

**Registration Form**

**Surface Water Production CEU Training Course \$200.00**  
**48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL \$50.00**

**Start and Finish Dates:** \_\_\_\_\_

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

**Name** \_\_\_\_\_ **Signature** \_\_\_\_\_

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

**Address** \_\_\_\_\_

**City** \_\_\_\_\_ **State** \_\_\_\_\_ **Zip** \_\_\_\_\_

**Email** \_\_\_\_\_ **Fax (\_\_\_\_)** \_\_\_\_\_

**Phone:**  
**Home (\_\_\_\_)** \_\_\_\_\_ **Work (\_\_\_\_)** \_\_\_\_\_

**Operator ID #** \_\_\_\_\_ **Exp Date** \_\_\_\_\_

**Class/Grade** \_\_\_\_\_

*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 \_\_\_\_\_

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**Toll Free (866) 557-1746 Fax (928) 272-0747 E-mail [info@tlch2o.com](mailto:info@tlch2o.com)**

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## **DISCLAIMER NOTICE**

I understand that it is my responsibility to ensure that this CEU course is either approved or accepted in my State for CEU credit. I understand State laws and rules change on a frequent basis and I believe this course is currently accepted in my State for CEU or contact hour credit, if it is not, I will not hold Technical Learning College responsible. I fully understand that this type of study program deals with dangerous, changing conditions and various laws and that I will not hold Technical Learning College, Technical Learning Consultants, Inc. (TLC) liable in any fashion for any errors, omissions, advice, suggestions or neglect contained in this CEU education training course or for any violation or injury, death, neglect, damage or loss of your license or certification caused in any fashion by this CEU education training or course material suggestion or error or my lack of submitting paperwork. It is my responsibility to 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. It is my responsibility to ensure all information is correct and to abide with all rules and regulations.

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

**Do not solely depend on TLC's Approval list for it may be outdated.**

**A second certificate of completion for a second State Agency \$50 processing fee.**

**Some States and many employers require the final exam to be proctored.**

<http://www.abctlc.com/downloads/PDF/PROCTORFORM.pdf>

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## Surface Water Production Answer Key

Name \_\_\_\_\_

Phone \_\_\_\_\_

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

*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.*

*You can use Adobe Acrobat DC Program to complete the assignment.*

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

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| 62. ABCDEF | 94. ABCDEF  | 126. ABCDEF |
| 63. ABCDEF | 95. ABCDEF  | 127. ABCDEF |
| 64. ABCDEF | 96. ABCDEF  | 128. ABCDEF |
| 65. ABCDEF | 97. ABCDEF  | 129. ABCDEF |
| 66. ABCDEF | 98. ABCDEF  | 130. ABCDEF |
| 67. ABCDEF | 99. ABCDEF  | 131. ABCDEF |
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| 70. ABCDEF | 102. ABCDEF | 134. ABCDEF |
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| 256. A B C D E F | 278. A B C D E F | 300. A B C D E F |

You are finished with this assignment, please fax or e-mail the answer key and registration form to TLC. Always call to ensure we've received the assignment. Thank you.

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

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

**SURFACE WATER PRODUCTION  
CEU TRAINING COURSE  
CUSTOMER SERVICE RESPONSE CARD**

NAME: \_\_\_\_\_

E-MAIL \_\_\_\_\_ PHONE \_\_\_\_\_

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

1. Please rate the difficulty of your course.

Very Easy 0 1 2 3 4 5 Very Difficult

2. Please rate the difficulty of the testing process.

Very Easy 0 1 2 3 4 5 Very Difficult

3. Please rate the subject matter on the exam to your actual field or work.

Very Similar 0 1 2 3 4 5 Very Different

4. How did you hear about this Course? \_\_\_\_\_

5. What would you do to improve the Course?

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Any other concerns or comments.

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*This course contains general EPA's SDWA federal rule requirements. Please be aware that each state implements water / sampling procedures/safety/ environmental / building regulations that may be more stringent than EPA's regulations.*

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

### **Rush Grading Service**

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

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

### **Grading Information**

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# SURFACE WATER PRODUCTION CEU TRAINING COURSE ASSIGNMENT

*The Assignment (Exam) is also available in Word on the Internet for your Convenience, please visit [www.ABCTLC.com](http://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](mailto: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.**

## Safe Drinking Water Act

1. A public water system that serves \_\_\_\_\_ service connections used by year-round residents of the area served by the system or regularly serves at least 25 year-round residents.

- A. At least 5
- B. At least 15
- C. 1,000
- D. At least 30
- E. At least 500
- F. None of the Above

2. Which of the following EPA terms is under section 1452 of the SDWA, the EPA awards capitalization grants to states to develop drinking water revolving loan funds to help finance drinking water system infrastructure improvements?

