalomethane Rule
E. Stage 1 Disinfectant/Disinfection Byproduct Rule
F. None of the Above

287. _____ are formed when disinfectants used in water treatment plants react with bromide and/or natural organic matter (i.e., decaying vegetation) present in the source water.

A. Cryptosporidium
B. Trihalomethanes
C. Disinfection byproduct Rule
D. Total Trihalomethane Rule
E. Disinfection byproducts (DBPs)
F. None of the Above

288. Different disinfectants produce different types or amounts of _____.

A. Cryptosporidium
B. Trihalomethanes
C. Disinfection byproduct Rule
D. Total Trihalomethane Rule
E. Disinfection byproducts (DBPs)
F. None of the Above

289. _____ for which regulations have been established have been identified in drinking water, including trihalomethanes, haloacetic acids, bromate, and chlorite.

A. Cryptosporidium
B. Trihalomethanes
C. Disinfection byproduct Rule
D. Total Trihalomethane Rule
E. Disinfection byproducts (DBPs)
F. None of the Above

290. _____ are a group of four chemicals that are formed along with other disinfection byproducts when chlorine or other disinfectants used to control microbial contaminants in drinking water react with naturally occurring organic and inorganic matter in water.

A. Cryptosporidium
B. Trihalomethanes
C. Disinfection byproduct Rule
D. Total Trihalomethane Rule
E. Disinfection byproducts (DBPs)
F. None of the Above

291. The _____ are chloroform, bromodichloromethane, dibromochloromethane, and bromoform. EPA has published the Stage 1 Disinfectants/Disinfection Byproducts Rule to regulate total trihalomethanes (TTHM) at a maximum allowable annual average level of 80 parts per billion.

A. Cryptosporidium
B. Trihalomethanes
C. Disinfection byproduct Rule
D. Total Trihalomethane Rule
E. Disinfection byproducts (DBPs)
F. None of the Above

292. _____are a group of chemicals that are formed along with other disinfection byproducts when chlorine or other disinfectants used to control microbial contaminants in drinking water react with naturally occurring organic and inorganic matter in water.

A. Disinfectant residual
B. Chlorite
C. Haloacetic Acids (HAA5)
D. Giardia and viruses
E. Disinfection By-Products (DBPs)
F. None of the Above

293. The regulated haloacetic acids, known as HAA5, are: monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid. EPA has published the Stage 1 Disinfectants/Disinfection Byproducts Rule to regulate _____at 60 parts per billion annual average. This standard became effective for large surface water public water systems in December 2001 and for small surface water and all ground water public water systems in December 2003.

A. Bromate
B. Counter pathogens
C. HAA5
D. From the results of coliform testing
E. Bacteria, Virus and Intestinal parasites
F. None of the Above

294. _____is a chemical that is formed when ozone, used to disinfect drinking water, reacts with naturally occurring bromide found in source water.

A. Bromate
B. Counter pathogens
C. Monobromoacetic acid
D. From the results of coliform testing
E. Bacteria, Virus and Intestinal parasites
F. None of the Above

295. _____is a byproduct formed when chlorine dioxide is used to disinfect water. The EPA has published the Stage 1 Disinfectants/Disinfection Byproducts Rule to regulate chlorite at a monthly average level of 1 ppm in drinking water.

A. Disinfectant residual
B. Chlorite
C. Haloacetic acid(s)
D. Giardia and viruses
E. Disinfection By-Products (DBPs)
F. None of the Above

Microbial Regulations

296. One of the key regulations developed and implemented by the United States Environmental Protection Agency (USEPA) to _____ in drinking water is the Surface Water Treatment Rule.

A. Bromate
B. Counter pathogens
C. Monobromoacetic acid
D. From the results of coliform testing
E. Bacteria, Virus and Intestinal parasites
F. None of the Above

297. Among its provisions, the rule 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 _____ by at least 99.9% and 99.99%, respectively.

A. Disinfectant residual
B. Chlorite
C. Haloacetic acid(s)
D. Giardia and viruses
E. Disinfection By-Products (DBPs)
F. None of the Above

298. The _____specifies treatment criteria to assure that these performance requirements are met; they include turbidity limits, disinfectant residual and disinfectant contact time conditions.

