Registration form

WATER TREATMENT 404 $250.00

48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL $50.00

We will match any other price if you can find equivalent course for less.

Start and Finish Dates: _____

You will have 90 days from this date in order to complete this course

Please record amount of hours worked on assignment, must match state requirement ____

Name_____Signature_____

I have read and understood the disclaimer notice on page 2. Digitally sign XXX

Address_____

City_____State_____Zip_____

Email_____ Fax (_____) _____

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

Operator ID #_____Exp. Date_____

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

Please circle/check which certification you are applying the course CEU's.
Water Treatment ___ Water Distribution ___ Other _____

Technical Learning College TLC PO Box 3060, Chino Valley, AZ 86323
Toll Free (866) 557-1746 Fax (928) 272-0747 info@tlch2o.com

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

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Please pay with your credit card on our website under Bookstore or Buy Now. Or call us and provide your credit card information.

We will stop mailing the certificate of completion so we need either your fax number or e-mail address. We will e-mail the certificate to you, if no e-mail address; we will fax it to you.

DISCLAIMER NOTICE
I understand that it is my responsibility to ensure that this CEU course is either approved or accepted in my State for CEU credit. I understand State laws and rules change on a frequent basis and I believe this course is currently accepted in my State for CEU or contact hour credit, if it is not, I will not hold Technical Learning College responsible.

I also understand that this type of study program deals with dangerous conditions and that I will not hold Technical Learning College, Technical Learning Consultants, Inc. (TLC) liable for any errors or omissions or advice contained in this CEU education training course or for any violation or injury caused by this CEU education training course material. I will call or contact TLC if I need help or assistance and double-check to ensure my registration page and assignment has been received and graded.

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

You can obtain a printed version of the course manual from TLC for an additional $69.95 plus shipping charges.

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

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

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.

Do not solely depend on TLC's Approval list for it may be outdated.

Some States and many employers require the final exam to be proctored.
http://www.abctlc.com/downloads/PDF/PROCTORFORM.pdf

All downloads are electronically tracked and monitored for security purposes.

No refunds.

Water Treatment 404 Answer Key

Name_____

Phone _____

You are solely responsible in ensuring that this course is accepted for credit by your State. <u>No refunds.</u> Did you check with your State agency to ensure this course is accepted for credit?

Method of Course acceptance confirmation. Please fill this section

Website __ Telephone Call___ Email____ Spoke to_____

Do not solely depend on TLC's Approval list for it may be outdated.

What is the approval number if Applicable? _____

You are responsible to ensure that TLC receives the Assignment and Registration Key. Please call us to ensure that we received it.

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

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Check with your state environmental/health agency for more information. These rules change frequently and are often difficult to interpret and follow. Be careful to not be in non-compliance and do not follow this course for proper compliance.

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

WATER TREATMENT 404 CEU COURSE
CUSTOMER SERVICE RESPONSE CARD

NAME: _____

E-MAIL_____PHONE_____

PLEASE COMPLETE THIS FORM BY CIRCLING THE NUMBER OF THE APPROPRIATE ANSWER IN THE AREA BELOW.

1. Please rate the difficulty of your course.
   Very Easy 0 1 2 3 4 5 Very Difficult

2. Please rate the difficulty of the testing process.
   Very Easy 0 1 2 3 4 5 Very Difficult

3. Please rate the subject matter on the exam to your actual field or work.
   Very Similar 0 1 2 3 4 5 Very Different

4. How did you hear about this Course? _____

5. What would you do to improve the Course?

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How about the price of the course?

Poor_____ Fair ____ Average ____ Good____ Great_____

How was your customer service?

Poor___ Fair ____ Average ____ Good _____ Great_____

Any other concerns or comments.

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

Always call us after faxing the paperwork to ensure that we've received it.

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.

Water Treatment 404 CEU Training Course Assignment

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

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

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

Bacteriological Monitoring Section

1. The_____ group is used as an indicator organism to determine the biological quality of your water.

A. Microbiological analysis
B. Bac-T
C. Coliform bacteria
D. Escherichia coli (E. coli)
E. Presence of an indicator
F. None of the Above

2. The presence of an indicator or _____in your drinking water is an important health concern.

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

3. Which of the following terms is used to 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

Bacteria Sampling

4. Which bug forms an obvious slime on the inside of pipes and fixtures?

A. Colonies
B. Algae
C. Coliform bacteria
D. Escherichia coli (E. coli)
E. Iron bacteria
F. None of the Above

5. Which of the following 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 that distribute water, and indicates that the water may be contaminated with germs that can cause disease?

A. Diseases
B. Germs
C. Coliform bacteria
D. Water bear
E. Iron bacteria
F. None of the Above

(S) Means answer may be plural or singular

Laboratory Procedures

6. 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
B. Coliform
C. Sample time
D. Total coliform analysis
E. Pathogen test
F. None of the Above

Methods

7. The MMO-MUG test, a product marketed as _____, is common. The sample results will be reported by the laboratories as simply coliforms present or absent.

A. Colilert
B. Coliform
C. Sample stuff
D. Total coliform analysis
E. Pathogen media
F. None of the Above

8. If coliforms are present, the laboratory will analyze the sample further to determine if these are _____ and/or _____and report their presence or absence.

A. Colilert, E. coli
B. Coliforms, E. coli
C. Fecal coliforms, E. coli
D. Total coliform analysis, Pathogens
E. Pathogens, Total coliform analysis
F. None of the Above

Types of Water Samples

9. It is important to properly identify the type of _____ you are collecting.

A. Colilert
B. Coliforms
C. Sample
D. Total coliform analysis
E. Pathogens
F. None of the Above

The three (3) types of samples are:

10. What type of samples can be collected on a routine basis to monitor for contamination? Collection should be in accordance with an approved sampling plan.

A. Repeat
B. Special
C. Sample
D. Total coliform analysis
E. Routine
F. None of the Above

Repeat Sampling

11. If this term 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
B. Distribution system
C. Routine sample
D. Original sampling location
E. Repeat sample(s)
F. None of the Above

The follow-up for repeat sampling is:

12. Repeat samples must be collected from: Within five (5) service connections downstream from the?

A. Special Sample
B. Routine sample
C. Repeat sample(s)
D. Coliform present
E. Original sampling location
F. None of the Above

13. Repeat samples must be collected from: 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. Special Sample
B. Routine sample
C. Repeat sample(s)
D. Coliform present
E. Original sampling location
F. None of the Above

14. Repeat samples must be collected from: All _____ are included in the MCL compliance calculation.

A. Special Sample
B. Routine sample
C. Repeat sample(s)
D. Coliform present
E. Original sampling location
F. None of the Above

Sampling Procedures

15. The_____ must be followed and all operating staff must be clear on how to follow the sampling plan.

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

16. 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
B. Sample siting plan
C. Total coliform
D. Proper procedures and sampling containers
E. Sampling containers
F. None of the Above

Chain of Custody Procedures

17. If both parties involved in the transfer must sign, date and note the time on the chain of custody record, this is known as?

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

18. 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
B. Chain of custody
C. Shipping invoices
D. Sample siting plan
E. Positive for total coliform
F. None of the Above

19. 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
B. Sample siting plan
C. Total coliform
D. TCR
E. A transfer
F. None of the Above

Arsenic

20. Long-term exposure of this compound/element/substance in drinking water to a variety of cancers in humans.

A. Arsenic
B. Copper
C. Basalt
D. THHMMS
E. Silica
F. None of the Above

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

A. Arsenic
B. Trihalomethanes
C. Disinfection
D. Copper
E. Disinfection byproducts (DBPs)
F. None of the Above

ICR

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

A. True B. False

23. 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)); Disease-causing microorganisms (pathogens), including Cryptosporidium; and engineering data to control these contaminants.

A. True B. False

Repeat Sampling

24. The follow-up for repeat sampling is: If only one _____ per month or quarter is required, four (4) repeat samples must be collected.

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

25. For systems collecting two (2) or more routine samples per month, three (3)_____must be collected.

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

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

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

27. Within five (5) service connections upstream from the?

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

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

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

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

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

Positive or Coliform Present Results

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

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

34. It is very important to initiate the _____as the corrective measures will be based on those results.
A. Storage and distribution D. Perform routine procedures
B. Repeat sampling immediately E. Corrective measures
C. Upgrading of the wellhead area F. None of the Above

Maximum Contaminant Levels (MCLs)

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

36. State and federal laws establish standards for drinking water quality known as maximum contaminant levels (MCL). When a particular contaminant exceeds its _____ a potential health threat may occur.

A. Coliform bacteria count D. HPC
B. MCL E. CFU
C. Standards F. None of the Above

37. 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.

A. Coliform bacteria D. HPC
B. MCLs E. CFU
C. Standards F. None of the Above

38. When you as the operator take samples to ensure your water is in compliance with the MCL, there are two types of _____for coliform bacteria.

A. Coliform bacteria D. MCL violations
B. MCLs E. CFU
C. Standards F. None of the Above

39. The first type of_____ is for total coliform; the second is an acute risk to health violation characterized by the confirmed presence of fecal coliform or E. coli.

A. Coliform bacteria D. MCL violations
B. MCLs E. CFU
C. Standards F. None of the Above

Heterotrophic Plate Count HPC

40. Heterotrophic Plate Count (HPC) --- formerly known as the standard plate count, is a procedure for estimating the number of live heterotrophic bacteria and measuring changes during water treatment and distribution in water or in swimming pools.

A. True B. False

41. Colonies may arise from pairs, chains, clusters, or single cells, all of which are included in the term?

A. Coliform bacteria units D. HPC units
B. MCLs units E. Colony-forming units
C. Standards F. None of the Above

Spread Plate Method

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

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

43. During the Spread Plate Method, colonies can be transferred quickly, and _____ can be easily discerned and compared to published descriptions.

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

Membrane Filter Method

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

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

Heterotrophic Plate Count
(Spread Plate Method)

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

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

46. Which of the following terms provides a technique to quantify the bacteriological activity of a sample?

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

47. The R2A agar provides a medium that will support a large variety of?

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

Total Coliforms

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

A. True B. False

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

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

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

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

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

51. A(n) _____to human health violation occurs if either one of the following happens:#52

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

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

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

Public Notice

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

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

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

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

55. There shall be certain information, be issued properly and in a timely manner, and contain certain_____ on the public notice.

A. Legal analysis
B. Drinking water rule information
C. NOVs
D. Mandatory language
E. Fecal language
F. None of the Above

56. Which of the following terms present to users, the timing and place of posting of the public notice may have different priorities?

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

The following are acute violations:

57. Which is violation of nitrate?

A. Presence
B. MCL
C. MCLG
D. Count
E. Acute violations
F. None of the Above

Pathogen Section

Bacterial Diseases

58. Which of the following terms 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

59. Which of the following terms is been the cause of 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. Beaver fever
F. None of the Above

Types of Bacteria

60. Which of the following terms is an important cause of travelers' diarrhea? Medical treatment generally is not prescribed because recovery is usually rapid.

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

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

A. Shigellosis
B. Cysts
C. Hepatitis A
D. Campylobacteriosis
E. HIV
F. None of the Above

62. Which of the following terms lives in water, readily killed or inactivated with chlorine or other disinfectants?

A. Cysts
B. Cryptogiardia
C. Bacteria
D. Viral Plaques
E. Oocysts
F. None of the Above

Viral-Caused Diseases

63. Which of the following terms is an example of a common viral disease that may be transmitted through water?

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

64. Most _____in drinking water can be inactivated by chlorine or other disinfectants.

A. Illnesses
B. Giardiasis
C. Viruses
D. Pathogen(s)
E. Infections
F. None of the Above

Waterborne Pathogens Basics

65. Bacteria, viruses and protozoan that cause disease are known as pathogens.

A. True B. False

66. Most pathogens are generally associated with diseases that _____and affect people in a relatively short amount of time, generally a few days to two weeks.