- A. Drinking Water State Revolving Fund
- B. Contamination Source Inventory
- C. Class V Underground Injection Control
- D. Phase I
- E. Phase II
- F. None of the Above

3. Which of the following bugs is a protozoan associated with the disease cryptosporidiosis in humans?

- A. Giardia lamblia
- B. Water bear
- C. Cryptosporidium
- D. Hypoxia
- D. Paramecium
- E. None of the above

## Safe Drinking Water Act (SDWA) Review

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

- A. True
- B. False

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

- A. True
- B. False

**Relating to prevention of waterborne disease, the SDWA required EPA to:**

6. Set numerical standards, referred to as Maximum Contaminant Levels (MCLs — the highest allowable contaminant concentrations in drinking water) or treatment technique requirements for contaminants in public water supplies;

A. True            B. False

7. Through the Surface Water Treatment Rule (SWTR), EPA has set treatment requirements to control microbiological contaminants in public water systems using surface water sources (and ground-water sources under the direct influence of surface water).

A. True            B. False

8. Set criteria under which systems are obligated to filter water from surface water sources; it must also develop procedures for states to determine which systems have to filter.

A. True            B. False

9. Treatment must remove or inactivate at least 99.9% of *Giardia lamblia* cysts and 99.99% of viruses.

A. True            B. False

10. All systems must disinfect, and are not required to filter if certain source water quality criteria and site-specific criteria are met.

A. True            B. False

11. The regulations set guidelines for determining if treatment, including turbidity (suspended particulate matter) removal and disinfection recommendations, is adequate for filtered systems.

A. True            B. False

12. Issue regulations requiring monitoring of all regulated and certain unregulated contaminants, depending on the number of people served by the system, the source of the water supply, and the contaminants likely to be found;

A. True            B. False

**Contaminant Selection**

13. 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

14. P.L. 104-182 directs the EPA to evaluate contaminants that present the greatest health concern and to regulate contaminants that occur at concentration levels and frequencies of public health concern.

A. True    B. False

15. The law also includes a schedule for the EPA to complete regulations for disinfectants and disinfection byproducts (D/DBPs) and Copper.

A. True    B. False

### Standard Setting

16. For each contaminant that the EPA has determined merits regulation, the EPA must set a non-enforceable action levels 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

17. 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.

A. True B. False

18. 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

19. 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

20. 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

### Water Quality Key Words

21. Which of the following substances or compounds has a high degree of microporosity, just one gram has a surface area of approximately 500 m<sup>2</sup>, as determined typically by nitrogen gas adsorption?

- |                      |                             |
|----------------------|-----------------------------|
| A. Activated alumina | D. Dissolved organic carbon |
| B. Fluoride          | E. Aluminum salts           |
| C. Activated carbon  | F. None of the Above        |

22. Which of the following substances or compounds is a broad classification for organic molecules of varied origin and composition within aquatic systems?

- |                      |                             |
|----------------------|-----------------------------|
| A. Activated alumina | D. Dissolved organic carbon |
| B. Fluoride          | E. Aluminum salts           |
| C. Activated carbon  | F. None of the Above        |

23. The "dissolved" fraction of which compound is an operational classification?

- |                      |                      |
|----------------------|----------------------|
| A. Activated alumina | D. Organic carbon    |
| B. Fluoride          | E. Aluminum salts    |
| C. Activated carbon  | F. None of the Above |

24. EDTA is a widely used abbreviation for the chemical compound electro dialysis acid.

A. True B. False

25. Which of the following substances or compounds is manufactured from aluminum hydroxide by dehydroxylating it in a way that produces a highly porous material?

- A. Activated alumina
- B. Fluoride
- C. Activated carbon
- D. Dissolved organic carbon
- E. Aluminum salts
- F. None of the Above

26. Which of the following substances or compounds has been processed to make it extremely porous and thus to have a very large surface area available for adsorption or chemical reactions?

- A. Activated alumina
- B. Fluoride
- C. Activated carbon
- D. Dissolved organic carbon
- E. Aluminum salts
- F. None of the Above

27. Which of the following substances or compounds forms especially strong complexes with Mn(II), Cu(II), Fe(III), Pb (II) and Co(III)?

- A. Activated alumina
- B. Dissolved organic carbon
- C. Activated carbon
- D. Ethylenediaminetetraacetic acid (EDTA)
- E. B and C
- F. None of the Above

### **SDWA Water Quality Chapter 2 - Information and MCLs - Radionuclides**

28. Which compound/element can dissolve and accumulate in underground water sources, such as wells, and in the air in your home?

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

29. Which compound/element do communities add to their drinking water to promote dental health?

- A. Fluorine
- B. Fluoride
- C. Floc
- D. Chlorine
- E. Arsenic
- F. None of the Above

30. 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

31. Some people who drink water containing this compound/element 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

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

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

33. 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

34. 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

### Microbial Regulations

35. 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 will tighten turbidity standards by December 2001.