A. Surface Water Treatment Rule
B. Counter pathogens
C. Monobromoacetic acid
D. From the results of coliform testing
E. Bacteria, Virus and Intestinal parasites
F. None of the Above

Disinfectant Review Statements:

299. The CT values for disinfection are used to determine the disinfection efficiency based upon time and what other parameter?

A. Disinfectant residual
B. Chlorite
C. Haloacetic acid(s)
D. Giardia and viruses
E. Disinfection By-Products (DBPs)
F. None of the Above

300. What types of organisms may transmit waterborne diseases?

A. Bromate
B. Counter pathogens
C. Monobromoacetic acid
D. From the results of coliform testing
E. Bacteria, Virus and Intestinal parasites
F. None of the Above

301. The products created due to the reaction of chlorine with organic materials (e.g. leaves, soil) present in raw water during the water treatment process. The EPA has determined that these DBPs can cause cancer.

A. Disinfectant residual
B. Chlorite
C. Haloacetic acid(s)
D. Giardia and viruses
E. Disinfection By-Products (DBPs)
F. None of the Above

302. How is the effectiveness of disinfection determined?

A. Bromate
B. Counter pathogens
C. Monobromoacetic acid
D. From the results of coliform testing
E. Bacteria, Virus and Intestinal parasites
F. None of the Above

Some of these questions may seem similar to the first section of the assignment.

Microorganism Appendix

Protozoa

303. _____ are around 10–50 micrometer, but can grow up to 1 mm and can easily be seen under a microscope.

A. Protozoa
B. Malaria parasites
C. Microinvertebrates
D. Algal production
E. Trophozoites and cysts
F. None of the Above

304. _____ exist throughout aqueous environments and soil.

A. Protozoa
B. Malaria parasites
C. Microinvertebrates
D. Algal production
E. Trophozoites and cysts
F. None of the Above

305. Protozoa occupy a range of trophic levels. As predators, they prey upon unicellular or filamentous algae, bacteria, and_____.

A. Microfungi
B. Malaria parasites
C. Microinvertebrates
D. Algal production
E. Trophozoites and cysts
F. None of the Above

306. _____ play a role both as herbivores and as consumers in the decomposer link of the food chain.

A. Protozoa
B. Malaria parasites
C. Microinvertebrates
D. Algal production
E. Trophozoites and cysts
F. None of the Above

307. Protozoa also play a vital role in controlling bacteria populations and biomass. As components of the micro- and_____, protozoa are an important food source for microinvertebrates.

A. Meiofauna
B. Malaria parasites
C. Microinvertebrates
D. Algal production
E. Trophozoites and cysts
F. None of the Above

308. The ecological role of protozoa in the transfer of bacterial and _____ to successive trophic levels is important.
A. Protozoa D. Algal production
B. Malaria parasites E. Trophozoites and cysts
C. Microinvertebrates F. None of the Above

309. Protozoa such as the _____ (Plasmodium spp.), trypanosomes and leishmania are also important as parasites and symbionts of multicellular animals.
A. Protozoa D. Algal production
B. Malaria parasites E. Trophozoites and cysts
C. Microinvertebrates F. None of the Above

310. Most protozoa exist in 5 stages of life which are in the form of _____.
A. Protozoa D. Algal production
B. Malaria parasites E. Trophozoites and cysts
C. Microinvertebrates F. None of the Above

311. As _____, protozoa can survive harsh conditions, such as exposure to extreme temperatures and harmful chemicals, or long periods without access to nutrients, water, or oxygen for a period of time.
A. Cysts D. Hermaphroditic
B. Trophozoite E. Apicomplexans
C. Pathogens F. None of the Above

312. Being a cyst enables parasitic species to survive outside of the host, and allows their transmission from one host to another. When protozoa are in the form of _____ (Greek, tropho=to nourish), they actively feed and grow.
A. Cysts D. Hermaphroditic
B. Trophozoites E. Apicomplexans
C. Pathogens F. None of the Above

313. The process by which the protozoa takes its cyst form is called encystation, while the process of transforming back into _____ is called excystation.
A. Cysts D. Hermaphroditic
B. Trophozoite E. Apicomplexans
C. Pathogens F. None of the Above

314. Protozoa can reproduce by binary fission or multiple fission. Some protozoa reproduce sexually, some asexually, and some both (e.g. Coccidia). An individual protozoan is _____.
A. Cysts D. Hermaphroditic
B. Trophozoite E. Apicomplexans
C. Pathogens F. None of the Above