A. Limits the treatment process
B. Are mild in nature
C. Cause intestinal illness
D. Will cause fatalities
E. Limit the travel of pathogens
F. None of the Above

How Diseases are Transmitted.

67. Waterborne pathogens are primarily spread by the?

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

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

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

General Contaminant Information

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

69. Which of the following terms including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production?

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

70. Which of the following terms 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

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

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

72. Which of the following terms, 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

73. Which of the following terms, 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

Background

74. Coliform bacteria and chlorine residual are the only routine sampling and monitoring requirements for small ground water systems with chlorination.

A.. True B. False

75. The coliform bacteriological sampling is governed by?
A. Multiple sources
B. Sample siting plan
C. Total coliform
D. TCB
E. Total Coliform Rule (TCR)
F. None of the Above

76. 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

Contaminant Selection
77. P.L. 104-182 establishes a new process for the EPA to select contaminants for regulatory consideration based on occurrence, health effects, and meaningful opportunity for health risk reduction.
A. True B. False

Standard Setting
78. For each contaminant that the EPA has determined merits regulation, the EPA must set a non-enforceable action level at a level at which no known or anticipated recommended health effects occur, and which allows an adequate margin of safety.
A. True B. False

79. The EPA must then set an enforceable standard, a maximum contaminant level (MCL), as close to the MCLG as is " feasible " using the best technology, treatment techniques, or other means available (taking costs into consideration).
A. True B. False

80. Each regulation establishing an MCL must list any technologies, treatment techniques, or other means that comply with the MCL and that are affordable for three categories of small public water systems.
A. True B. False

81. The 1996 Amendments authorize the EPA to set a standard at other than the feasible level if the feasible level would lead to an increase in some risks by increasing the concentration of other contaminants or by interfering with the technologies used to comply with other SDWA regulations.
A. True B. False

82. If the EPA determines that the benefits do not justify the costs, the EPA may, with certain exceptions, promulgate a standard that minimizes benefits at a low cost that is justified by the benefits.
A. True B. False

State Primacy
83. The primary enforcement responsibility for public water systems lies with the states, provided they adopt regulations as stringent as the national requirements, adopt authority for administrative penalties, develop adequate procedures for enforcement, maintain records, and create a plan for providing emergency water supplies.
A. True B. False

Nonprimacy State

84. Primacy states may establish alternative monitoring requirements to provide interim monitoring relief for systems serving 10,000 or fewer persons for most contaminants, if a contaminant is not detected in the first quarterly sample.

A. True B. False

Radionuclides

85. Some people who drink water containing this compound/element 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. Copper
D. Aluminum
E. Arsenic
F. None of the Above

86. Some people who drink water containing _____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 mineral
D. Alpha emitters
E. Combined Radium 226/228
F. None of the Above

87. Which compound/element typically leaches into water from plumbing in older buildings?

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

88. Which secondary standard of 2 mg/L is there to protect against dental fluorosis?

A. Lead
B. Fluoride
C. Arsenic
D. Florentine
E. Floraslitic
F. None of the Above

Public Health Concerns

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

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

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

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

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

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

92. Which of the following rules and Disinfection Byproducts Rule applies to all community and nontransient non-community water systems that treat their water with a chemical disinfectant?

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

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

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

Stage 2 DBP Rule Federal Register Notices

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

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

95. Which of the following rules focuses on public health protection by limiting exposure to DBPs, specifically total trihalomethanes and five haloacetic acids, which can form in water through disinfectants used to control microbial pathogens?

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

96. This rule will apply to all community water systems and nontransient non-community water systems that add a primary or residual disinfectant other than _____or deliver water that has been disinfected by a primary or residual disinfectant other than UV.

A. Ultraviolet (UV) light
B. The open-channel system
C. UV rather than ozone
D. UV source
E. UV radiation
F. None of the Above

97. Which of the following rules has been highly effective in protecting public health and has also evolved to respond to new and emerging threats to safe drinking water?

A. Stage 2 DBPR
B. DBP exposure
C. The Stage 2 DBP rule
D. Long Term 2 Enhanced Surface Water Treatment Rule
E. Safe Drinking Water Act (SDWA)
F. None of the Above

98. Which of the following terms is one of the major public health advances in the 20th century?

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

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

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

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

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

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

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

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

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

What does the rule require?

103. Under the _____, systems will conduct an evaluation of their distribution systems, known as an Initial Distribution System Evaluation.

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

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

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

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

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

Who must comply with the rule?

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

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

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

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

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

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

Microbial Regulations

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

A. True B. False

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

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

111. The _____ was established in December 1998 to control Cryptosporidium, and to maintain control of pathogens while systems lower disinfection byproduct levels to comply with the Stage 1 Disinfectants/Disinfection Byproducts.

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

112. The EPA established a MCL of 0.0010 for all public water systems and a 99% removal requirement for Cryptosporidium in filtered public water systems that serve at least 100,000 people. The new rule tightened turbidity standards back in December 2001.

A. True B. False

113. Color is an indicator of the physical removal of particulates, including pathogens.

A. True B. False

114. Which rule improves physical removal of Cryptosporidium, and to maintain control of pathogens?
A. Long Term 1 Enhanced Surface Water Treatment Rule
B. Maximum Contaminant Level Goal (MCLG)
C. Stage 1 Disinfectants/Disinfection Byproducts Rule
D. Surface Water Treatment Rule
E. Interim Enhanced Surface Water Treatment Rule
F. None of the Above

Bromate

115. Fill in the missing information in order. _____ is a chemical that is formed when _____ used to disinfect drinking water reacts with naturally occurring _____ found in source water.
A. Bromate, Ozone, Chlorite
B. Bromide, Bromate, Ozone
C. Bromate, Bromate, Bromate
D. Hydrogen sulfide, Water, Nitrogen
E. Bromate, Ozone, Bromide
F. None of the Above

116. What is the annual average for Bromate which was established in the Stage 1 Disinfectants/Disinfection Byproducts Rule?
A. 1 part per billion
B. 10 parts per billion
C. 100 parts per billion
D. 10 parts per million
E. 500 parts per million
F. None of the Above

Chlorite

117. According to the Stage 1 Disinfectants/Disinfection Byproducts Rule, what is the monthly average level of chlorite in drinking water?
A. 1 part per million
B. 10 parts per billion
C. 100 parts per billion
D. 10 parts per million
E. 500 parts per million
F. None of the Above

IOC Section

118. Which of the following terms in biological systems incorporates carbohydrates into the molecular structure?
A. Volatile Organic Compounds (VOCs)
B. Synthetic Organic Chemicals (SOCs)
C. Polychlorinated Biphenyls (PCBs)
D. Maximum Contaminant Levels (MCL)
E. Organic compounds
F. None of the Above

119. Which of the following terms are rather simple chemicals present in ground water?
A. Volatile Organic Compounds (VOCs)
B. Synthetic Organic Chemicals (SOCs)
C. Polychlorinated Biphenyls (PCBs)
D. Maximum Contaminant Levels (MCL)
E. Organic compounds
F. None of the Above

120. Which of the following terms are dissolved from the rock/soil which make up the aquifer or water-bearing rock formations below the soil surface?
A. Presence of a carbon atom
B. Atmospheric CO_2
C. Typical examples
D. Inorganic compounds
E. Minerals
F. None of the Above

121. Organic chemists traditionally refer to any molecule containing carbon as an organic compound and by default this means that _____deals with molecules lacking carbon.

A. Presence of a carbon atom
B. Atmospheric CO_2
C. Inorganic chemistry
D. Inorganic compounds
E. Carbon
F. None of the Above

122. Which of the following terms have been metabolically incorporated into living tissues persist in decomposing tissues?

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

123. The distinction between inorganic and organic compounds is not always clear when dealing with open and closed systems, some view the open environment as an extension of life and from this perspective may consider atmospheric CO_2 as?

A. Presence of a carbon atom
B. An organic compound
C. Typical examples
D. Inorganic compounds
E. Carbon
F. None of the Above

124. Which of the following terms may be introduced into ground water by human activities?

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

125. Water purveyors need to test for 30 different _____ including all arsenic, barium, cadmium, lead, mercury, selenium, and thallium

A. Presence of a carbon atom
B. Atmospheric CO_2
C. Typical examples
D. Inorganic compounds
E. Carbon
F. None of the Above

126. Which of the following terms - these are once living, or are living and can bring life to cells?

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

127. Which of the following terms - these were never living, without carbon and cannot bring life to cells?

A. Presence of a carbon atom
B. Atmospheric CO_2
C. Typical examples
D. Inorganic compounds
E. Carbon
F. None of the Above

SOC Section

SOC Introduction

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

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

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

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

130. Which of the following terms - are very persistent in the environment, whether in soil or water?

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

131. Which of the following terms or "blue baby syndrome" from ingestion of elevated levels of nitrate or nitrite?

A. Methemoglobinemia
B. Most contaminants
C. Three contaminant groups
D. Elevated levels of nitrate or nitrite
E. Chemical compounds
F. None of the Above

132. All public water systems must monitor for?

A. Valuable Organic Compounds (VOCs)
B. Synthesis Organic Chemicals (SOCs)
C. Polychlorinated Biphenyls (PCBs)
D. Maximum Constant Levels (MCL)
E. Nitrate and Nitrite
F. None of the Above

Volatile Organic Compounds (VOCs)
VOCs Explained

133. Which of the following terms are organic chemicals that have a high vapor pressure at ordinary, room-temperature conditions?

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

134. Which of the following terms - _____ are of VOCs?.

A. 3 organic chemicals
B. Most scents or odors
C. Five contaminant groups
D. Elevated odors
E. Substances
F. None of the Above

135. Which of the following terms are regulated by law, especially indoors, where concentrations are the highest?

A. Anthropogenic VOCs
B. Aqueous solvents
C. VOCs
D. Benzene
E. Methylene chloride
F. None of the Above

Specific Components
Paints and Coatings

136. Which of the following terms - are required to spread a protective or decorative film. Approximately 12 billion liters of paints are produced annually?

A. Solvents
B. VOC
C. Benzene
D. Cleaning products
E. Carbon monoxide
F. None of the Above

Chlorofluorocarbons and Chlorocarbons

137. Which of the following terms - which are banned or highly regulated, were widely used cleaning products and refrigerants?

A. Solvents
B. VOC
C. Benzene
D. Cleaning products
E. Carbon monoxide
F. None of the Above

Water Treatment Section

Preliminary Treatment

138. If not removed, weeds, leaves, and trash will cause problems to the treatment plant's pumps and equipment, the best way to protect the plant is _____.

A. Screening
B. Settling
C. Coagulation
D. Change source
E. Pump groundwater
F. None of the Above

139. Bar screens and wire mesh screens both require _____.

A. Manual cleaning
B. Automatic cleaning
C. No cleaning
D. Replacement
E. A and B
F. None of the Above

140. Mechanical bar screens vary in size and use some type of raking mechanism that travels horizontally down the bars to scrap the debris off.

A. True
B. False

Pre-Sedimentation

141. Sand and grit will damage plant equipment and pipes, so it must be removed with either rectangular or round shaped basin prior to?

A. Filtration
B. Coagulation
C. Purification
D. Flocculation
E. Sedimentation basin(s)
F. None of the Above

142. Which of the following treatment terms is used after the flocculation process?

A. Filtration
B. Coagulation
C. Purification
D. Flocculation
E. Sedimentation basin(s)
F. None of the Above

143. A rectangular clarifier has scrapers on the bottom to move the settled sludge to one or more hoppers at the influent end of the tank. It could also have _____ or traveling bridge used to collect the sludge.