- A. True
- B. False

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

- A. True
- B. False

37. 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

38. 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 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

39. 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

40. Which rule was established to maintain control of pathogens while systems lower disinfection byproduct levels to comply with the Stage 1 Disinfectants/Disinfection Byproducts Rule and to control Cryptosporidium?

- 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**

41. 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

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

**Chlorite**

43. 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

**New EPA Rules**

**Arsenic**

44. Long-term exposure of which 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

45. The EPA set a standard limit on the amount of compound/element/substance in drinking water to 10 ppb.
- A. Arsenic
  - B. Trihalomethanes
  - C. Disinfection
  - D. Copper
  - E. Disinfection byproducts (DBPs)
  - F. None of the Above

46. This compound/element/substance is a chemical that occurs naturally in the earth's crust. When rocks, minerals, and soil erode, they release this compound/element/substance into water supplies.
- A. Arsenic
  - B. Trihalomethanes
  - C. Disinfection byproducts
  - D. Basalt
  - E. Granite
  - F. None of the Above

**ICR**

47. 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

48. 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

## Disinfection Rule

49. Chlorine is the most widely used water disinfectant due to its effectiveness and cost. Using chlorine as a drinking water disinfectant has prevented millions of water borne diseases, such as typhoid, cholera, dysentery, and diarrhea. Most states require community water systems to use chlorination.

- A. True
- B. False

50. These compounds are called disinfection by-products (DBPs). All disinfectants form DBPs in one of two reactions: Chlorine and chlorine-based compounds (halogens) react with organics in water causing the chlorine atom to substitute other atoms resulting in \_\_\_\_\_.

- A. Chlorine
- B. Organic sulfide(s)
- C. Calcium carbonate
- D. Halogenated by-products
- E. HOCl
- F. None of the Above

51. Oxidation reactions, where chlorine oxidizes \_\_\_\_\_ present in water.

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

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

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

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

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

54. Which of the following rules applies to all public water systems using groundwater?

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

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

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

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

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

57. Which of the following rules apply to all community and non-community water systems using a disinfectant such as chlorine, chloramines, ozone and chlorine dioxide?

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

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

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

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

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

### Public Health Concerns

60. 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

61. Which of the following terms have 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

62. 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

63. 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 Surface Water Treatment Rule
- E. Interim Enhanced Surface Water Treatment Rule
- F. None of the Above

64. 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

65. 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
- E. Interim Enhanced Surface Water Treatment Rule
- F. None of the Above

66. 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

67. 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

68. 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

69. 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

70. 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

71. 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

72. 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

73. 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

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

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

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

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

76. Which of the following rules targets systems with the greatest risk and builds incrementally on existing rules?

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

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

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

78. Which of the following terms 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

79. Compliance with the maximum contaminant levels for two groups of disinfection byproducts (TTHM and HAA5), referred to as?

- 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

80. 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?**

81. Which of the following rules will 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

82. 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

83. 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

**Water Treatment Section Chapter 3**

**Preliminary Treatment**

84. Weeds, leaves, and trash, if not removed, these 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

85. According to the text, wire mesh screens need maintenance and will require?

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

86. 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**

87. 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

88. 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

89. Scrapers on the bottom move the settled sludge to one or more hoppers at the influent end of the tank; it may have a \_\_\_\_\_ or traveling bridge used to collect the sludge.

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

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

- A. True
- B. False

### Flights and Chains

91. 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

92. 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

93. To prevent damage to the flights and chains due to overloads, a \_\_\_\_\_ is used.

- A. Bearing
- B. Reducer
- C. Shear pin
- D. Safety net
- E. A and B
- F. None of the Above

### Conventional Water Treatment

94. 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

95. 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

96. 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

97. 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

98. 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

99. 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

100. 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
  - B. Coagulation
  - C. The coagulant
  - D. Conventional treatment
  - E. Clarification and filtration
  - F. None of the Above

### Destabilization Mechanisms

101. There are two primary destabilization mechanisms in drinking water treatment: charge neutralization and sweep flocculation.

- A. True
- B. False

102. 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

103. Adding excess coagulant beyond charge-neutralization results in the formation of metal coagulant precipitates. These metal hydroxide compounds (e.g.,  $\text{Al}(\text{OH})_3$  or  $\text{Fe}(\text{OH})_3$ ) are heavy, sticky and larger in particle size.

- A. True
- B. False

104. In charge neutralization, the positively charged metal coagulant is attracted to the negatively charged \_\_\_\_\_ via electrostatic interaction.