Classification
315. Protozoa were commonly grouped in the kingdom of Protista together with the plant-like algae and fungus-like water molds and slime molds. In the 21st-century systematics, protozoans, along with ciliates, mastigophorans, and apicomplexans, are arranged as animal-like protists. However, protozoans are neither _____(with the possible exception of the enigmatic, moldy Myxozoa).
A. Cysts D. Animalia nor Metazoa
B. Trophozoite E. Apicomplexans
C. Pathogens F. None of the Above

316. There are many ways that infectious diseases can spread. _____ usually have specific routes by which they are transmitted, and these routes may depend on the type of cells and tissue that a particular agent targets.
A. Cysts D. Hermaphroditic
B. Trophozoite E. Apicomplexans
C. Pathogens F. None of the Above

317. Once in the air, the viruses can infect another person who is unlucky enough to inhale air containing the_____.
A. Cysts D. Hermaphroditic
B. Trophozoite E. Apicomplexans
C. Virus particles F. None of the Above

318. Agents vary greatly in their stability in the environment. Some viruses may survive for only a few minutes outside of a host, while some _____are extremely durable and may survive in a dormant state for a decade or more.
A. Cysts D. Spore-forming bacteria
B. Trophozoite E. Apicomplexans
C. Pathogens F. None of the Above

Protozoa Section
319. The diverse assemblage of organisms that carry out all of their life functions within the confines of a single, complex _____ are called protozoa.
A. Eukaryotic cell D. Marine ciliates
B. Protozoa(ns) E. Cytoplasma
C. Amoeba(s) F. None of the Above

320. Paramecium, _____, and Amoeba are well-known examples of these major groups of organisms.
A. Eukaryotic cell D. Euglena
B. Protozoa(ns) E. Cytoplasma
C. Amoeba(s) F. None of the Above

321. Some _____ are more closely related to animals, others to plants, and still others are relatively unique.
A. Eukaryotic cell D. Marine ciliates
B. Protozoa(ns) E. Cytoplasma
C. Amoeba(s) F. None of the Above

322. The _____are sometimes also called algae and are addressed elsewhere. This report considers the status of our knowledge of heterotrophic protozoa (protozoa that cannot produce their own food).
A. Eukaryotic cell D. Marine ciliates
B. Protozoa(ns) E. Unicellular photosynthetic protozoa
C. Amoeba(s) F. None of the Above

Free-living Protozoa
323. _____ are found in all moist habitats within the United States, but we know little about their specific geographic distribution.
A. Eukaryotic cell D. Marine ciliates
B. Protozoa(ns) E. Cytoplasma
C. Amoeba(s) F. None of the Above

324. Because of their small size, production of resistant cysts, and ease of distribution from one place to another, many species appear to be cosmopolitan and may be collected in similar _____. Other species may have relatively narrow limits to their distribution.
A. Eukaryotic cell D. Marine ciliates
B. Protozoa(ns) E. Cytoplasma
C. Amoeba(s) F. None of the Above

325. _____ inhabit interstices of sediment and beach sands, surfaces, deep sea and cold Antarctic environments, planktonic habitats, and the algal mats and detritus of estuaries and wetlands.
A. Eukaryotic cell D. Marine ciliates
B. Protozoa(ns) E. Cytoplasma
C. Amoeba(s) F. None of the Above

Amoebas
326. Amoebas (Phylum Rhizopoda) are unicellular protists that are able to change their shape constantly. Each species has its own _____.
A. Eukaryotic cell D. Marine ciliates
B. Protozoa(ns) E. Cytoplasma
C. Amoeba(s) F. None of the Above

How does an amoeba locomote?
327. _____ locomote by way of cytoplasmic movement. (cytoplasm is the cell content around the nucleus of the cell)
A. Eukaryotic cell D. Marine ciliates
B. Protozoa(ns) E. Cytoplasma
C. Amoeba(s) F. None of the Above

328. The amoeba forms pseudopods (false feet) with which they 'flow' over a surface. The _____ not only flows, it also changes from a fluid into a solid state.
A. Eukaryotic cell D. Marine ciliates
B. Protozoa(ns) E. Cytoplasma
C. Amoeba(s) F. None of the Above