A. A screw conveyor
B. Conveyor belts
C. Dissolved air floatation
D. Manual skimmers
E. Turnstile
F. None of the Above

144. Most rectangular clarifiers will have baffles to prevent backflow from entering the effluent.

A. True
B. False

Flights and Chains

145. Flights and chains remove the scum from the _____ of the basin.

A. Supernatant
B. Surface
C. Scum box
D. Armature
E. A and B
F. None of the Above

146. The flights are usually concrete flights mounted on parallel chains and the motor shaft is connected through a shaft that turns the gear.
A. True B. False

147. To prevent damage to the flights and chains due to overloads, a _____is used.
A. Bearing D. Safety net
B. Reducer E. A and B
C. Shear pin F. None of the Above

Circular Clarifiers
148. The most common type of circular clarifier has a center pier or column.
A. True B. False

149. Which of the following processes uses alum and cationic polymer to neutralize the charge?
A. Filtration D. Flocculation
B. Reconditioning E. Conventional
C. Purification F. None of the Above

150. Which of the following compounds combines with alkalinity in the raw water to form a white precipitate that neutralizes suspended particles' electrical charge?
A. Activated sodium D. Dissolved organic carbon
B. PAC E. Alum
C. Activated carbon F. None of the Above

151. Which of the following systems uses a 30 to 50 mg/L alum dosage to form a large floc that requires extensive retention time to permit settling?
A. Conventional technology D. All of the above except C
B. Reconditioning cycle E. Chemical pretreatment
C. Traditional sand filter F. None of the Above

152. Which of the following systems use graded silica sand filter media?
A. Conventional technology D. All of the above except C
B. Reconditioning cycle E. Chemical pretreatment
C. Membranes F. None of the Above

153. Which part of the reconditioning cycle lasts about 5 to 10 minutes?
A. Conventional technology D. Fast rinse
B. Reconditioning cycle E. Chemical pretreatment
C. Traditional F. None of the Above

154. Which of the following terms is often used to enhance filter performance?
A. Conventional technology D. Fast rinse
B. Reconditioning cycle E. Chemical pretreatment
C. Traditional F. None of the Above

155. Feeding chemicals such as alum, ferric chloride, or a cationic polymer neutralizes the charge, allowing the particles to cling to one another and to the filter media.
A. True B. False

156. Which of the following terms may increase filtered water clarity, measured in NTU, by 90% compared with filtration alone?
A. Conventional technology D. Fast rinse
B. Reconditioning cycle E. Chemical pretreatment
C. Traditional F. None of the Above

157. According to the text, if an operator is present to make adjustments for variations in the Sedimentation process, clarity improvements in the range of 93 to 95% are achievable.
A. True B. False

Direct Filtration Plant vs. Conventional Plant
158. The primary difference between Direct Filtration Plant vs. Conventional Plant is that the _____ or step is omitted from the Direct Filtration plant.
A. Conventional technology D. Fast rinse
B. Reconditioning cycle E. Chemical pretreatment
C. Sedimentation process F. None of the Above

Rapid Sand Filtration
159. Which of the following terms is the most prevalent form of water treatment technology in use today?
A. Conventional technology D. Rapid Sand filtration
B. Reconditioning cycle E. Chemical pretreatment
C. Sedimentation process F. None of the Above

160. Rapid Sand filtration process employs a combination of _____ in order to achieve maximum effectiveness.
A. Filtration D. Sedimentation process
B. Aluminum Sulfate E. Physical and chemical processes
C. Chemical pretreatment F. None of the Above

Coagulation
161. At the Water Treatment Plant, alum is added to the water in the "flash mix" to cause microscopic impurities in the water to clump together.
A. True B. False

162. The alum and the water are mixed rapidly by the?
A. Cationic polymers D. Shaker
B. Flash mixer E. All of the Above
C. Coagulant chemicals F. None of the Above

163. What is the process of joining together particles in water to help remove organic matter called?
A. Cationic polymers D. Flocculation
B. Coagulation E. All of the Above
C. Coagulant chemicals F. None of the Above

164. Aluminum Sulfate is also excellent for removing nutrients such as phosphorous in wastewater treatment.
A. True B. False

165. Fine particles must be coagulated, or "stuck together" to form larger particles that can be filtered, this is achieved through the use of?
A. Sedimentation
B. Coagulation
C. Coagulant chemicals
D. Flocculation
E. All of the Above
F. None of the Above

166. Which of the following terms are required since colloidal particles by themselves have the tendency to stay suspended in water and not settle out?
A. Cationic polymers
B. Coagulation
C. Coagulant chemicals
D. Flocculation
E. All of the Above
F. None of the Above

167. Which of the following terms are so small, their charge per volume is significant?
A. Cationic polymers
B. Colloidal particles
C. Coagulant chemicals
D. Aluminum Sulfate molecules
E. All of the Above
F. None of the Above

168. Coagulation is necessary to meet the current regulations for almost all potable water plants using surface water.
A. True
B. False

169. Coagulant chemicals such as "alum" work by neutralizing the negative charge, which allows the particles to come together.
A. True
B. False

170. Which coagulants can be thought of as positively charged strings that attract the particles to them, and in the process, form a larger particle?
A. Cationic polymers
B. Coagulation helpers
C. Salts
D. Lime
E. All of the Above
F. None of the Above

171. New chemicals have been developed which combine the properties of alum-type coagulants and?
A. Cationic polymers
B. Chlorine
C. Salts
D. Ammonia Hydroxide
E. All of the Above
F. None of the Above

172. Which of the following terms is the most widely used coagulant in water treatment?
A. Cationic polymers
B. Coagulation helpers
C. Salts
D. Aluminum Sulfate
E. Soda ash
F. None of the Above

173. Liquid _____is a 48.86% solution.
A. Cationic polymers
B. Ammonia Hydroxide
C. Salts
D. Aluminum Sulfate
E. Soda ash
F. None of the Above

174. In water treatment, large microorganisms, including algae and amoebic cysts, are readily removed by _____ and filtration.
A. Cationic polymers D. Coagulation
B. Coagulation helpers E. All of the Above
C. Salts F. None of the Above

175. According to the text, more than 98% of poliovirus type 1 was removed by conventional _____ and filtration.
A. Cationic polymers D. Coagulation
B. Coagulation helpers E. All of the Above
C. Salts F. None of the Above

Flocculation
176. Flocculation is the process of bringing together destabilized or coagulated particles to form larger masses that can be settled and/or filtered out of the water being treated.
A. True B. False

177. Flocculation is the process where the suspended particles can collide, _____, and form heavier particles called “floc”.
A. Equalization D. Destabilized or coagulated particles
B. Agitation of the water E. All of the Above
C. Agglomerate F. None of the Above

178. Gentle _____ and appropriate detention times (the length of time water remains in the basin) help facilitate the flocculation process.
A. Equalizing D. Settling
B. Agitation of the water E. All of the Above
C. Agglomerating F. None of the Above

179. Inside the contact chambers, water is slowly mixed allowing the coagulated particles, this is called "floc," and the particles become larger and stronger.
A. True B. False

180. Which of the following process statements happens in the water, bacteria and other microorganisms are caught in the floc structure?
A. Equalize the basin D. Coagulated particles
B. Agitate the water E. All of the Above
C. Floc particles mix F. None of the Above

Pre-Sedimentation
181. According to the text, depending on the quality of the source water, some plants have pre-sedimentation, this allows larger _____ in a reservoir or lake reducing solid removal loads.
A. Equalize the basin D. Coagulated particles
B. Agitate the water E. Particles time to settle
C. Floc particles mix F. None of the Above

Sedimentation
182. Sedimentation is the process of destabilizing coagulated particles in water.
A. True B. False

183. Which of the following statements before sedimentation in which the velocity of the water is decreased so that the suspended material, including flocculated particles, can settle out by gravity?
A. Conventional technology
B. Flocculation
C. Sedimentation process
D. Rapid Sand filtration
E. Chemical pretreatment
F. None of the Above

184. Which of the following statements is later removed from the bottom of the basin?
A. Equalize the basin
B. Agitate the water
C. Floc particles mix
D. Particles combine to form a sludge
E. Particles time to settle
F. None of the Above

Filtration

185. Filtration is a water treatment process step used to remove turbidity, dissolved organics, odor, taste and color.
A. True B. False

186. According to the text, the filter is periodically cleaned by a reversal of flow and the _____ into a drain.
A. Activated carbon filters
B. Cartridge filters
C. Anthracite coal
D. Rapid-sand filters
E. Discharge of back-flushed water
F. None of the Above

187. Which of the following terms are made of fabric, paper, or plastic?
A. Activated carbon filters
B. Cartridge filters
C. Anthracite filters
D. Rapid-sand filters
E. Granular synthetic filters
F. None of the Above

188. Which of the following terms will also remove turbidity, but would not be recommended for that purpose only?
A. Activated carbon filters
B. Cartridge filters
C. Anthracite coal
D. Rapid-sand filters
E. Granular synthetic material
F. None of the Above

189. According to the text, water is filtered at a rate of between 2 and 10 gpm per square foot, the water is filtered through an approximate 36" depth of graded sand.
A. True B. False

190. The water flows by gravity through large filters of_____, silica sand, garnet and gravel.
A. Activated carbon filters
B. Cartridge filters
C. Anthracite coal
D. Rapid-sand filters
E. All of the Above
F. None of the Above

191. Water filters for suspended particle removal can also be made of graded sand, _____, screens of various materials, and fabrics.
A. Activated carbon filters
B. Cartridge filters
C. Anthracite coal
D. Rapid-sand filters
E. Granular synthetic material
F. None of the Above

192. Which are the most widely used filters, that in these units, gravity holds the material in place and the flow is downward?

A. Activated carbon filters
B. Cartridge filters
C. Anthracite coal
D. Rapid-sand filters
E. Granular synthetic material
F. None of the Above

193. For the removal of organic contaminants and taste and odor problems, Anthracite coal or _____ may also be included in the sand to improve the filtration process, especially

A. Sand
B. Garnet
C. Activated carbon
D. Post-disinfection
E. All of the Above
F. None of the Above

194. Which of the following terms should be conducted on a routine basis, at least once per day?

A. Wall scum
B. Gate position
C. Effluent control measurement
D. Post-disinfection
E. Filtration process performance
F. None of the Above

195. Good chemical treatment management can often result in either early turbidity breakthrough or rapid head loss buildup.

A. True B. False

Declining Rate Filters

196. The flow rate will vary with?

A. Head loss
B. Uniform media
C. Effluent control
D. Post-disinfection
E. All of the Above
F. None of the Above

197. The declining rate filters system requires _____ to provide adequate media submergence.

A. Head loss
B. Uniform media
C. Effluent control structure
D. Post-disinfection
E. Flocculation
F. None of the Above

Detention Time

198. Detention time is the actual time required for a small amount of water to pass through a sedimentation basin at a given rate of flow, or the calculated time required for a small amount of liquid to pass through a tank at a given rate of flow.

A. True B. False

Jar Testing

199. Jar testing traditionally has been done on a monthly basis in most water treatment plants to control THMs.

A. True B. False

pH

200. According to the text, pH is an expression of a basic or acid condition of a liquid. The range is from 0-14, zero being the most acid and 14 being the most alkaline. A pH of 7 is considered to be neutral.