- A. Ions
- B. Coagulation particles
- C. Coagulants chemicals
- D. Colloids
- E. Flocs
- F. None of the Above

105. Which of the following terms start to form during the neutralization step as particle collisions occur?

- A. Ions
- B. Coagulation particles
- C. Coagulants chemicals
- D. Colloids
- E. Flocs
- F. None of the Above

106. 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
- B. Coagulation
- C. Sweep flocculation
- D. Conventional treatment
- E. Clarification, and filtration
- F. None of the Above

### Coagulation

107. 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
- B. Insufficient doses
- C. Temperature
- D. The optimal pH range
- E. The speciation of the coagulant
- F. None of the Above

108. Which of the following terms for high alkalinity water, may be needed to lower the pH to the optimal pH range?

- A. Enhanced coagulation
- B. Coagulant
- C. Coagulation process
- D. Excessive amounts of coagulant
- E. The coagulation-filtration process
- F. None of the Above

109. Which of the following terms is now widely practiced for removing disinfection byproduct precursors?

- A. Enhanced coagulation
- B. Coagulant
- C. Coagulation process
- D. An excessive amount of coagulant
- E. The coagulation-filtration process
- F. None of the Above

110. It is important to determine the optimal dose for coagulation; insufficient doses will not affect the particles and adding excessive doses cannot cause detrimental effects such as re-stabilization, excessive sludge production, or corrosion.

- A. True
- B. False

### **Circular Clarifiers**

111. The most common type of Circular Clarifier has a center pier or column.

- A. True
- B. False

112. Which of the following processes uses Alum and cationic polymer to neutralize the charge?

- A. Filtration
- B. Reconditioning
- C. Purification
- D. Flocculation
- E. Conventional
- F. None of the Above

113. 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
- B. PAC
- C. Activated carbon
- D. Dissolved organic carbon
- E. Alum
- F. None of the Above

114. 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
- B. Reconditioning cycle
- C. Traditional sand filter
- D. All of the above except C
- E. Chemical pretreatment
- F. None of the Above

115. Which of the following systems use graded silica Sand filter media?

- A. Conventional technology
- B. Reconditioning cycle
- C. Membranes
- D. All of the above except C
- E. Chemical pretreatment
- F. None of the Above

116. Filtration occurs only within the last few inches of the courser materials at the bottom of the bed.

- A. True
- B. False

117. Which of the following terms may increase filtered water clarity, measured in NTU, by 90% compared with filtration alone?

- A. Conventional technology
- B. Reconditioning cycle
- C. Traditional
- D. Fast rinse
- E. Chemical pretreatment
- F. None of the Above

118. 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

119. 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
- B. Reconditioning cycle
- C. Sedimentation process
- D. Fast rinse
- E. Chemical pretreatment
- F. None of the Above

### Rapid Sand Filtration

120. Which of the following terms is the most prevalent form of water treatment technology in use today?

- A. Conventional technology
- B. Reconditioning cycle
- C. Sedimentation process
- D. Rapid Sand filtration
- E. Chemical pretreatment
- F. None of the Above

121. Rapid Sand filtration process employs a combination of \_\_\_\_\_ in order to achieve maximum effectiveness.

- A. Filtration
- B. Aluminum Sulfate
- C. Chemical pretreatment
- D. Sedimentation process
- E. Physical and chemical processes
- F. None of the Above

### Coagulation

122. 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

123. The alum and the water are mixed rapidly by the?

- A. Cationic polymers
- B. Flash mixer
- C. Coagulant chemicals
- D. Shaker
- E. All of the Above
- F. None of the Above

124. What is the process of joining together particles in water to help remove organic matter called?

- A. Cationic polymers
- B. Coagulation
- C. Coagulant chemicals
- D. Flocculation
- E. All of the Above
- F. None of the Above

125. Aluminum Sulfate is also excellent for removing nutrients such as phosphorous in wastewater treatment.

- A. True
- B. False

126. 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

127. 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

128. 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

129. Coagulation is necessary to meet the current regulations for almost all potable water plants using surface water.

- A. True
- B. False

130. Coagulant chemicals such as "alum" work by neutralizing the negative charge, which allows the particles to come together.

- A. True
- B. False

131. Which of the following terms 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

132. 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

133. 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

### **Flocculation**

134. Flocculation is the process of bringing together destabilized or coagulated particles to form larger masses which can be settled and/or filtered out of the water being treated.

- A. True
- B. False



135. Flocculation is the process where the suspended particles can collide, \_\_\_\_\_, and form heavier particles called "floc".

- A. Equalization
- B. Agitation of the water
- C. Agglomerate
- D. Destabilized or coagulated particles
- E. All of the Above
- F. None of the Above

136. 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

137. Which of the following process statements happens in the water, bacteria and other microorganisms are caught in the floc structure?

- A. Equalize the basin
- B. Agitate the water
- C. Floc particles mix
- D. Coagulated particles
- E. All of the Above
- F. None of the Above

### Pre-Sedimentation

138. 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
- B. Agitate the water
- C. Floc particles mix
- D. Coagulated particles
- E. Particles time to settle
- F. None of the Above

### Sedimentation

139. Sedimentation is the process of destabilizing coagulated particles in water.

- A. True
- B. False

140. 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

141. 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

142. Filtration is a water treatment process step used to remove turbidity, dissolved organics, odor, taste and color.

- A. True
- B. False

143. 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

144. 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

145. 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

146. 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

147. 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

148. 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

149. 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

150. 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

151. Which of the following statements 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

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

- A. True
- B. False

**Declining Rate Filters**

153. 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

**Detention Time**

154. Detention time is 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

**Disinfection**

155. For disinfection, Chlorine is added to the water at the flash mix for pre-disinfection in which the chlorine kills or inactivates harmful microorganisms.