329. These pseudopods are also used to capture prey, they simply engulf the food. They can detect the kind of prey and use different_____.
A. Eukaryotic cell D. 'Engulfing tactics'
B. Protozoa(ns) E. Cytoplasma
C. Amoeba(s) F. None of the Above

330. Other species may have many_____. The cell is full of brown food vacuoles and also contains small crystals.
A. Eukaryotic cell D. Marine ciliates
B. Protozoa(ns) E. Cytoplasma
C. Amoeba(s) F. None of the Above

Protozoa Information
331. In general, freshwater protozoan communities are similar to marine communities except the specialized interstitial fauna of the sand is largely missing. In freshwater habitats, the foraminifera and radiolaria common in marine environments are absent or low in numbers while _____ exist in greater numbers.
A. Foraminifera D. Soil biomass
B. Testate amoebae E. Microsporidia
C. Cytoplasm of protozoa F. None of the Above

332. _____have been documented from almost every type of soil and in every kind of environment, from the peat-rich soil of bogs to the dry sands of deserts. In general, protozoa are found in greatest abundance near the soil surface, especially in the upper 15 cm (6 in), but occasional isolates can be obtained at depths of a meter (yard) or more.
A. Foraminifera
B. Protozoan fauna
C. Soil-dwelling protozoa
D. Soil biomass
E. Microsporidia
F. None of the Above

333. Protozoa do not constitute a major part of _____, but in some highly productive regions such as forest litter, the protozoa are a significant food source for the microinvertebrates, with a biomass that may reach 20 g/m2 of soil surface area there.
A. Foraminifera
B. Protozoan fauna
C. Cytoplasm of protozoa
D. Soil biomass
E. Microsporidia
F. None of the Above

334. Our actual knowledge of salinity, temperature, and oxygen requirements of _____ is poor (although some groups, such as the foraminifera, are better studied than others), and even the broadest outlines of their biogeographic ranges are usually a mystery.
A. Foraminifera
B. Protozoan fauna
C. Cytoplasm of protozoa
D. Soil biomass
E. Marine protozoa
F. None of the Above

Environmental Quality Indicators
335. Polluted waters often have a rich and characteristic _____. The relative abundance and diversity of protozoa are used as indicators of organic and toxic pollution.
A. Foraminifera
B. Protozoan fauna
C. Cytoplasm of protozoa
D. Soil biomass
E. Microsporidia
F. None of the Above

Symbiotic Protozoa
Parasites
336. Protozoa are infamous for their role in causing disease, and parasitic species are among the best-known protozoa. Nevertheless, our knowledge has large gaps, especially of normally free-living protozoa that may become _____.
A. Foraminifera
B. Protozoan fauna
C. Cytoplasm of protozoa
D. Soil biomass
E. Microsporidia
F. None of the Above

337. _____ comprise a unique group of obligate, intracellular parasitic protozoa.
A. Foraminifera
B. Protozoan fauna
C. Cytoplasm of protozoa
D. Soil biomass
E. Microsporidia
F. None of the Above

338. _____ are amazingly diverse organisms with more than 700 species and 80 genera that are capable of infecting a variety of plant, animal, and even other protist hosts.
A. Foraminifera
B. Protozoan fauna
C. Cytoplasm of protozoa
D. Soil biomass
E. Microsporidia
F. None of the Above

339. They are found worldwide and have the ability to thrive in many ecological conditions. Until the past few years, their ubiquity did not cause a threat to human health, and _____ worked to describe and classify the species.
A. Foraminifera
B. Protozoan fauna
C. Cytoplasm of protozoa
D. Soil biomass
E. Microsporidia
F. None of the Above

340. Since 1985, however, physicians have documented an unusual rise in worldwide infections in AIDS patients caused by four different genera of microsporidia (Encephalitozoon, Nosema, Pleistophora, and_____).
A. Foraminifera D. Enterocytozoon
B. Protozoan fauna E. Microsporidia
C. Cytoplasm of protozoa F. None of the Above

Protozoan Reservoirs of Disease
341. The presence of bacteria in the _____ is well known, whereas that of viruses is less frequently reported.
A. Foraminifera D. Soil biomass
B. Protozoan fauna E. Microsporidia
C. Cytoplasm of protozoa F. None of the Above