A. True B. False

201. According to the text, which of the following has a pH between 6.0 and 8.5?
A. Treated water D. All of the Above
B. Disinfectants E. Chlorine
C. Natural water F. None of the above

Caustic
202. NaOH is a strong chemical used in the treatment process to neutralize acidity, and to lower the pH value.
A. True B. False

Polymer
203. Polymer is a water treatment chemical that when combined with other types of coagulants, aids in binding small _____ to larger particles to help in the settling and filtering processes.
A. Excess floc D. Color
B. Coagulants E. Solids
C. Suspended particles F. None of the Above

Post-Chlorine
204. The operator should make sure that the chlorinated water holds a residual in the distribution system.
A. True B. False

Pre-Chlorination
205. Before the filtration process, chlorination will help: control fish and vegetation.
A. True B. False

Hydrofluosilicic Acid
206. H_2SiF_6 is a clear _____, with a pH ranging from 1 to 1.5 and used in water treatment to fluoridate drinking water.
A. Gas D. Fuming corrosive liquid
B. But colored liquid E. Dark pleasant liquid
C. Fluoridating drinking water liquid F. None of the Above

Corrosion Control
207. The pH of the water is adjusted with?
A. Acid E. Soda pop
B. Sodium carbonate D. Subsequent treatment processes
C. Fluoride acid F. None of the Above

208. Which of the following chemicals is fed into the water after filtration?
A. Acid E. Soda ash
B. Sodium Chloride D. Subsequent treatment processes
C. Fluoride acid F. None of the Above

Taste and Odor Control
209. Which of the following chemicals is occasionally added for taste and odor control?
A. Turbidity powder D. HOCL
B. Powdered activated carbon (PAC) E. All of the Above
C. Fluoride F. None of the Above

Water Quality

210. Water quality testing is conducted throughout the water treatment process.
A. True B. False

Chemical Feed and Rapid Mix

211. To improve the subsequent treatment processes, chemicals are added to the water, and may include pH adjusters and coagulants.
A. True B. False

212. Alum is a coagulant chemical, that neutralize positive or negative charges on small particles, allowing them to stick together and form larger particles that are more easily removed by sedimentation or filtration.
A. True B. False

Short-Circuiting

213. Short-circuiting is a condition that occurs in tanks or basins when some of the water travels faster than the rest of the flowing water.
A. True B. False

214. Short-circuiting is usually undesirable, since it may result in shorter contact, reaction, or settling times in comparison with the?
A. Presumed detention times
B. Sedimentation/clarification process
C. Modification of the conventional process
D. Up-flow clarifier
E. All of the Above
F. None of the Above

Tube Settlers

215. Tube settlers are a modification of the conventional process that contains many metal "tubes" that are placed in?
A. Clearwell
B. Sedimentation basin or clarifier
C. Flocculation basin
D. An up-flow clarifier
E. Filter
F. None of the Above

216. The slope of the tubes facilitates gravity settling of the solids to the bottom of the basin, where they can be?
A. Adjusted for detention times
B. Sampled
C. Collected and removed
D. Modified
E. Used for the sedimentation/clarification process
F. None of the Above

217. The large surface settling area also means that adequate clarification can be obtained with detention times of 45 minutes or more.
A. True B. False

218. Which of the following terms happened before this sedimentation step that is followed by filtration through mixed media?
A. Tube settlers
B. Reconditioning cycle
C. Traditional sand filter
D. Coagulation
E. Chemical pretreatment
F. None of the Above

Adsorption Clarifiers

219. In this sedimentation/clarification process, turbidity is _____ of the coagulated and flocculated solids onto the adsorption media and onto the solids already adsorbed onto the media.

A. Increased by adsorption
B. Reduced by adsorption
C. Destroyed
D. Decreased
E. A modification of the conventional process
F. None of the Above

EPA Filter Backwash Rule

220. The U.S. Environmental Protection Agency has finalized the Long Term 1 Enhanced Surface Water Treatment Rule and Filter Backwash Rule to_____ from contamination by Cryptosporidium and other microbial pathogens.

A. Enforce standards to protect
B. Increase filtration and disinfection
C. Increase protection of finished drinking water supplies
D. Remove
E. All of the Above
F. None of the Above

221. Long Term 1 Enhanced Surface Water Treatment Rule and Filter Backwash Rule will apply to public water systems using surface water or ground water under the direct?

A. Enforceable standards
B. Filtration and disinfection rules
C. Influence of surface water
D. Groundwater
E. All of the Above
F. None of the Above

222. Which of the following statements will reduce the potential risks associated with recycling contaminants removed during the filtration process?

A. Enforceable standards
B. Filter backwash requirements
C. Influence of surface water
D. Increase protection of finished drinking water supplies
E. Filtration and disinfection rules
F. None of the Above

Background

223. The EPA has determined that the presence of microbiological contaminants is a health concern. If finished water supplies contain _____, disease outbreaks may result.

A. Disease symptoms
B. Cryptosporidium
C. Waterborne diseases
D. Microbiological contaminants
E. All of the Above
F. None of the Above

Turbidity

224. Which of the following terms must comply with specific combined filter effluent turbidity requirements?

A. Watershed control
B. Raw water control
C. Disinfection profile
D. Disinfection benchmark
E. Conventional and Direct filtration systems
F. None of the Above

225. According to the text, conventional and _____must comply with individual filter turbidity requirements.
A. Groundwater D. Raw water
B. Direct filtration systems E. A and D
C. Disinfection processes F. None of the Above

Disinfection Benchmarking
226. Public water systems will be required to develop a(n) _____unless they perform applicability monitoring which demonstrates their disinfection byproduct levels are less than 80% of the maximum contaminant levels.
A. Updated watershed control D. Disinfection benchmark
B. Direct filtration system E. A and D
C. Disinfection profile F. None of the Above

227. According to the text, if a system considers making a significant change to their disinfection practice they must develop a(n) _____and receive State approval for implementing the change.
A. Updated watershed control D. Disinfection benchmark
B. Direct filtration systems E. A and D
C. Disinfection profile F. None of the Above

Other Requirements
228. Finished water reservoirs for which construction begins after the effective date of the rule must be covered; and unfiltered systems must comply with _____ requirements that add Cryptosporidium as a pathogen of concern.
A. Updated watershed control D. Disinfection benchmarking
B. Direct filtration system E. A and D
C. Disinfection profiling F. None of the Above

The Filtration Process
229. Sources of surface water are subject to run-off and do not undergo natural filtration, it must be filtered to remove particles and impurities.
A. True B. False

230. Removal of _____ plays an important role in the natural treatment of groundwater as it percolates through the soil.
A. Coagulation and flocculation processes
B. Coagulation or oxidation processes
C. Serious problems in filter operation
D. Suspended solids by filtration
E. A and D
F. None of the Above

231. Which of the following statements will happen especially if coagulation and flocculation of the water before filtration was not properly controlled?
A. Some coagulation and flocculation may occur in the filter bed
B. Coagulation or oxidation processes will work
C. No problems in filter operation
D. Physical and chemical mechanisms will improve
E. A and B
F. None of the Above

Types of Filters

232. The earliest water filters developed were the slow sand filters; these have filter rates of around 0.05 gpm/ft^2 of surface area. This type of filter requires large filter areas.
A. True B. False

233. What is the term for the mass of growing material that collects on the surface of the filter?
A. Schmutzdecke D. Mud balls
B. Water moss E. Zoological growth
C. Backwash F. None of the Above

234. Most water filters are classified by filtration rate, type of _____, or type of operation.
A. Schmutzdecke D. Filter media
B. Slow rate filtration E. Filter size
C. Backwash capabilities F. None of the Above

Rapid Sand Filters

235. Rapid sand filters can accommodate filter rates 40 times more than?
A. Fixed film D. Activated carbon beds
B. Slow sand filters E. Without sand
C. Mixed media F. None of the Above

236. Filters in large water treatment plants are usually constructed next to each other in a row, allowing the piping from the Sedimentation basins to feed the filters from a central pipe gallery.
A. True B. False

Filter Sand

237. The filter sand used in rapid sand filters is normal play sand for the purpose of water filtration.
A. True B. False

238. The gravel installed under the sand layer(s) in the filter prevents the _____ from being lost during the operation.
A. Rapid filters D. Sedimentation basin
B. Filter sand E. Mixed media
C. Backwash trough F. None of the Above

False floor

239. The false floor design of a _____ is used together with a porous plate design or with screens that retain the sand when there is no undergravel layer.
A. Rapid sand filter system D. Filter underdrain
B. Slow rate filtration system E. Leopold system
C. Backwash system F. None of the Above

240. Underdrains allows the jet action or open space under the floor to act as the collection area for the filtered water and of the filter backwash water.
A. True B. False

Diatomaceous Earth Filter

241. The Diatomaceous Earth Filter process was developed by the military during World War II to remove microorganisms that cause amoebic dysentery from water used in the field.
A. True B. False

Filtration Processes

242. The traditional design for many years is conventional filtration; this method provides effective treatment for just about any range of?
A. Raw-water turbidity
B. Costs
C. Microorganisms
D. Increase plant capacity
E. All of the Above
F. None of the above

243. Conventional filtration success is due partially to the sedimentation that precedes filtration and follows the coagulation and flocculation steps.
A. True B. False

244. Many treatment plants have converted rapid sand filters in to multi-media filters in an attempt to?
A. Control raw-water turbidity
B. Lower capital cost
C. Kill microorganisms
D. Increase plant capacity
E. All of the Above
F. None of the Above

245. In the other type of filtration process "direct filtration" no sedimentation follows the coagulation phase.
A. True B. False

246. Which of the following water treatment terms is designed to filter water with an average turbidity of less than 25 NTU?
A. Direct Filtration
B. Dual and multi-media filtration
C. Conventional Filtration
D. Flocculation
E. Pressure Sand Filtration
F. None of the Above

247. According to the text, dual and multi-media filters are used with Conventional Filtration.
A. True B. False

248. Some of the benefits of this method is that it has a lower capital cost, but this method or process cannot handle large variations in raw water turbidity.
A. Direct Filtration
B. Dual and multi-media filtration
C. Conventional Filtration
D. Flocculation
E. Sand Filtration
F. None of the Above

High Rate Filters

249. High rate filters, which operate at a rate _____, use a combination of different filter media, not just sand.
A. That finer material are farther down
B. Faster than 3 feet per second
C. Of 2 feet per second
D. Three-to-four times that of rapid sand filters
E. All of the Above
F. None of the Above

250. In the design of the high rate filter, the top layers consist of a fine material with the course material farther down, allowing the suspended material to penetrate less into the filter.
A. True B. False

251. The filter bed material forms layers in the filter, depending on their weight and specific gravities.
A. True B. False

Pressure Sand Filters
252. Pressure filtration rates are twice as good as gravity filters.
A. True B. False

253. Which type of filter is used extensively in iron and manganese removal plants?
A. Slow sand/RO D. Fast sand
B. Gravity filters E. Conventional
C. Pressure sand filter F. None of the Above

254. Which of the following terms or methods cracking of the filter bed can occur quite easily, allowing the iron and manganese particles to go straight through the filter?
A. Slow sand/RO D. Fast sand
B. Gravity filters E. Conventional
C. Pressure filters F. None of the Above

255. Which of the following filtration terms is contained under pressure in a steel tank?
A. Slow sand/RO D. Fast sand
B. Gravity filters E. Conventional
C. Pressure sand filter F. None of the Above

256. Which of the following filtration terms is the media usually sand or a combination of media?
A. Slow sand/RO D. Fast sand
B. Gravity filters E. Fixed film
C. Pressure sand filter F. None of the Above

257. During filtration, the water is under pressure, but _____will not occur in the filter.
A. Gravity D. Flow
B. Velocity E. Heat
C. Air binding F. None of the Above

Filtration Operation
258. Filtration operation is divided into three steps: filtering, backwashing, and?
A. Filter run D. Drying
B. Filtering to waste E. Rinsate
C. Return to waste F. None of the Above

259. Which of the following terms is a low-pressure membrane filtration process that removes suspended solids and colloids generally larger than 0.1-micron diameter?
A. Nanofiltration D. Semi-permeable
B. Pressure recovery E. Declining rate
C. Microfiltration F. None of the Above

260. Which of the following terms is a relatively recent membrane process used most often with low total dissolved solids water such as surface water and fresh groundwater?
A. Nanofiltration D. Semi-permeable
B. Pressure recovery E. Declining rate
C. Microfiltration F. None of the Above

Declining Rate
261. According to the text, which of the following terms or methods of control is used where the head loss through the plant is quite large?
A. Slow sand/RO D. Fast sand
B. Gravity filters E. Declining Rate
C. Pressure filters F. None of the Above