- A. True
- B. False

**Jar Testing**

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

- A. True
- B. False

**pH**

157. According to the text, which of the following has a pH between 6.0 and 8.5?

- A. Treated water
- B. Disinfectants
- C. Natural water
- D. All of the Above
- E. Chlorine
- F. None of the above

**Caustic**

158. NaOH is a strong chemical used in the treatment process to neutralize acidity, and to lower the pH value.

- A. True
- B. False

**Polymer**

159. 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
- B. Coagulants
- C. Suspended particles
- D. Color
- E. Solids
- F. None of the Above

**Post-Chlorine**

160. The operator should make sure that the chlorinated water holds a residual in the distribution system.

- A. True
- B. False

**Pre-Chlorination**

161. Before the filtration process, chlorination will help: control fish and vegetation.

- A. True
- B. False

### Hydrofluosilicic Acid

162.  $\text{H}_2\text{SiF}_6$  a clear \_\_\_\_\_, with a pH ranging from 1 to 1.5 and used in water treatment to fluoridate drinking water.

- A. Gas
- B. But colored liquid
- C. Fluoridating drinking water liquid
- D. Fuming corrosive liquid
- E. Dark pleasant liquid
- F. None of the Above

### Corrosion Control

163. Which of the following terms is fed into the water after filtration?

- A. Acid
- B. Sodium Chloride
- C. Fluoride acid
- D. Soda ash
- E. Subsequent treatment processes
- F. None of the Above

### Taste and Odor Control

164. Which of the following terms is occasionally added for taste and odor control?

- A. Turbidity powder
- B. Powdered activated carbon (PAC)
- C. Fluoride
- D. HOCL
- E. All of the Above
- F. None of the Above

### Water Quality

165. Some Water quality items are tested several times per day, some once per quarter and others once per year.

- A. True
- B. False

### Chemical Feed and Rapid Mix

166. To improve the subsequent treatment processes, chemicals are added to the water, and may include pH adjusters and coagulants.

- A. True
- B. False

167. 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

168. 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

169. 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

170. Tube settlers are a modification of the conventional process 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

171. The slope of the tube settlers 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

172. 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

173. Which of the following terms happened before the 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

174. In the 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

175. Water scouring cleans adsorption clarifiers followed by air flushing is a must.

- A. True
- B. False

176. Cleaning of the clarifier is initiated less often than filter backwashing because the clarifier removes less solids.

- A. True
- B. False

177. Tube-settler type of package plant, the Sedimentation/clarification process is followed by mixed-media filtration and disinfection to complete the water treatment.

- A. True
- B. False

### Clearwell

178. The clearwell provides temporary storage for the treated water, which is the final step in the conventional filtration process.

- A. True
- B. False

### EPA Filter Backwash Rule

179. 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

180. 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?

- 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

181. 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

182. 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

183. Which of the following statements 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

184. According to the text, conventional and \_\_\_\_\_ must comply with individual filter turbidity requirements.

- A. Groundwater
- B. Direct filtration systems
- C. Disinfection processes
- D. Raw water
- E. A and D
- F. None of the Above

### Disinfection Benchmarking

185. 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
- B. Direct filtration system
- C. Disinfection profile
- D. Disinfection benchmark
- E. A and D
- F. None of the Above

186. 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
- B. Direct filtration systems
- C. Disinfection profile
- D. Disinfection benchmark
- E. A and D
- F. None of the Above

### Other Requirements

187. 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
- B. Direct filtration system
- C. Disinfection profiling
- D. Disinfection benchmarking
- E. A and D
- F. None of the Above

### The Filtration Process

188. 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

189. Groundwater that has been softened or treated through iron and manganese removal will require filtration to remove floc created by?

- A. Coagulation and flocculation
- B. Coagulation or oxidation processes
- C. Serious problems in filter operation
- D. A combination of complex physical and chemical mechanisms
- E. Suspension
- F. None of the Above

190. Which of the following statements will happen especially if coagulation and flocculation of the water before filtration was not properly controlled?

- A. 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

191. The oldest water filters developed were the slow sand filters, these have filter rates of around 0.05 gpm/ft<sup>2</sup> of surface area. This type of filter requires large filter areas.