342. Most of these reports simply record the presence of bacteria or viruses and assume some sort of symbiotic relationship between them and the _____.
A. Flagella D. Free-living amoebae
B. Bacteria or viruses E. Cell's cytoplasm
C. Protozoa F. None of the Above

343. Recently, however, certain human pathogens were shown to not only survive but also to multiply in the cytoplasm of free-living,_____. Indeed, it is now believed that protozoa are the natural habitat for certain pathogenic bacteria.
A. Kinetosome or centriole D. Nonpathogenic protozoa
B. Vacuole or tonoplast E. Various microtubular roots
C. Beneficial symbionts F. None of the Above

344. To date, the main focus of attention has been on the_____, the causative organism of Legionnaires' disease; these bacteria live and reproduce in the cytoplasm of some free-living amoebae.
A. Flagella D. Free-living amoebae
B. Bacteria or viruses E. Bacterium Legionella pneumophila
C. Protozoa F. None of the Above

Symbionts
345. Some protozoa are harmless or even beneficial symbionts. A bewildering array of ciliates, for example, inhabit the rumen and _____and the cecum and colon of equids. Little is known about the relationship of the ciliates to their host, but a few may aid the animal in digesting cellulose.
A. Kinetosome or centriole D. Reticulum of ruminates
B. Vacuole or tonoplast E. Various microtubular roots
C. Beneficial symbionts F. None of the Above

Contractile Vacuoles
346. Many protozoa have_____, which collect and expel excess water, and extrusomes, which expel material used to deflect predators or capture prey.
A. Flagella D. Free-living amoebae
B. Contractile vacuoles E. Cell's cytoplasm
C. Protozoa F. None of the Above

347. In multicellular organisms, hormones are often produced in vesicles. In higher plants, most of a cell's volume is taken up by a central vacuole or tonoplast, which maintains its _____.
A. Kinetosome or centriole D. Nonpathogenic protozoa
B. Vacuole or tonoplast E. Various microtubular roots
C. Osmotic pressure F. None of the Above

348. Many _____have slender motile projections, usually called flagella when long and cilia when short. These are variously involved in movement, feeding, and sensation.
A. Eukaryotes D. Free-living amoebae
B. Bacteria or viruses E. Cell's cytoplasm
C. Protozoa F. None of the Above

349. These are entirely distinct from prokaryotic flagella. They are supported by a bundle of microtubules arising from a basal body, also called a kinetosome or centriole, characteristically arranged as_____.
A. Kinetosome or centriole D. Nine doublets surrounding two singlets
B. Vacuole or tonoplast E. Various microtubular roots
C. Beneficial symbionts F. None of the Above

350. Flagella also may have hairs or mastigonemes, scales, connecting membranes, and internal rods. Their interior is continuous with the _____.
A. Flagella D. Free-living amoebae
B. Bacteria or viruses E. Cell's cytoplasm
C. Protozoa F. None of the Above

Centrioles
351. Centrioles are often present even in cells and groups that do not have flagella. They generally occur in groups of one or two, called _____that give rise to various microtubular roots.
A. Kinetosome or centriole D. Nonpathogenic protozoa
B. Kinetids E. Various microtubular roots
C. Beneficial symbionts F. None of the Above

352. These form a primary component of the_____, and are often assembled over the course of several cell divisions, with one flagellum retained from the parent and the other derived from it.
A. Paramecium D. Cytoskeletal structure
B. Haptonema E. Cytoplasm
C. Cyst F. None of the Above

353. _____may also be associated in the formation of a spindle during nuclear division. Some protists have various other microtubule-supported organelles.
A. Contractile vacuoles D. Microtubule-supported organelles
B. Centrioles E. Protozoan-caused disease
C. Paramecium F. None of the Above

354. These include the_____, which produce axopodia used in flotation or to capture prey, and the haptophytes, which have a peculiar flagellum-like organelle called the haptonema.
A. Paramecium D. Protozoan pathogens
B. Haptonema E. Radiolaria and heliozoa
C. Cyst F. None of the Above

Paramecium
355. Members of the genus _____ are single-celled, freshwater organisms in the kingdom Protista.
A. Contractile vacuoles D. Microtubule-supported organelles
B. Cytoplasm E. Protozoan-caused disease
C. Paramecium F. None of the Above