Loss of Head Indicator
262. As filtration proceeds, an increasing amount of pressure, called _____ across the filter, is required to force the water through the filter.
A. Filter run D. Head loss
B. Filtering to waste E. Head
C. Flow tube controller F. None of the Above

263. Which of the following parameters should be continuously measured to help determine when the filter should be backwashed?
A. Filter run D. Head loss
B. Filtering to waste E. Head
C. Flow tube controller F. None of the Above

264. Which of the following terms is measured in the difference by a piezometer connected to the filter above the media and the effluent line?
A. Filter run D. Head loss
B. Filtering to waste E. Head
C. Flow tube controller F. None of the Above

In-line Turbidimeter
265. Continuous turbidity monitors provide information about when the filter is approaching this point so that the operators can start the backwash before the turbidity is too great.
A. True B. False

266. Which of the following terms in water is caused by small-suspended particles that scatter or reflect light?
A. Shelter bacteria D. Floc
B. Suspended material E. Breakthrough
C. Turbidity F. None of the Above

267. Which of the following terms of the filtered water may shelter bacteria, preventing chlorine from reaching it?
A. Shelter bacteria D. Floc
B. Suspended material E. Breakthrough
C. Turbidity F. None of the Above

268. Which of the following terms of the filtered water is one of the factors that determine the length of a filter run?
A. Shelter bacteria
B. Suspended material
C. Turbidity
D. Floc
E. Breakthrough
F. None of the Above

269. Which of the following terms in water measurements will also indicate whether the coagulation and other treatment processes are operating properly?
A. Shelter bacteria
B. Suspended material
C. Turbidity
D. Floc
E. Breakthrough
F. None of the Above

Filtration Process

270. A rapid sand filter will have a flow of two-to-three gpm/square foot of filter area. The high rate filter may have four-to-six gpm/square foot applied to the surface.
A. True B. False

271. Water from the source or, more commonly, from pre-treatment processes is applied to the top of the filter; it then flows downward. The water level above the filter bed is usually kept at two-to-six feet.
A. True B. False

272. When the filtration is started after being backwashed, there will be great head loss.
A. True B. False

273. Which of the following terms in water is restricted during this time in filters with a control valve installed on the filter effluent pipe?
A. Shelter bacteria
B. Suspended material
C. Turbidity
D. Filter flow
E. All of the above except D
F. None of the Above

274. The control valve prevents filter surges, which could disturb the media and force _____ through the filter.
A. Flow
B. Suspended material
C. Dissolved solids
D. Floc
E. Breakthrough
F. None of the Above

275. Which of the following terms in water rate on a filter depends on the type of filter?
A. Flow
B. Suspended material
C. Turbidity
D. Floc
E. Breakthrough
F. None of the Above

276. Which of the following terms is almost fully closed when a filter is clean so that the desired water level on top of the filter is maintained?
A. Headloss valve
B. Constant rate flow valve
C. Flow restrictor
D. Backwash cycle valve
E. Variable declining rate flow control
F. None of the Above

Back Washing

277. A normal backwash rate is between 1.2 to 1.5 gpm per square foot of filter surface area.
A. True B. False

278. Proper backwashing is a very important step in the operation of a filter.
A. True B. False

279. Filter media expansion causes the filter grains to violently rub against each other, dislodging the _____ from the media.
A. Headloss D. Backwash cycle
B. Floc(s) E. Media
C. Flow restricting F. None of the Above

280. The filter backwash rate has to be great enough to expand and agitate the filter media and suspend the _____ in the water for removal.
A. Headloss D. Backwash cycle
B. Floc(s) E. Media
C. Flow restricting F. None of the Above

281. If the filter _____ is too high, media will be washed from the filter into the troughs and out of the filter.
A. Headloss D. Backwash rate
B. Floc(s) E. Media
C. Flow restricting F. None of the Above

282. During filter backwash, the media expands upwards and around the washing arms.
A. True B. False

283. According to the text, a newer method of surface wash involves using _____before the water wash.
A. Headloss calculation D. Backwash cycle
B. Floc(s) scouring E. Air washing
C. Air scour F. None of the Above

284. Which of the following terms needs two-to-five cubic feet of air per square foot of filter area?
A. Headloss calculation D. Backwash cycle
B. Floc(s) scouring E. Air washing
C. Air scour F. None of the Above

285. Which of the following terms is so high that the filter will no longer produce water at the desired rate?
A. Headloss D. Backwash rate
B. Floc(s) E. Flow rate
C. Flow restricting F. None of the Above

Backwashing Process

286. The normal method for opening the filter backwash valve involves draining the water level above the filter to a point six inches above the filter media.
A. True B. False

287. When the backwash valve is opened, which action allows backwash water to start flowing into the filter and start?
A. Control headloss D. Some means of controlling the media carryover
B. Crust on the filter E. Carrying suspended material away from the filter
C. Expand the bed F. None of the Above

288. For a filter with an air wash, the filter backwash water and the air wash should not be used together**.** This would be possible only if _____ is installed.
A. Control headloss D. Some means of controlling the media carryover
B. Crust on the filter E. Carrying suspended material away from the filter
C. Expand the bed F. None of the Above

289. When the surface wash is turned on it should be allowed to operate for several minutes to break up?
A. Control headloss D. Some means of controlling the media carryover
B. Crust on the filter E. Carrying suspended material away from the filter
C. Expand the bed F. None of the Above

290. The time elapsed from when the filter wash is started until full flow is applied to the filter should be greater than one minute.
A. True B. False

Disposal of Filter Backwash Water
291. Water from the filter backwash can be returned directly to the environment.
A. True B. False

292. The supernatant is then pumped back to the head of the treatment plant at a rate not exceeding ten percent of the?
A. Daily flow D. Raw water flow entering the plant
B. Backwash water E. Amount of solids that must be removed
C. Eliminates the need to obtain F. None of the Above

293. The settled material is pumped to a sewer or is treated in the solids-handling process, this conserves most of the backwash water and _____ a pollution discharge permit.
A. Daily flow D. Raw water flow entering the plant
B. Backwash water E. Amount of solids that must be removed
C. Eliminates the need to obtain F. None of the Above

Filter to Waste
294. When filtration is started after backwash, suspended material remains in the filter media until the turbidity in the effluent meets standards. Depending on the type of filter, this may last from 20-40 minutes.
A. True B. False

295. According to the text, wasting is needed as some _____following the backwash.
A. Daily flow D. Suspended material remains in the filter media
B. Backwash water E. Filtration should always be started
C. Return F. None of the Above

296. Which of the following terms should be done slowly after a backwash to prevent breakthrough of suspended material?
A. Daily flow
B. Backwash water
C. Return
D. Suspended material
E. Filtration should always be started
F. None of the Above

Filter Aids
297. A normal dose of polymer for filter aiding will be less than 0.1 ppm, but the exact dose will be decided by the result of a jar test and by experimentation in the treatment plant.
A. True B. False

298. _____ have very high molecular weight and cause the floc to coagulate and flocculate quickly.
A. Filter medias
B. Sand
C. Filters
D. Filter aids
E. Floc
F. None of the Above

299. More frequent filter backwashing and _____ will be required to remove the floc that has penetrated deeply into the filter bed?
A. Filter backwashing
B. Backwash water leaving the filter
C. Raw water flow entering the plant
D. Use of large volumes of backwash water
E. Serious damage to the filter underdrain
F. None of the Above

300. A _____ is a material that adds strength to the floc and prevents its breakup.
A. Filter backwashing
B. Backwash water leaving the filter
C. Raw water flow entering the plant
D. Too much backwash water is used
E. Filter aid
F. None of the Above

Filter Operating Problems
301. According to the text, there are three major types of filter problems. They can be caused by chemical treatment before the filter, _____, and backwashing of filters.
A. Filter aid
B. Control of filter flow rate
C. Filter media process
D. Turbidity breakthrough
E. Coagulation and flocculation stages
F. None of the above

Chemical Treatment before the Filter
302. Which of the following terms of the water treatment must be monitored continuously?
A. Filter aid
B. Control of filter flow rate
C. Filter media process
D. Turbidity breakthrough
E. Coagulation and flocculation stages
F. None of the above

303. Adjustments in the amount of coagulant added must be made frequently to prevent the filter from becoming overloaded with suspended material. This overload may cause the filter to prematurely reach its_____.
A. Filter aid
B. Control of filter flow rate
C. Maximum headloss
D. Turbidity breakthrough
E. Coagulation and flocculation stages
F. None of the above

304. If there is early turbidity breakthrough in the filter effluent, more coagulant may have to be added to the coagulation process.
A. True B. False

Control of Filter Flow Rate
305. When a filter is subjected to rapid changes in flow rate, the turbidity of the effluent will not be affected; the dirtier the coagulation and flocculation stages, the greater the effect.
A. True B. False

306. According to the text, addition of filter aids may also reduce the impact on the filter effluent.
A. True B. False

307. Backwashing a filter temporarily takes it out of service, the remaining filter(s) must pick up the additional flow, this can cause a change in flow that will cause?
A. Turbidity breakthrough
B. Backwash storage basin
C. Filter media breakthrough
D. Filter aid breakthrough
E. Coagulation and flocculation stages
F. None of the Above

Conventional Water Treatment
308. Which of the following terms gentle mixing accelerates the rate of particle collision, and the destabilized particles are further aggregated and enmeshed into larger precipitates?
A. Rapid mix chamber
B. GAC adsorption
C. Conventional treatment
D. Flocculation
E. Coagulant dose
F. None of the Above

309. According to the text, flocculation is affected by several parameters, including the mixing speed, mixing intensity (G), and mixing time. The product of the mixing intensity and mixing time (Gt) is frequently used to describe coagulation.
A. True B. False

310. Conventional treatment consists of the following unit processes: coagulation, flocculation clarification, and filtration, and is typically followed by disinfection at full-scale.
A. True B. False

311. Conventional treatment is often preceded by_____, may be accompanied by powdered activated carbon (PAC) addition.
A. Rapid mix chamber
B. GAC adsorption
C. Pre-sedimentation
D. Coagulant aid polymer(s) (s) Means plural or singular
E. Coagulant dose
F. None of the Above

312. During water treatment, conventional treatment is often preceded by _____takes place concurrently.
A. Flocculation process
B. Coagulation
C. The coagulant
D. Pre-oxidation, or oxidation
E. Clarification, and filtration
F. None of the Above

313. Occasionally membrane processes, either membrane filtration or ultrafiltration, accompany?
A. Flocculation process
B. Coagulation
C. The coagulant
D. Conventional treatment
E. Clarification, and filtration
F. None of the Above

314. Which of the following terms in this area or process is where a positively charged coagulant is added to raw water and mixed in the rapid mix chamber?
A. Flocculation process D. Conventional treatment
B. Coagulation E. Clarification and filtration
C. The coagulant F. None of the Above

315. Which of the following terms alters or destabilizes negatively charged particulate, dissolved, and colloidal contaminants?
A. Flocculation process D. Floc
B. Coagulation E. Clarification and filtration
C. The coagulant F. None of the Above

316. Which of the following terms and/or acid may also be added to enhance the coagulation process?
A. Rapid mix chamber D. Coagulant aid polymer(s)
B. GAC adsorption E. Coagulant dose
C. Conventional treatment F. None of the Above

317. Turbidity and total organic carbon (TOC) are measures of particulates and dissolved organics impacting?
A. Flocculation process D. Conventional treatment
B. Coagulation E. Clarification, and filtration
C. The effluent F. None of the Above

Destabilization Mechanisms
318. There are two primary destabilization mechanisms in drinking water treatment: charge neutralization and sweep flocculation.
A. True B. False

319. According to the text, many drinking water treatment plants operate using sweep flocculation, which requires a higher coagulant dose, rather than charge neutralization.
A. True B. False