- A. True
- B. False

192. What is the term for the mass of growing material that collects on the surface of the filter?

- A. Schmutzdecke
- B. Water moss
- C. Backwash
- D. Mud balls
- E. Zoological growth
- F. None of the Above

193. Most water filters are classified by filtration rate, type of \_\_\_\_\_, or type of operation.

- A. Schmutzdecke
- B. Slow rate filtration
- C. Backwash capabilities
- D. Filter media
- E. Filter size
- F. None of the Above

### Rapid Sand Filters

194. Rapid sand filters can accommodate filter rates 40 times more than?

- A. Fixed film
- B. Slow sand filters
- C. Mixed media
- D. Activated carbon beds
- E. Without sand
- F. None of the Above

195. 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

196. The filter sand used in rapid sand filters is normal play sand for the purpose of water filtration.

- A. True
- B. False

197. The gravel installed under the sand layer(s) in the filter prevents the \_\_\_\_\_ from being lost during the operation.

- A. Rapid filters
- B. Filter sand
- C. Backwash trough
- D. Sedimentation basin
- E. Mixed media
- F. None of the Above

198. This under-gravel supports the filter sand and is usually graded in three to five layers, each generally 6-18 inches in thickness, depending on the type of underdrain used.

- A. True
- B. False

199. Which of the following will contain 24-30 inches of sand, but some newer filters are deeper?

- A. Rapid sand filters
- B. Slow rate filtration
- C. Backwash trough
- D. Sedimentation basin
- E. Mixed media
- F. None of the Above

200. According to the text, the coarser sand in the \_\_\_\_\_ has larger voids that do not fill as easily.

- A. Rapid filters
- B. Slow rate filtration
- C. Backwash trough
- D. Sedimentation basin
- E. Mixed media
- F. None of the Above

### False floor

201. 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
- B. Slow rate filtration system
- C. Backwash system
- D. Filter underdrain
- E. Leopold system
- F. None of the Above

202. 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



### Leopold System

203. According to the text, the Leopold system consists of a series of clay or plastic blocks that form the channels to remove the filtered water from the filter and distribute the?

- A. Backwash water
- B. Surface wash system
- C. Media
- D. Backwashing of the filter or backwash cycle
- E. Removed filtered water
- F. None of the Above

### Washwater Troughs

204. During the operation of a filter, the upper six-to-ten inches of the filter media remove most of the suspended material, this layer is thoroughly cleaned during the?

- A. Rinsing cycle
- B. Method of agitation
- C. Washing
- D. Backwash cycle
- E. Filtered water cycle
- F. None of the Above

205. In most cases, backwashing does not clean this layer completely; some \_\_\_\_\_ is needed to break up the top layers of the filter and to help the backwash water remove any material caught there.

- A. Rinsing cycle
- B. Method of agitation
- C. Washing
- D. Backwash cycle
- E. Surface wash
- F. None of the Above

206. Which of the following terms uses compressed air to mix the upper layer and loosen the particles from the sand so that the backwash water can remove the particles more easily?

- A. Rinsing cycle
- B. Method of agitation
- C. Washing
- D. Backwash cycle
- E. Surface wash
- F. None of the Above

207. Washwater troughs placed above the filter media collect the \_\_\_\_\_ and carry it to the drain system.

- A. Backwash water
- B. Raw water
- C. Media
- D. Rinsing of the filter or backwash cycle
- E. Rinsate
- F. None of the Above

208. Proper troughs placement must ensure that the filter media is not carried into the troughs during the \_\_\_\_\_ and removed from the filter.

- A. Backwash
- B. Raw water
- C. Media
- D. Mudballs
- E. Rinsate
- F. None of the Above

209. Wash troughs must be installed at the same elevation so that they remove the \_\_\_\_\_ evenly from the filter and so that an even head is maintained across the entire filter.

- A. Backwash
- B. Raw water
- C. Media
- D. Mudballs
- E. Rinsate
- F. None of the Above

210. Which of the following are constructed from concrete, plastic, fiberglass, or other corrosion-resistant materials?

- A. Backwash troughs
- B. Surface wash system piping
- C. False floor
- D. Trap door
- E. Center stand
- F. None of the Above

**Diatomaceous Earth Filter**

211. 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

**High Rate Filters**

212. 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

213. Multi-media or mixed-media filters use three or four different materials, sand, anthracite coal, and garnet.

- A. True            B. False

214. Finer sand grains are at this location farther down into the filter, in rapid sand filters.

- A. Bottom of the sand layer with larger grains
- B. Top of the sand layer with larger grains
- C. Front of the sand layer with larger grains
- D. End of the sand layer with larger grains
- E. Top of the sand layer with finer grains
- F. None of the Above

215. In the design of the high rate filter?

- A. Finer material are farther down
- B. The media size decreases
- C. Larger suspended particles are removed first
- D. The media size increases
- E. Water is treated better
- F. None of the Above

216. 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

217. The filter bed material forms layers in the filter, depending on their weight and specific gravities.

- A. True            B. False

**Pressure Sand Filters**

218. Filtration rates are twice as good as gravity filters.

- A. True            B. False

219. Which type of filter is used extensively in iron and manganese removal plants?

- A. Slow sand/RO
- B. Gravity filters
- C. Pressure sand filter
- D. Fast sand
- E. Conventional
- F. None of the Above