356. They exist in an environment in which the osmotic concentration in their external environment is much lower than that in their _____.
A. Paramecium D. Protozoan pathogens
B. Haptonema E. Cytoplasm
C. Cyst F. None of the Above

357. More specifically, the habitat in which they live is_____. As a result of this, Paramecium is subjected to a continuous influx of water, as water diffuses inward to a region of higher osmotic concentration.
A. Contractile vacuoles D. Microtubule-supported organelles
B. Cytoplasm E. Hypotonic to their cytoplasm
C. Paramecium F. None of the Above

358. If Paramecium is to maintain_____, water must be continually pumped out of the cell (against the osmotic gradient) at the same rate at which it moves in.
A. Paramecium D. Protozoan pathogens
B. Haptonema E. Cytoplasm
C. Homeostasis F. None of the Above

359. This process, known as osmoregulation, is carried out by two organelles in Paramecium known as _____.
A. Contractile vacuoles D. Microtubule-supported organelles
B. Cytoplasm E. Protozoan-caused disease
C. Paramecium F. None of the Above

Protozoan Diseases
360. _____ are larger than bacteria and viruses, but still microscopic. They invade and inhabit the gastrointestinal tract.
A. Paramecium D. Protozoan pathogens
B. Haptonema E. Cytoplasm
C. Cyst F. None of the Above

361. Some parasites enter the environment in a dormant form, with a _____called a "cyst."
A. Contractile vacuoles D. Microtubule-supported organelles
B. Cytoplasm E. Protozoan-caused disease
C. Protective cell wall F. None of the Above

362. The _____ can survive in the environment for long periods of time and be extremely resistant to conventional disinfectants such as chlorine.
A. Paramecium D. Protozoan pathogens
B. Haptonema E. Cytoplasm
C. Cyst F. None of the Above

363. Effective _____ is therefore critical to removing these organisms from water sources.
A. Contractile vacuoles D. Microtubule-supported organelles
B. Cytoplasm E. Protozoan-caused disease
C. Paramecium F. None of the Above

Giardiasis Many of these questions seem to repeat but they are a little different.

364. Giardiasis is a commonly reported protozoan-caused disease. It has also been referred to as "_____" and "beaver fever" because of the many cases reported among hikers and others who consume untreated surface water.

A. Backpacker's disease
B. Cytoplasm
C. Paramecium
D. Microtubule-supported organelles
E. Protozoan-caused disease
F. None of the Above

365. Symptoms include chronic diarrhea, abdominal cramps, bloating, frequent loose and pale greasy stools, fatigue and weight loss. The _____, with an average of 7-10 days. Many infections are asymptomatic (no symptoms).

A. Asymptomatic
B. Giardia lamblia
C. Cryptosporidium organisms
D. General malaise
E. Hepatitis A
F. None of the Above

366. _____occurs worldwide. Waterborne outbreaks in the United States occur most often in communities receiving their drinking water from streams or rivers without adequate disinfection or a filtration system.

A. Giardia lamblia
B. Giardiasis
C. Animal-to-person contact
D. Major symptom
E. Cryptosporidium infections
F. None of the Above

367. The organism, _____, has been responsible for more community-wide outbreaks of disease in the U.S. than any other pathogen. Drugs are available for treatment but are not 100% effective.

A. Asymptomatic
B. Giardia lamblia
C. Cryptosporidium organisms
D. General malaise
E. Hepatitis A
F. None of the Above

Cryptosporidiosis

368. _____ is an example of a protozoan disease that is common worldwide, but was only recently recognized as causing human disease. The major symptom in humans is diarrhea, which may be profuse and watery.

A. Giardia lamblia
B. Cryptosporidiosis
C. Animal-to-person contact
D. Major symptom
E. Cryptosporidium infections
F. None of the Above

369. The diarrhea is associated with cramping abdominal pain. _____, fever, anorexia, nausea, and vomiting occur less often.

A. Asymptomatic
B. Giardia lamblia
C. Cryptosporidium organisms
D. General malaise
E. Hepatitis A
F. None of the Above

370. _____usually come and go, and end in fewer than 30 days in most cases. The incubation period is 1-12 days, with an average of about seven days.