320. Adding excess coagulant beyond charge-neutralization results in the formation of metal coagulant precipitates. These metal hydroxide compounds (e.g., Al(OH)3 or Fe(OH)3) are heavy, sticky and larger in particle size.
A. True B. False

321. In charge neutralization, the positively charged metal coagulant is attracted to the negatively charged _____via electrostatic interaction.
A. Ions D. Colloids
B. Coagulation particles E. Flocs
C. Coagulants chemicals F. None of the Above

322. Which of the following terms start to form during the neutralization step as particle collisions occur?
A. Ions D. Colloids
B. Coagulation particles E. Flocs
C. Coagulants chemicals F. None of the Above

323. Which of the following terms occurs when colloidal contaminants are entrained or swept down by the precipitates as they settle in the suspension?
A. Flocculation process D. Conventional treatment
B. Coagulation E. Clarification, and filtration
C. Sweep flocculation F. None of the Above

Coagulation
324. Which of the following terms for coagulation is 6 to 7 when using alum and 5.5 to 6.5 when using iron?
A. Effectively lower chemical costs D. The optimal pH range
B. Insufficient doses E. The speciation of the coagulant
C. Temperature F. None of the Above

325. Which of the following terms for high alkalinity water, may be needed to lower the pH to the optimal pH range?
A. Enhanced coagulation D. Excessive amounts of coagulant
B. Coagulant E. The coagulation-filtration process
C. Coagulation process F. None of the Above

326. Which of the following terms is now widely practiced for removing disinfection byproduct (DBP) precursors?
A. Enhanced coagulation D. An excessive amount of coagulant
B. Coagulant E. The coagulation-filtration process
C. Coagulation process F. None of the Above

Water Quality Parameters
327. Temperature impacts the coagulation process because it affects the viscosity of the water. Thus, lower temperature waters can decrease the hydrolysis and precipitation kinetics.
A. True B. False

328. The pH controls both the speciation of the coagulant as well as its solubility, and it also affects the speciation of the contaminants.
A. True B. False

329. Water quality parameters such as pH, temperature, and alkalinity may dictate effectiveness of?
A. Enhanced coagulation D. The program
B. Coagulant testing E. The coagulation-filtration process
C. Coagulation process F. None of the Above

330. The pH during this has a profound influence on the effectiveness during the destabilization process.
A. Coagulation D. The optimal pH range
B. Insufficient doses E. The speciation of the coagulant
C. Temperature F. None of the Above

331. Which of the following terms for high alkalinity water, may be required to lower the pH to the optimal pH ranges (alum pH 6 to 7, iron 5.5 to 6.5)?
A. Lime D. An excessive amount of coagulant
B. Coagulant E. GAC
C. PAC F. None of the Above

332. Which of the following terms along with other parameters like iron, manganese or sulfate impact coagulation?

A. Effectively lower chemical costs
B. Insufficient doses
C. For some treatment objectives
D. The optimal pH range
E. The speciation of the coagulant
F. None of the Above

Polyaluminium Chloride (PACl)

333. According to the text, some of the alternative coagulants such as polyaluminium chloride (PACl) can be advantageous over the traditional coagulants in low temperature conditions as these coagulants are already hydrolyzed, and therefore temperature tends to have less effect on the coagulation process.

A. True B. False

334. Following which one of the terms, agglomerated particles enter the clarification unit where they are removed by sedimentation by gravity or are floated and skimmed?

A. Enhanced coagulation
B. Sedimentation process
C. Coagulation process
D. Flocculation
E. The coagulation-filtration process
F. None of the Above

335. Which one of the following statements will the majority of the solids are removed by gravitational settling; particles that do not settle and are still suspended are removed during the filtration process?

A. Filtration
B. Insufficient doses
C. Aeration
D. Sedimentation processes
E. The speciation of the coagulant
F. None of the Above

336. Which one of the following term is generally accomplished in rectangular or circular basins and is often enhanced by the addition of inclined plates or tubes which increase effectiveness of the process by effectively increasing the surface area of the sedimentation basin?

A. Enhanced coagulation
B. Sedimentation
C. Coagulation process
D. Aeration
E. The coagulation-filtration process
F. None of the Above

Dissolved Air Flotation (DAF)

337. Dissolved air flotation (DAF) is another conventional treatment process in which air is diffused as fine bubbles and total suspended particles are floated to the surface and removed by skimming.

A. True B. False

338. DAF is most effective for small, fine, low-density particles like algae and may not be effective is all instances.

A. True B. False

Clarification Process

339. According to the text, the overflow rate is the process loading rate and is usually expressed in gpm/sf or gpd/sf.

A. True B. False

340. Sand-ballasted clarification systems have been demonstrated to operate effectively at overflow rates as high as 20 gpm/sf.

A. True B. False

341. There are two parameters frequently used to describe the clarification process are the overflow rate and?
A. Typical detention times D. The detention time
B. DAF E. Conventional treatment process
C. Filters F. None of the Above

342. Which of the following terms is used to express this for other processes can vary significantly?
A. Typical detention times D. The overflow rate(s)
B. DAF E. Conventional treatment process
C. Filters F. None of the Above

343. Typical detention times range from 1 to 2 hours, although many states require up to 4 hours for?
A. Typical detention times D. Full-scale surface water treatment
B. DAF E. Conventional treatment process
C. Filters F. None of the Above

Dual-media Filter
344. The most commonly used filter type in the conventional treatment process is a dual-media filter comprised of anthracite and sand
A. True B. False

345. Mono-media (sand), multi-media (garnet, anthracite, and sand), and other media configurations, including the use of granular activated carbon, are used in drinking water treatment.
A. True B. False

Filter Loading Rate
346. Which of the following terms is a measure of the filter production per unit area and is typically expressed in gpm/sf?
A. Contact time D. Higher filter rates
B. The filter run time E. The filter loading rate
C. Spent backwash time F. None of the Above

347. According to the text, typical filter loading rates range from 2 to 4 gpm/sf; however, _____, 4 to 6 gpm/sf, are becoming more common at full-scale.
A. Contact time D. Higher filter loading rates
B. The filter run time E. The filter loading rate
C. Spent backwash time F. None of the Above

348. Which of the following terms describes the length of time between filter backwashes during which a filter is in production mode?
A. Contact time D. Higher filter rates
B. The filter run time E. The filter loading rate
C. Spent backwash time F. None of the Above

349. Which of the following terms is not only an indicator of the effectiveness of prior treatment, but also plays a role in the effectiveness of the filter itself?

A. Filter(s)
B. The filter run time
C. Spent backwash
D. Conventional treatment process
E. Process solids
F. None of the Above

Filter Performance

350. Which of the following terms, particularly with regard to particulate contaminants, is often poorest immediately following a backwash?

A. Filter performance
B. The filter run time
C. Spent backwash
D. Conventional treatment process
E. Process solids
F. None of the Above

351. As the filter run time increases and the concentration of solids in the media increases, the filtration process often performs better with regard to particulate contaminant removal.

A. True B. False

Membrane Filtration Processes

352. Which of the following terms enables some water systems having contaminated water sources to meet new, more stringent regulations?

A. Membrane technology
B. Macromolecule(s)
C. Solute(s)
D. Conventional thermal separation process(es)
E. Direct filtration
F. None of the Above

Description of Membrane Filtration Processes

353. In the simplest _____, water is forced through a porous membrane under pressure, while suspended solid, large molecules or ions are held back or rejected.

A. The recovery of organic vapor(s)
B. Fractional distillation
C. Membrane processes
D. A selective barrier
E. Thermal separation method(s)
F. None of the Above

Microfiltration

354. The current primary use of MF is by industries to remove very fine particles from process water; in addition, this process has also been used as a pretreatment for?

A. Reverse osmosis or RO
B. Potable water treatment
C. Other membrane processes
D. Direct filtration process
E. Microfiltration or MF
F. None of the Above

Ultrafiltration

355. The smaller pore size is designed to remove colloids and substances that have larger molecules, which are called?

A. Reverse osmosis or RO
B. Potable water treatment
C. High-molecular-weight materials
D. Direct filtration process
E. Microfiltration or MF
F. None of the Above

356. UF membranes can be designed to pass material that weigh less than or?

A. Process liquid
B. Chloride and sodium
C. Total dissolved solids (TDS)
D. Material
E. Equal to a certain molecular weight
F. None of the Above

357. Although UF does not generally work well for removal of_____, it can be used effectively for removal or most organic chemicals.

A. Process liquid
B. Chloride and sodium
C. Total dissolved solids (TDS)
D. Material
E. Salt or dissolved solids
F. None of the Above

Nanofiltration

358. Nanofiltration (NF) process has been used primarily for water softening and reduction of?

A. Process liquid
B. Chloride and sodium
C. Total dissolved solids (TDS)
D. Material
E. Bacterial and protozoan life
F. None of the Above

359. NF capability will undoubtedly increase the use of _____for potable water treatment.

A. Reverse osmosis or RO
B. Potable water treatment
C. NF
D. Direct filtration process
E. Microfiltration or MF
F. None of the Above

Reverse Osmosis

360. RO membranes have very low MWC pore size that can reject ions at very high rates, including?

A. Process liquid
B. Chloride and sodium
C. Total dissolved solids (TDS)
D. Material
E. Bacterial and protozoan life
F. None of the Above

361. RO also works for most organic chemicals, radionuclides and microorganisms. An important _____ is for industrial water uses such as semiconductor manufacturing.

A. RO process
B. Potable water treatment
C. Colloids and substances
D. Direct filtration process
E. Microfiltration or MF
F. None of the Above

Microfiltration Specific Process

362. Microfiltration is a type of physical filtration process where a contaminated fluid is passed through a special pore-sized membrane to separate microorganisms and suspended particles from?

A. Process liquid
B. Chloride and sodium
C. Total dissolved solids (TDS)
D. Material
E. Bacterial and protozoan life
F. None of the Above

363. Which of the following terms works with such as ultrafiltration and reverse osmosis to provide a product stream that is free of undesired contaminants?

A. Various other separation processes
B. MF membranes
C. Ultrafiltration and reverse osmosis
D. Batch or semi-continuous filtration
E. Retentate and product streams
F. None of the Above

364. Microfiltration usually serves as a pre-treatment for other separation processes such as?

A. Cross flow filtration
B. Filtration process(es)
C. Performance of microfiltration
D. Ultrafiltration
E. Microfiltration process
F. None of the Above

Reverse Osmosis
Reverse Osmosis Process Section

365. Osmosis is a natural phenomenon in which a liquid - water in this case - passes through a semi-permeable membrane from a relatively dilute solution toward a more concentrated solution. This flow produces a measurable pressure, called osmotic pressure.
A. True B. False

366. Which of the following terms produces high quality water at low cost compared to other purifications processes?
A. Pressure differential
B. Osmotic pressure
C. Higher molecular weights
D. RO
E. Waste (concentrate)
F. None of the Above

367. Which of the following is determined by the total dissolved solids content of the saline solution, or contaminated solution on one side of the membrane?
A. This pressure differential
B. Osmotic pressure
C. Higher molecular weights
D. Virtually 100% of colloidal and suspended matter
E. Waste (concentrate)
F. None of the Above

368. The higher the content of dissolved solids, the higher the?
A. Pressure differential
B. Osmotic pressure
C. Higher molecular weights
D. Virtually 100% of colloidal and suspended matter
E. Waste (concentrate)
F. None of the Above

369. Which of the following result in higher osmotic pressures?
A. Pressure differential
B. Osmotic pressure
C. Higher molecular weights
D. Colloidal and suspended matter
E. Waste (concentrate)
F. None of the Above

370. According to the text, common tap water as found in most areas may have an osmotic pressure of about 10 PSI (Pounds per Square Inch), or about?
A. 36,000 PPM
B. A pressure of 10 PSI
C. Osmotic pressure(s)
D. 1.68 Bar
E. 376 PSI
F. None of the Above

371. According to the text, Seawater at _____ typically has an osmotic pressure of about 376 PSI (26.75 Bar).
A. 36,000 PPM
B. A pressure of 10 PSI
C. Osmotic pressure(s)
D. 1.68 Bar
E. 56 PSI
F. None of the Above

372. To reach the point at which osmosis stops for tap water, a pressure of 10 PSI would have to be applied to the saline solution, and to stop osmosis in seawater, a pressure of _____would have to be applied to the seawater side of the membrane.
A. 36,000 PPM
B. A pressure of 10 PSI
C. Osmotic pressure(s)
D. 1.68 Bar
E. 376 PSI
F. None of the Above

Brine Channel

373. Concentrated raw water is called the reject stream or concentrate stream, it may also be called brine if it is coming from a?