220. 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
- B. Gravity filters
- C. Pressure filters
- D. Fast sand
- E. Conventional
- F. None of the Above

221. Which of the following filtration terms is contained under pressure in a steel tank?

- A. Slow sand/RO
- B. Gravity filters
- C. Pressure sand filter
- D. Fast sand
- E. Conventional
- F. None of the Above

222. Which of the following filtration terms is the media usually sand or a combination of media?

- A. Slow sand/RO
- B. Gravity filters
- C. Pressure sand filter
- D. Fast sand
- E. Fixed film
- F. None of the Above

223. During filtration, the water is under pressure, but this term will not occur in the filter.

- A. Gravity
- B. Velocity
- C. Air binding
- D. Flow
- E. Heat
- F. None of the Above

224. Which of the following terms or methods have a major disadvantage in that the backwash cannot be observed?

- A. Slow sand/RO
- B. Gravity filters
- C. Pressure filters
- D. Fast sand
- E. Conventional
- F. None of the Above

225. According to the text, which of the following terms or methods have limitations, and must not be used to treat surface water?

- A. Slow sand/RO
- B. Gravity filters
- C. Pressure filters
- D. Fast sand
- E. Conventional
- F. None of the Above

### **Filtration Operation**

226. Filtration operation is divided into three steps: filtering, backwashing, and?

- A. Filter run
- B. Filtering to waste
- C. Return to waste
- D. Drying
- E. Rinsate
- F. None of the Above

227. 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
- B. Pressure recovery
- C. Microfiltration
- D. Semi-permeable
- E. Declining rate
- F. None of the Above

228. 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
- B. Pressure recovery
- C. Microfiltration
- D. Semi-permeable
- E. Declining rate
- F. None of the Above

### Declining Rate

229. According to the text, \_\_\_\_\_ or methods of control is used where the head loss through the plant is quite large.

- A. Slow sand/RO
- B. Gravity filters
- C. Pressure filters
- D. Fast sand
- E. Declining Rate
- F. None of the Above

230. The rate through the declining rate filter is much greater in the beginning of a filter run than at the end when the?

- A. Filter run
- B. Filter is dirty
- C. Head loss is low
- D. Flow tube controller is operating
- E. All of the Above
- F. None of the Above

231. According to the text, which of the following terms or methods allows the filter head to increase until the filter becomes plugged with particles and the Head loss is too great to continue operation of the filter?

- A. Slow sand/RO
- B. Gravity filters
- C. Pressure filters
- D. Fast sand
- E. Declining Rate
- F. None of the Above

### Filtration Processes

232. 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

233. Conventional filtration success is due partially to the sedimentation that precedes filtration and follows the coagulation and flocculation steps.

- A. True
- B. False

234. 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

235. In the other type of filtration process "direct filtration" no sedimentation follows the coagulation phase.

- A. True
- B. False

236. 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

237. According to the text, dual and multi-media filters are used with Conventional Filtration.

- A. True
- B. False

238. 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

#### Loss of Head Indicator

239. Which of the following terms is required to force the water through the filter?

- A. Filter run
- B. Filtering to waste
- C. Flow tube controller
- D. Head loss
- E. Head
- F. None of the Above

240. Which of the following terms should be continuously measured to help determine when the filter should be backwashed?

- A. Filter run
- B. Filtering to waste
- C. Flow tube controller
- D. Head loss
- E. Head
- F. None of the Above

241. 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
- B. Filtering to waste
- C. Flow tube controller
- D. Head loss
- E. Head
- F. None of the Above

#### In-line Turbidimeter

242. 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

243. Which of the following terms in water is caused by small suspended particles that scatter or reflect light?

- A. Shelter bacteria
- B. Suspended material
- C. Turbidity
- D. Floc
- E. Breakthrough
- F. None of the Above

#### Filtration Process

244. 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

245. 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

246. When the filtration is started after being backwashed, there will be great head loss.

- A. True
- B. False

### Water Quality Parameters

247. 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

248. 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

249. 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

250. The pH during \_\_\_\_\_ 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

251. 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

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

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

### Polyaluminium Chloride (PACl)

253. 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.

- A. True      B. False

254. 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      D. Flocculation  
B. Filtration      E. The coagulation-filtration process  
C. Coagulation process      F. None of the Above

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

256. 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)**

257. 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

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

- A. True
- B. False

### **Clarification Process**

259. 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

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

- A. True
- B. False

261. There are two parameters frequently used to describe the clarification process are the overflow rate and?

- A. Typical detention times
- B. DAF
- C. Filters
- D. The detention time
- E. Conventional treatment process
- F. None of the Above

262. Which of the following terms is used to express this for other processes can vary significantly?

- A. Typical detention times
- B. DAF
- C. Filters
- D. The overflow rate(s)
- E. Conventional treatment process
- F. None of the Above

263. Typical detention times range from 1 to 2 hours, although many states require up to 4 hours for?

- A. Typical detention times
- B. DAF
- C. Filters
- D. Full-scale surface water treatment
- E. Conventional treatment process
- F. None of the Above

### **Dual-media Filter**

264. 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

265. Mono-media, multi-media, and other media configurations, including the use of granular activated carbon, are also used in drinking water treatment.