A. Giardia lamblia
B. Incubation period
C. Animal-to-person contact
D. Symptoms
E. Cryptosporidium infections
F. None of the Above

371. _____ have been identified in human fecal specimens from more than 50 countries on six continents.

A. Asymptomatic
B. Giardia lamblia
C. Cryptosporidium organisms
D. General malaise
E. Hepatitis A
F. None of the Above

372. The mode of transmission is fecal-oral, either by person-to-person or animal-to-person. There is no specific treatment for _____.

A. Giardia lamblia
B. Incubation period
C. Animal-to-person contact
D. Major symptom
E. Cryptosporidium infections
F. None of the Above

373. For those operating systems that currently provide _____ and treatment, operating and maintaining the system at a high level on a continuing basis is critical to prevent disease.

A. Asymptomatic
B. Giardia lamblia
C. Cryptosporidium organisms
D. General malaise
E. Hepatitis A
F. None of the Above

374. All of these diseases, with the exception of _____, have one symptom in common: diarrhea.

A. Asymptomatic
B. Giardia lamblia
C. Cryptosporidium organisms
D. General malaise
E. Hepatitis A
F. None of the Above

375. They also have the same_____, fecal-oral, whether through person-to-person or animal-to-person contact, and the same routes of transmission, being either foodborne or waterborne.

A. Giardia lamblia
B. Incubation period
C. Animal-to-person contact
D. Mode of transmission
E. Cryptosporidium infections
F. None of the Above

376. Although most _____cause mild, self-limiting disease, on occasion, they can cause serious, even life threatening illness.

A. Pathogens
B. Giardia lamblia
C. Cryptosporidium organisms
D. General malaise
E. Hepatitis A
F. None of the Above

377. By understanding the nature of_____, the importance of properly constructed, operated and maintained public water systems becomes obvious.

A. Giardia lamblia
B. Waterborne diseases
C. Animal-to-person contact
D. Major symptom
E. Cryptosporidium infections
F. None of the Above

378. While water treatment cannot achieve sterile water (_____), the goal of treatment must clearly be to produce drinking water that is as pathogen-free as possible at all times.

A. No microorganisms
B. Giardia lamblia
C. Cryptosporidium organisms
D. General malaise
E. Hepatitis A
F. None of the Above

379. For those who operate water systems with inadequate source protection or treatment facilities, the potential risk of a _____is real.

A. Giardia lamblia
B. Waterborne disease outbreak
C. Animal-to-person contact
D. Major symptom
E. Cryptosporidium infections
F. None of the Above

Giardia Lamblia Many of these questions seem to repeat but they are a little different

380. Giardia lamblia (synonymous with _____and Giardia duodenalis) is a flagellated protozoan parasite that colonizes and reproduces in the small intestine, causing giardiasis.

A. Giardia lamblia
B. Incubation period
C. Animal-to-person contact
D. Lamblia intestinalis
E. Cryptosporidium infections
F. None of the Above

381. The _____ attaches to the epithelium by a ventral adhesive disc, and reproduces via binary fission.

A. Water-borne sources
B. Giardia trophozoites
C. Giardia cyst
D. Giardia infections
E. Giardia parasite
F. None of the Above

382. _____ does not spread via the bloodstream, nor does it spread to other parts of the gastro-intestinal tract, but remains confined to the lumen of the small intestine.

A. Giardiasis
B. Infected
C. Cytoplasm
D. Giardia infection
E. Trophozoites and cysts
F. None of the Above

383. _____ absorb their nutrients from the lumen of the small intestine, and are anaerobes.

A. Water-borne sources
B. Giardia trophozoites
C. Giardia cyst
D. Giardia infections
E. Giardia parasite
F. None of the Above

384. _____ can occur through ingestion of dormant cysts in contaminated water, or by the fecal-oral route (through poor hygiene practices).

A. Giardiasis
B. Infected
C. Cytoplasm
D. Giardia infection
E. Trophozoites and cysts
F. None of the Above

385. The _____ can survive for weeks to months in cold water and therefore can be present in contaminated wells and water systems, and even clean-looking mountain streams, as well as city reservoirs, as the Giardia cysts are resistant to conventional water treatment methods, such as chlorination and ozonolysis.