A. Each sheet of membrane material
B. Microporous support layer
C. Salt water source
D. Amount of permeate or product water
E. Concentrations of TDS
F. None of the Above

374. A membrane with a rejection rate of 99% (usually based on Na (Sodium)) will allow only 1% of the concentration of _____to pass through into the permeate.

A. Percentage of permeate
B. Raw water
C. Seawater and brackish water
D. Dissolved solids
E. Concentrate
F. None of the Above

375. As the raw water is processed, the concentrations of _____increase as it passes along the membrane's length and usually multiple membranes are employed, with each membrane in series seeing progressively higher dissolved solids levels.

A. Percentage of permeate
B. Raw water
C. Seawater and brackish water
D. TDS
E. Concentrate
F. None of the Above

376. Typically, starting with seawater of 36,000 PPM, standard rejection membranes produce?

A. Each sheet of membrane material
B. Permeate below 500 PPM
C. Brine
D. Amount of permeate or product water
E. Concentrations of TDS
F. None of the Above

Clean in Place" (CIP) System

377. Which of the following terms has proved to be the most reliable and cost effective method of desalinating water, and hence its use has become more and more widespread?

A. Reverse Osmosis
B. Potable water treatment
C. Nanofiltration
D. Direct filtration process
E. Microfiltration or MF
F. None of the Above

378. Which of the following terms is usually some 70% less than for comparable evaporation technologies?

A. Reverse Osmosis
B. Potable water treatment
C. Nanofiltration
D. Direct filtration process
E. Energy consumption
F. None of the Above

379. Which of the following terms have been improved as well, reducing maintenance and down time?

A. Each sheet of membrane material
B. Microporous support layer
C. Brine channel
D. Amount of permeate or product water
E. Component parts
F. None of the Above

Ozone

380. Which compound is obtained by passing a flow of air or oxygen between two electrodes that are subjected to an alternating current in the order of 10,000 to 20,000 volts?

A. Chloramine
B. Liquid Ozone
C. Ozone
D. Oxygen and nascent oxygen
E. O2
F. None of the Above

381. Which compound is a light blue gas at room temperature?
A. Chloramine D. Oxygen and nascent oxygen
B. Liquid Ozone E. O2
C. Ozone F. None of the Above

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

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

384. Ozone falls into the same category as other disinfectants because it can produce?
A. Carcinogens D. Oxygen and nascent oxygen
B. THMs E. Strongest oxidizing agent
C. DBPs F. None of the Above

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

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

Chlorine Section
Pathophysiology
387. As far as chlorine safety and respiratory protection, the intermediate _____of chlorine accounts for its effect on the upper airway and the lower respiratory tract.
A. Generation of free oxygen radicals D. Water solubility
B. Vapor from Chlorine gas E. The odor threshold for chlorine
C. Effects of Hydrochloric acid F. None of the Above

388. According to the text, respiratory exposure to _____ may be prolonged because its moderate water solubility may not cause upper airway symptoms for several minutes.
A. Hydrochloric acid D. The chemical species produced
B. Chlorine gas E. Plasma exudation
C. The gas F. None of the Above

389. Because chlorine gas is so dangerous, the odor threshold for chlorine is approximately?
A. 1 parts per million (ppm)
B. 3 parts per million (ppm)
C. 10 parts per million (ppm)
D. 3-5 parts per million (ppm)
E. 0.3-0.5 parts per million (ppm)
F. None of the Above

Mechanism of Activity

390. The mechanisms of cellular injury are believed to result from the oxidation of functional groups in cell components, from reactions with tissue water to form_____, and from the generation of free oxygen radicals.
A. Generation of free oxygen radicals
B. Chlorine acid
C. Hydrochloric acid
D. A caustic effect
E. Hypochlorous and hydrochloric acid
F. None of the Above

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

392. Chlorine gas should be stored in vented rooms that have panic bar equipped doors.
A. True B. False

Solubility Effects

393. Which of the following terms is highly soluble in water?
A. Hydrochloric acid
B. H2SO4
C. Hypochloric acid
D. Sodium hypochlorite solution
E. Sulfuric Acid
F. None of the Above

394. Because it is highly water soluble, Hypochlorous acid has an injury pattern similar to?
A. Hydrochloric acid
B. H2SO4
C. Hypochloric acid
D. Sodium hypochlorite solution
E. Sulfuric Acid
F. None of the Above

395. Which of the following terms may account for the toxicity of elemental chlorine and hydrochloric acid to the human body?
A. Hydrochloric acid
B. H2SO4
C. Hypochloric acid
D. Hypochlorous acid
E. Sulfuric Acid
F. None of the Above

Early Response to Chlorine Gas

396. If you mix ammonia with chlorine gas, this compound reacts to form?
A. Hypochlorous acid
B. Chlorine gas
C. Hydrochloric acid
D. Sulfuric acid
E. Chloramine gas
F. None of the Above

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

Immediate Effects

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

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

Chemistry of Chlorination

399. The hypochlorite ion is a much weaker disinfecting agent than Hypochlorous acid , about 100 times less effective.

A. True B. False

400. According to the text, pH and temperature affect the ratio of hypochlorous acid to hypochlorite ions. As the temperature is decreased, the _____increases.

A. Reduction Ratio
B. CT actual
C. Free chlorine residual
D. "CT" disinfection concept
E. Ratio of hypochlorous acid
F. None of the Above

401. Under normal water conditions, hypochlorous acid will also chemically react and break down into the hypochlorite ion.

A. True B. False

402. Although the ratio of _____is greater at lower temperatures, pathogenic organisms are actually harder to kill.

A. Hypochlorous acid
B. The amount of chlorine
C. Chlorine Demand
D. Total chlorine
E. pH value and temperature
F. None of the Above

403. All other things being equal, _____ and a lower pH are more conducive to chlorine disinfection.

A. Lower pH
B. Hypochlorous acid
C. Higher water temperatures
D. Lower water temperature
E. The hypochlorite ion
F. None of the Above

404. Under normal water conditions, hypochlorous acid will also chemically react and break down into a hypochlorite ion. (OCl -): HOCl $H^+ + OCl^-$ Also expressed $HOCl \rightarrow H^+ + OCl^-$

A. True B. False

405. All three forms of chlorine produce Sodium hypochlorite when added to water.

A. True B. False

406. Hypochlorous acid is a strong acid but a weak disinfecting agent. The amount of hypochlorous acid depends on the pH and temperature of the water.

A. True B. False

Types of Residual

407. _____ is all the chlorine that is available for disinfection.

A. Chlorine residual
B. Chlorine demand
C. Free chlorine
D. Break-point chlorination
E. Total chlorine residual
F. None of the Above

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

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

410. Which of the following terms is much more effective as a disinfecting agent?
A. Chlorine residual D. Break-point chlorination
B. Chlorine demand E. Total chlorine residual
C. Free chlorine F. None of the Above

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

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

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

Chlorine (DDBP)
Introduction to Chlorine (DDBP)
414. A typical chlorine residual is 2 ppm for this type of chlorine residual?
A. Free available chlorine and Total D. Combined Chlorine
B. Residual E. Combined chlorine and readily available
C. Break point and Free F. None of the Above

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

The Principal Trihalomethanes are:

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

A. True B. False

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

A. True B. False

Risks and Benefits of Chlorine

418. Many cities utilize ozone to disinfect their source water and to reduce formation of this parameter?

A. Chlorate and Chlorite
B. CO2 and H2SO4
C. Trihalomethanes (THMs)
D. Ammonia and THMS
E. Chloramines
F. None of the Above

419. _____ is a highly effective disinfectant; it breaks down quickly, so that small amounts of _____ or other disinfectants must be added to the water to ensure continued disinfection as the water is piped to the consumer's tap.

A. Ozone, Chlorine
B. UV, Chlorine
C. Chlorite, Chlorine
D. Chlorine Dioxide, Chlorine
E. Chloramines, Chlorine
F. None of the Above

Chlorination Equipment Requirement Section

420. Chlorine gas under pressure shall not be permitted outside the chlorine room. A chlorine room is where chlorine gas cylinders and/or ton containers are?

A. Under pressure
B. In this stage
C. Stored
D. At the point of solution application
E. Dosing enough chlorine
F. None of the Above

421. Anti-siphon valves shall be incorporated in the _____or in the discharge piping.

A. Gas vacuum line
B. A gas pressure relief system
C. Manual chlorine feed systems
D. Mechanical gas proportioning equipment
E. Pump heads
F. None of the Above

Capacity

422. Which of the following shall have the capacity to dose enough chlorine to overcome the demand and maintain the required concentration of the "free" or "combined" chlorine?

A. The chlorinator
B. Constant flow rate(s)
C. Uninterrupted chlorination
D. Automatic proportional controlled
E. Constant pre-established dosage
F. None of the Above

Methods of Control

423. Which piece if chlorination equipment, the feed rate of the chlorinator is controlled by a flow proportional signal and a residual analyzer signal to maintain particular chlorine residual in the water?

A. Gas vacuum line
B. Compound loop control system
C. Manual chlorine feed systems
D. Mechanical gas proportioning equipment
E. After post chlorination
F. None of the Above

Standby Provision

424. As a safeguard against_____ , standby chlorination equipment having the capacity to replace the largest unit shall be provided.

A. Flow change(s)
B. Constant flow rate(s)
C. Uninterrupted chlorination
D. Malfunction and/or shut-down
E. Constant pre-established dosage
F. None of the Above

Weigh Scales

425. Scales for weighing cylinders shall be provided at all plants using chlorine gas to permit an accurate reading of total daily weight of chlorine used. At large plants, scales of the recording and indicating type are recommended. As a minimum, a platform scale shall be provided. Scales shall be of corrosion-resistant material.

A. True B. False

Securing Cylinders

426. All chlorine cylinders shall be securely positioned to safeguard against movement. Tag the cylinder “empty” and store flat and chained. Ton containers may be stacked.

A. True B. False

Chlorine Leak Detection

427. Which of the following related chlorine alarm equipment shall be installed at all water treatment plants using chlorine gas?

A. Caustic soda solution reaction tanks
B. Corrosion resistant
C. Securely positioned
D. Automatic chlorine leak detection
E. Chlorine room ventilation system
F. None of the Above

428. You can use a spray solution of ammonia or a rag soaked with sulfur dioxide to detect a small Cl_2 leak. If there is a leak, the sulfur dioxide will create a white colored smoke - Sulfuric chloride.

A. True B. False

Chlorine Room Design Requirements

429. 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, corrosion resistant and?

A. Mechanically ventilated enclosure
B. Corrosion resistant
C. Securely positioned
D. Automatic chlorine leak detection
E. Chlorine room ventilation system
F. None of the Above

Ventilation

430. Which chlorine safety related equipment term shall have entirely separate exhaust ventilation systems capable of delivering one (1) complete air change per minute during periods of chlorine room occupancy only?

A. Shut off
B. The chlorine room
C. The room
D. Automatic chlorine leak detection
E. Chlorine room ventilation system
F. None of the Above

431. Which chlorine safety related equipment term should be louvered near the ceiling, the air being of such temperature as to not adversely affect the chlorination equipment?