- A. True      B. False

266. During filtration, the majority of suspended particles are removed in the?

- A. Filter(s)      D. Scum box  
B. The filter run time      E. Top portion of the filter media  
C. Spent backwash      F. None of the Above

267. Filters are backwashed to dislodge and remove particles trapped within this missing term to reduce head loss, and to keep the filter media clean.

- A. Filter(s)      D. Filter to waste valve  
B. The filter run time      E. Filter inlet  
C. Filter bed      F. None of the Above

### **Filter Loading Rate**

268. 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

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

### **Filter Performance**

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

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

### **Back Washing**

271. A normal backwash rate is between 1.2 to 1.5 gpm per square foot of filter surface area.

- A. True      B. False

272. Proper backwashing is a very important step in the operation of a filter.

- A. True      B. False

273. The filter will eventually develop additional operational problems, if the filter is not completely?

- A. Bumped      D. Backwashed  
B. Jetted      E. Flow restrictor  
C. Air scoured      F. None of the Above



274. Which of the following terms starts to break through the filter and the turbidity in the filter effluent increases; and/or a filter run reaches a given hour of operation?

- A. Headloss
- B. Floc(s)
- C. Flow
- D. Backwash rate
- E. Media
- F. None of the Above

275. If a filter is taken out of service for some reason, it does not need to be backwashed prior to being put on line.

- A. True
- B. False

### Backwashing Process

276. 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

277. When the backwash valve is opened, this action allows backwash water to start flowing into the filter and start?

- A. Control headloss
- B. Crust on the filter
- C. Expand the bed
- D. Some means of controlling the media carryover
- E. Carrying suspended material away from the filter
- F. None of the Above

278. For a filter with an air wash, the filter backwash water and the air wash should not be used together; this could be possible only if the following is installed.

- A. Control headloss
- B. Crust on the filter
- C. Expand the bed
- D. Some means of controlling the media carryover
- E. Carrying suspended material away from the filter
- F. None of the Above

279. Opening the valves too rapidly can cause \_\_\_\_\_, filter gravel, and filter media.

- A. Backwash water is used
- B. Backwash water leaving the filter
- C. Raw water flow entering the plant
- D. Too much backwash water is used
- E. Serious damage to the filter underdrain
- F. None of the Above

### Disposal of Filter Backwash Water

280. Water from the filter backwash can be returned directly to the environment.

- A. True
- B. False

281. 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
- B. Backwash water
- C. Eliminates the need to obtain
- D. Raw water flow entering the plant
- E. Amount of solids that must be removed
- F. None of the Above

282. 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
- B. Backwash water
- C. Eliminates the need to obtain
- D. Raw water flow entering the plant
- E. Amount of solids that must be removed
- F. None of the Above

**Filter to Waste**

283. 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

284. According to the text, wasting is needed as some \_\_\_\_\_ following the backwash.

- A. Daily flow
- B. Backwash water
- C. Return
- D. Suspended material remains in the filter media
- E. Filtration should always be started
- F. None of the Above

285. 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**

286. 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

287. Which of the following terms 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

288. Which of the following terms should be added just ahead of the filter?

- A. Filter media
- B. Polymer
- C. Filter
- D. Filter aid
- E. Floc
- F. None of the Above

289. Which of the following terms if too much is added will cause the bonds to become too strong, which may then cause the filter to plug?

- A. Filter media
- B. Polymer
- C. Filter
- D. Filter aid
- E. Floc
- F. None of the Above

**Filter Operating Problems**

290. 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**

291. 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**

292. 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

**Bacteriological Monitoring Section**

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

294. Which of the following terms is used to signal possible fecal contamination, and therefore, the potential presence of pathogens?  
A. Indicator bacteria      D. Microbiological analysis  
B. Pathogenic bacteria      E. Presence of an indicator  
C. Contaminate      F. None of the Above

**Chain of Custody Procedures**

295. Which of the following terms begins when the sample containers are obtained from the laboratory? From this point on, a chain of custody record will accompany the sample containers.  
A. Multiple sources      D. Chain of custody record  
B. Sample siting plan      E. Sampling containers  
C. Total coliform      F. None of the Above

**Positive or Coliform Present Results**

396. 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

**Heterotrophic Plate Count HPC**

297. 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

**Spread Plate Method**

298. During the Spread Plate Method, colonies can be transferred quickly, and \_\_\_\_\_ easily can be 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**

299. 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

**Total Coliforms**

300. 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