A. Water-borne sources
B. Giardia trophozoites
C. Giardia cyst
D. Giardia infections
E. Giardia parasite
F. None of the Above

386. _____is also possible, and therefore Giardia infection is a concern for people camping in the wilderness or swimming in contaminated streams or lakes, especially the artificial lakes formed by beaver dams (hence the popular name for giardiasis, "Beaver Fever").

A. Giardiasis
B. Infected
C. Cytoplasm
D. Giardia infection
E. Zoonotic transmission
F. None of the Above

387. As well as water-borne sources, _____can also occur, for example in day care centers, where children may have poorer hygiene practices.

A. Water-borne sources
B. Giardia trophozoites
C. Giardia cyst
D. Giardia infections
E. Fecal-oral transmission
F. None of the Above

388. Those who work with children are also at risk of being infected, as are family members of _____ individuals.
A. Giardiasis D. Giardia infection
B. Infected E. Trophozoites and cysts
C. Cytoplasm F. None of the Above

389. Not all _____ are symptomatic, so some people can unknowingly serve as carriers of the parasite.
A. Water-borne sources D. Giardia infections
B. Giardia trophozoites E. Giardia parasite
C. Giardia cyst F. None of the Above

390. The life cycle begins with a non-infective cyst being excreted with feces of an infected individual. Once out in the environment, the cyst becomes infective. A distinguishing characteristic of the cyst is 4 nuclei and a_____.
A. Giardiasis D. Retracted cytoplasm
B. Infected E. Trophozoites and cysts
C. Cytoplasm F. None of the Above

391. Once ingested by a host, the _____emerges to an active state of feeding and motility. After the feeding stage, the trophozoite undergoes asexual replication through longitudinal binary fission.
A. Water-borne sources D. Giardia infections
B. Trophozoite E. Giardia parasite
C. Giardia cyst F. None of the Above

392. The resulting _____ then pass through the digestive system in the feces. While the trophozoites may be found in the feces, only the cysts are capable of surviving outside of the host.
A. Giardiasis D. Giardia infection
B. Infected E. Trophozoites and cysts
C. Cytoplasm F. None of the Above

393. Distinguishing features of the trophozoites are _____and lack of peripheral chromatin, giving the two nuclei a halo appearance.
A. Large karyosomes D. Giardia infections
B. Giardia trophozoites E. Giardia parasite
C. Giardia cyst F. None of the Above

394. Cysts are distinguished by a retracted _____.
A. Giardiasis D. Giardia infection
B. Infected E. Trophozoites and cysts
C. Cytoplasm F. None of the Above

Hepatitis
395. _____ can be contracted from infected blood, seminal fluid, vaginal secretions, or contaminated drug needles, including tattoo or body-piercing equipment. It can also be spread from a mother to her newborn.
A. Type A hepatitis D. Type D hepatitis
B. Type B hepatitis E. Type E hepatitis
C. Type C hepatitis F. None of the Above

396. _____ is not easily spread through sex. You're more likely to get it through contact with infected blood, contaminated razors, needles, tattoo and body-piercing equipment, or manicure or pedicure tools that haven't been properly sanitized, and a mother can pass it to her baby during delivery.
A. Type A hepatitis D. Type D hepatitis
B. Type B hepatitis E. Type E hepatitis
C. Type C hepatitis F. None of the Above

397. _____ can be passed through contact with infected blood, contaminated needles, or by sexual contact with an HIV-infected person.
A. Type A hepatitis D. Type D hepatitis
B. Type B hepatitis E. Type E hepatitis
C. Type C hepatitis F. None of the Above

398. _____ is most likely to be transmitted in feces, through oral contact, or in water that's been contaminated.
A. Type A hepatitis D. Type D hepatitis
B. Type B hepatitis E. Type E hepatitis
C. Type C hepatitis F. None of the Above

399. There are five types of hepatitis -- A through E -- all of which cause inflammation of the liver. Type D affects only those who also have hepatitis B, and _____ is extremely rare in the United States.
A. Type A hepatitis D. Type D hepatitis
B. Type B hepatitis E. Type E hepatitis
C. Type C hepatitis F. None of the Above

400. _____ is contracted through anal-oral contact, by coming in contact with the feces of someone with hepatitis A, or by eating or drinking hepatitis A contaminated food or water.
A. Type A hepatitis D. Type D hepatitis
B. Type B hepatitis E. Type E hepatitis
C. Type C hepatitis F. None of the Above

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