A. The ceiling
B. The chlorine room
C. Air inlets
D. Automatic chlorine leak detection
E. Chlorine room ventilation system
F. None of the Above

432. Which chlorine safety related equipment term should 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. Gas chlorine room
B. The chlorine room
C. Chlorine room ventilation system
D. Automatic chlorine leak detection
E. Separate switches for fans and lights
F. None of the Above

Heating

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

A. Gas chlorine room
B. Separate heating systems
C. The room
D. Automatic chlorine leak detection
E. Chlorine room ventilation system
F. None of the Above

434. Which chlorine safety related equipment term shall be protected to ensure that the chlorine maintains its gaseous state when entering the chlorinator.

A. Cylinders or containers
B. Corrosion resistant
C. Securely positioned
D. Automatic chlorine leak detection
E. Chlorine room ventilation system
F. None of the Above

Storage of Chlorine Cylinders

435. If necessary, _____may be provided to simply store the chlorine gas cylinders, with no connection to the line. The chlorine cylinder storage room shall have access either to the chlorine room or from the plant exterior, and arranged to prevent the uncontrolled release of spilled gas.

A. Cylinders or containers
B. The outside of the room
C. A separate storage room
D. Uncontrolled release of spilled gas
E. Air inlets
F. None of the Above

436. Which chlorine safety related equipment term shall have provision for ventilation at thirty air changes per hour?

A. A panic button
B. The chlorine room
C. Scrubber(s)
D. The chlorine gas storage room
E. The chlorine cylinder storage room
F. None of the Above

437. Sometimes entry in very large facilities, may be through a vestibule from outside in to ?
A. Cylinders or containers access
B. The outside of the room
C. Chlorine rooms
D. Uncontrolled release of spilled gas
E. Air inlets
F. None of the Above

Scrubbers

438. According to the text, facilities located within residential or densely populated areas, consideration shall be given to provide scrubbers for_____.
A. A panic button
B. The chlorine room
C. Scrubber(s)
D. The chlorine gas storage room
E. The chlorine cylinder storage room
F. None of the Above

439. Chlorine combines with a wide variety of materials. These side reactions complicate the use of chlorine for disinfecting purposes. Their _____must be satisfied before chlorine becomes available to accomplish disinfection.
A. Combined residual
B. Free chlorine residual
C. Demand for chlorine
D. Total chlorine
E. Free chlorine
F. None of the Above

440. Which term means the amount of chlorine required to produce a residual of 0.1 mg/l after a contact time of fifteen minutes as measured by iodmetic method of a sample at a temperature of twenty degrees in conformance with Standard methods?
A. Combined residual
B. Free chlorine residual
C. Chlorine Demand
D. Total chlorine
E. Break point chlorination
F. None of the Above

Definitions

441. The amount of chlorine required to achieve disinfection and that reacts with the other chemicals is the?
A. Chlorine residual
B. Color change
C. Chlorine demand
D. Total
E. Free chlorine residual
F. None of the Above

442. Which of the following terms is used to disinfect - decreases, as the concentration of the chlorine increases?
A. pH increases
B. Chlorine level and water quality
C. Free chlorine residual
D. Required contact time
E. Available for disinfection
F. None of the Above

443. By adding a little more chlorine to what is already sufficient, this action will generally result in _____that can be measured easily.
A. pH increases
B. Chlorine level and water quality
C. Chlorine demand
D. Required contact time
E. A free chlorine residual
F. None of the Above

Common Hydraulic Terms

444. Which of the following definitions is when the pressure is equal to the height times the density of the liquid?
A. Head, Friction
B. Head, static
C. Head
D. Hydraulics
E. Hydrokinetics
F. None of the Above

445. Which of the following definitions is required to overcome the friction at the interior surface of a conductor and between fluid particles in motion?
A. Head, Friction D. Hydraulics
B. Head, static E. Hydrokinetics
C. Head F. None of the Above

446. The head required to overcome the friction at the interior surface of a conductor and between fluid particles in motion is the definition of _____.
A. Head, Friction D. Hydraulics
B. Head, static E. Hydrokinetics
C. Head F. None of the Above

447. Which of the following definitions is the pressure in a fluid at rest?
A. Pressure, Atmospheric D. Pressure, Gauge
B. Pressure, Static E. Pascal's Law
C. Hydraulics F. None of the Above

448. Which of the following definitions is the height of a column or body of fluid above a given point?
A. Head, Friction D. Hydraulics
B. Head, static E. Hydrokinetics
C. Head F. None of the Above

449. _____ is the pressure exerted by the atmosphere at any specific location.
A. Pressure, Atmospheric D. Pressure, Gauge
B. Pressure, Static E. Pascal's Law
C. Hydraulics F. None of the Above

450. Which of the following definitions is pressure above zone absolute, i.e. the sum of atmospheric and gauge pressure?
A. Pressure, Absolute D. Hydrokinetics
B. Pressure E. Pascal's Law
C. Hydraulics F. None of the Above

451. Sea level pressure is approximately 2.31 pounds per square inch absolute, 1 bar = .433psi.
A. True B. False

General Pumping Fundamentals
452. According to the text, suction lift is when the level of water to be pumped is below the?
A. Impeller D. Centerline of the pump
B. Suction E. Bellows
C. Lift water F. None of the Above

453. According to the text, the ability of the pump to lift water is the result of a partial vacuum created at the?
A. Partial vacuum D. Pressure differential
B. Suction lift E. Negative suction head
C. Center of the pump F. None of the Above

Pump Definitions

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

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

455. _____ is a rectangular piece of metal that prevents the impeller from rotating on the shaft.

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

Pumps

456. Pumps are excellent examples of?

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

457. More complicated pumps have valves check valves that open to allow _____, and close automatically to prevent reverse flow.

A. Pistons
B. Diaphragms
C. Discharged fluid
D. Passage in one direction
E. Lift pumps
F. None of the Above

458. There are many kinds of_____, and they are usually the most trouble-prone and complicated part of a pump.

A. Rotors
B. Force pumps
C. Inlets
D. Air space
E. Valves
F. None of the Above

Basic Water Pump

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

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

460. As the water slows down and its kinetic energy decreases, that water's pressure potential energy increases.

A. True B. False

461. As the water spins, the pressure near the outer edge of the pump housing becomes much lower than near the center of the impeller.

A. True B. False

462. The impeller blades cause the water to move faster and faster.

A. True B. False

Venturi (Bernoulli's law):

463. A venturi is a pipe that has a gradual restriction that opens up into a gradual enlargement.

A. True B. False

464. The area of the restriction in a venture will have a _____than the enlarged area ahead of it.

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

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

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

Types of Water Pumps

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

A. True B. False

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

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

468. Which of the following terms will produce at different rates relative to the amount of pressure or lift the pump is working against?

A. Variable displacement pump
B. Drive shaft
C. Column pipe
D. Single or multiple bowls
E. Pump's lifting capacity
F. None of the Above

469. Careful operation of oil-lubricated turbines is needed to ensure that the pumping levels do not drop enough to allow oil to enter the pump.

A. True B. False

470. According to the text, water and oil lubricated turbine pump units can be driven by?

A. Gears
B. Drive shaft
C. Column pipe
D. Electric or fuel powered motors
E. Pump's lifting capacity
F. None of the Above

471. Often an electric motor that is connected to the _____by a keyway and nut.

A. Drive shaft
B. Rotor
C. Inboard
D. Sprocket
E. Time delay or ratchet assembly
F. None of the Above

472. Where electricity is not readily available, fuel powered engines may be connected to the drive shaft by a?
A. Gear D. Volumetric positive displacement
B. Lantern ring E. Right angle drive gear
C. Drive shaft F. None of the Above

473. Oil and water lubricated systems will have a strainer attached to the _____to prevent sediment from entering the pump.
A. Intake D. Lantern ring
B. Diaphragm E. Sump
C. Inboard F. None of the Above

474. Which of the following terms: water flowing back down the column, turning the impellers in a reverse direction?
A. Vapor bubbles are created D. Volumetric positive displacement is turned off
B. Chamber pressure E. Line shaft turbine is turned off
C. Drive shaft is off F. None of the Above

Backflow Cross-Connection Section
475. Which of the following rules are required to be at least as stringent as the federal regulations as developed and enforced by the E.P.A.?
A. Enforcement responsibility D. Cross-Connection Control
B. Federal laws E. Local level laws
C. State program regulations F. None of the Above

476. Which of the following definition terms is "the link or channel connecting a source of pollution with a potable water supply?"
A. Direct piping D. Cross-Connection
B. Backflow E. Air break
C. Direct connection F. None of the Above

477. Which of the following definition terms, also referred to as Cross-Connection Control, addresses a serious health issue?
A. Direct piping D. Cross-Connection
B. Backflow prevention E. Water purveyor rules
C. Direct connection F. None of the Above

478. Cross-Connection was addressed by passage of the "Federal Safe Drinking Water Act" as developed by the Environmental Protection Agency (E.P.A.).
A. True B. False

479. The SDWA tasked each state with primary enforcement responsibility for a program to assure access to safe drinking water by all citizens.
A. True B. False

480. The following could be a cause of a cross-connection: A Situation as simple as leaving a garden hose nozzle submerged in a bucket of liquid or attached to a chemical sprayer.
A. True B. False

481. As far as a cross-connection, another potential hazard source within any environment may be a cross-connection of piping?
A. With an air gap
B. Backwater
C. Without a direct connection
D. Involving a water well located on the property.
E. Air break
F. None of the Above

482. The proper control of cross-connections is possible but?
A. Only through knowledge and vigilance
B. The key is public safety and the second is protection
C. Residential environment is always the pollutant source
D. Certainly not usually intentional
E. None of the Above

483. According to the text, public education is not essential, for many that are educated in piping and plumbing installations are able to recognize cross-connection dangers.
A. True B. False

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

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

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

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

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

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

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

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

492. Which of the following terms is any temporary or permanent connection between a public water system or consumer's potable water system and any source or system containing nonpotable water or other substances?
A. Backflow D. Cross-connection
B. Backpressure E. Indirect connection
C. Backsiphonage F. None of the Above

493. Which of the following terms is a form of backflow caused by a negative pressure (i.e., a vacuum or partial vacuum) in a public water system or consumer's potable water system?
A. Backflow D. Cross-connection
B. Backpressure E. Indirect connection
C. Backsiphonage F. None of the Above

494. Which of the following terms can occur whenever the amount of water being used exceeds the amount of water being supplied, such as during water line flushing, fire fighting, or breaks in water mains?
A. Backflow D. Cross-connection
B. Backpressure E. Reductions
C. Backsiphonage F. None of the Above

Protozoan Diseases
Protozoan Caused Diseases
495. Which of the following bugs is larger than bacteria and viruses but still microscopic, they invade and inhabit the gastrointestinal tract?
A. HIV infections D. Hepatitis A
B. Symptoms E. Protozoan pathogens
C. Giardiasis F. None of the Above

496. The backpacker's disease incubation period is 5-25 days or longer, with an average of 7-10 days, many infections are _____ (no symptoms).
A. Total D. Asymptomatic
B. Weak E. Unisymptomatic
C. Strong F. None of the Above

497. Which of the following bugs/disease terms occurs worldwide primarily because customers are 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 symptoms
E. Cryptosporidiosis symptoms
F. None of the Above

498. Which of the following bugs has been responsible for more community-wide outbreaks of disease in the U.S. than any other, drug treatment is not 100% effective?

A. HIV infection
B. Giardia lamblia
C. Giardiasis
D. Hepatitis A
E. Cryptosporidiosis
F. None of the Above

499. Which of the following is an example of a protozoan disease that is common worldwide, but was only recently recognized as causing human disease?

A. HIV infection
B. Giardia lamblia symptom
C. Giardiasis
D. Hepatitis A
E. Cryptosporidiosis
F. None of the Above

500. Which of the following 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